BOOK OF ABSTRACTS

ENTOMOLOGY STUDENTS CONCLAVE 2025

Assam Agricultural University, Jorhat, Assam
15-17, March 2025

ORGANISED BY

The Entomological Society of India, New Delhi
Assam Agricultural University, Jorhat, Assam
ICAR-Indian Agricultural Research Institute, New Delhi

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Entomology Students Conclave 2025

Book of Abstracts

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15-17 March, 2025
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The Entomological Society of India, New Delhi,
Department of Entomology, Assam Agricultural University, Jorhat, Assam
Division of Entomology, ICAR-Indian Agricultural Research Institute, New Delhi

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Entomology Students Conclave 2025

March 15-17, 2025 at Assam Agricultural University, Jorhat, Assam

PREFACE

Entomology is a science of discovery - one that unravels the complexities of the insect world and its profound impact on ecosystems, agriculture, and human well-being. The Entomology Students Conclave 2025 (ESC2025), hosted at Assam Agricultural University (AAU), Jorhat is a witness to the ever-growing curiosity and dedication of young entomologists who strive to explore, innovate, and contribute to this fascinating field.

Organized under the aegis of the Entomological Society of India (ESI), ESC2025 in collaboration with AAU, Assam and ICAR-IARI, New Delhi, it serves as a platform for aspiring researchers, students, and experts to come together, exchange ideas, and push the frontiers of entomological science. With important keynote talks, industry-academia session, and student-led presentations, this conclave will foster an environment of learning, collaboration, and innovation.

The Department of Entomology, AAU, Jorhat, with its legacy of academic excellence and research in entomological sciences, provides the perfect setting for this prestigious gathering. The conclave will not only highlight advancements in Entomology but it will provide overview of the research happening in the field of entomology. It also offers opportunities for networking, skill-building, and interdisciplinary dialogue for young entomologist essential for shaping the future of insect science in India and beyond.

We extend our sincere gratitude to the organizing committee, distinguished speakers, and enthusiastic participants whose collective efforts have made ESC2025 possible. It is our firm belief that this conclave will inspire new perspectives, nurture budding talents, and strengthen the community of young entomologists dedicated to making meaningful contributions to science and society. We thank ESI for providing ESI Travel Grants for the selected students to encourage them to attend ESC2025.

With great enthusiasm, we welcome you all to ESC2025 at AAU, Jorhat. May this conclave ignite curiosity, foster friendships, and pave the way for a brighter future in Entomology!

EDITORS

Entomology Students Conclave 2025 (ESC2025)

Dr. Bidyut C. Deka
Vice Chancellor

ASSAM AGRICULTURAL UNIVERSITY
JORHAT-785013, ASSAM (INDIA)

(Recipient of Sardar Patel Outstanding Institution Award)

Message

It gives me immense pleasure to learn that the Department of Entomology of Assam Agricultural University is going to organize 'the Entomology Students Conclave' during March 15 -17,2025 in collaboration with the Entomological Society of India, New Delhi. It is indeed an important conclave which will assemble students, scientists and eminent entomologists in a single platform for future course of action in education and research.

I strongly believe that the conclave will pave the way for new perspectives of research for the benefit of farmers and other stakeholders in the field of agriculture in the days to come.

I congratulate the organizers for their noble initiative of organizing the conclave.

I wish the event a grand success.

(Bidyut C. Deka)

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Message

It gives me immense pleasure to extend my best wishes for the Entomology Students Conclave-2025 (ESC-2025), a significant initiative aimed at fostering scientific exchange and research excellence among young entomologists. Building upon the success of ESC-2024, this conclave, jointly organized by Assam Agricultural University (AAU), the Entomological Society of India, and the Division of Entomology, ICAR-IARI, New Delhi, continues to serve as a premier platform for students to present their research, engage in meaningful discussions, and receive valuable feedback from experts in the field.

Entomology plays a pivotal role in crop protection, integrated pest management, and ecological sustainability. In the face of climate change and evolving pest dynamics, the development of innovative pest control strategies, sustainable agricultural practices, and biodiversity conservation measures has become more crucial than ever. This conclave provides young researchers the opportunity to explore emerging challenges, exchange knowledge, and contribute to solutions that will benefit both agriculture and the environment.

A key highlight of ESC-2025 is the recognition and encouragement of students through awards for best oral and poster presentations, along with travel grants, which serve as motivation for academic excellence and innovation. Such incentives foster a spirit of competition and inspire students to contribute meaningfully to the field of entomology.

ICAR-IARI has always been committed to nurturing young scientists by supporting platforms like the Entomology Students Conclave, which facilitate interaction between students and leading experts while promoting interdisciplinary research. I urge all participants to make the most of this opportunity, engage actively, and take forward the knowledge gained from this event.

I congratulate the organizers for their dedication in bringing together students, researchers, and experts in a collaborative learning environment. I sincerely hope that such initiatives will be held more frequently, ensuring continuous learning and progress in the field of entomology.

7/3/25
(Ch. Srinivasa Rao)

Message

I am truly delighted to share this message for the Entomology Students Conclave 2025 (ESC25). Having been associated with the Entomological Society of India (ESI) for decades, I have witnessed its remarkable growth as a custodian and leading platform for Entomology in India. Over the past five years, ESI has been buzzing with impactful initiatives aimed at advancing and disseminating entomological knowledge.

One of the novel and important initiative to bringing young entomology students together on a common platform to hear their voices, experiences, and aspirations is Entomology Student Conclave. As an academician, research manager, and entomologist, I have always longed to see how the next generation practices this profession, to nurture their potential, and to create opportunities for them to thrive. We have made strides by organizing first ESC2024 at Bengaluru, Karnataka which bought entomologists from different part of the country. However, connecting entomologist from challenging regions like Northeastern states with other parts of country was challenging. This ESC2025 at Jorhat, Assam is bringing entomologist in challenging regions with entomologists at a national scale. It fills me with immense joy to see this long-cherished vision come to life through ESC25. The sight of hundreds of enthusiastic young minds coming together without regional boundaries to share, learn, and grow is truly an unparalleled achievement. I sincerely hope that this initiative not only thrives but becomes a sustained tradition in the years to come.

Wishing ESC25 great success and hoping it fulfils its objectives in inspiring and shaping the future of entomology.

Dr. SN Puri
Chief Patron, ESI

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Message

It has always been a pleasure and a privilege to be part of the Entomological Society of India (ESI) and actively contribute to its initiatives. As the oldest professional society dedicated to Entomology, ESI has been at the forefront of promoting this vital field for over eight decades. I take immense pride in the fact that it remains the only dedicated platform supporting the dissemination of knowledge generated by budding entomologists, especially young postgraduate students specializing in various aspects of Entomology. What makes this even more exciting is ESI's latest initiative—bringing together young students who are just beginning their professional journey in Entomology onto a common platform. This effort is not just about fostering academic growth; it is about building a strong community of future entomologists.

The organization of ESC24 at Bengaluru, Karnataka is a remarkable step in this direction and this year's ESC2025 at AAU, Jorhat, Assam is bringing more than 250 students from different part of the country. The idea of gathering and listening to hundreds of young entomologists is both ambitious and inspiring. These passionate students are coming together for this event is nothing short of extraordinary. This conclave provides them with a unique opportunity to learn from each other, share ideas, and engage in meaningful discussions that will shape their futures. I wholeheartedly congratulate ESI for making this vision a reality. Bringing together entomology students from across the country for a few days of exchange and learning is a truly commendable achievement. This initiative will undoubtedly play a significant role in promoting Entomology both as a profession and as a lifelong passion.

My warmest congratulations and best wishes for ESC25's success!

Dr. KS Khokhar
Patron, ESI

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Message

On behalf of the Entomological Society of India, I extend warm greetings to all the enthusiastic students and faculty gathered at the Assam Agricultural University, Jorhat for the Entomology Students Conclave ESC25. I heartily congratulate the Assam Agricultural University, in particular the Department of Entomology for venturing in this activity with all its hard work, efforts and dedication.

As the future entomologists of India, students are the torchbearers of a legacy that has shaped our understanding of the intricate world of insects. Our curiosity, passion, and dedication will drive the next wave of innovations in entomology, addressing pressing challenges in agriculture, public health, and environmental sustainability. This conclave is a fantastic opportunity for all of us to engage with peers, share knowledge, and learn from each other's experiences. It's a platform to ignite new ideas, foster collaborations, and build lasting connections within the entomological community. As we embark on this exciting journey, we must remember that entomology is not just a science, but a way of understanding the interconnectedness of life on our planet. Our work will have a profound impact on the health of our ecosystems, the well-being of our communities, and the future of our planet. We need to understand that Entomologists require to change especially in fostering an integrated and holistic approach to resolving the emerging challenges in plant protection.

I will be joyous and satisfied if this ESC25 encourage the students to be curious, ask questions, and seek answers. Accomplishing productive networks with fellow students, researchers, and professionals in the field is the motive. Sharing the current research, learning from others, and be inspired by the incredible diversity of entomological research is the objective. I earnestly wish that the ESC25 serves this purpose.

The Entomological Society of India is committed to supporting and nurturing the next generation of entomologists. Society is looking forward to seeing the impact of the students' research work and celebrating the achievements in the years to come.

I welcome you all to this conclave and wish you stimulating, informative, and enjoyable days with memorable happenings.

Best regards
Ramamurthy
President, ESI

डॉ. वाय. जी. प्रसाद
निदेशक
Dr. Y. G. Prasad
Director

Message

It is with great pleasure that I extend my best wishes to the organizers and participants of the Entomology Students Conclave 2025 (ESC2025), to be held at Assam Agricultural University, Jorhat. This event conceptualized by the Entomological Society of India is unique, bringing together bright minds and passionate students all under one roof.
Insects are an integral component of our ecosystems, influencing food security, biodiversity, and environmental sustainability. As the challenges posed by climate change, pest outbreaks, and habitat loss become more pressing, the role of entomologists has never been more vital. This conclave provides an excellent platform for students to engage with emerging research, share innovative ideas, and foster collaborations that will shape the future of entomological sciences in India and beyond. I am confident that this conclave will leave an indelible mark on our collective understanding of Entomology.

I encourage each participant to actively participate, share your experiences, and embrace the opportunity to learn from fellow delegates. Whether you are a young researcher, a budding entomologist, or someone with a keen interest in the subject, this conclave is a space for collaboration, networking, and growth. Let us seize this moment to ignite new ideas, challenge existing paradigms, and collectively contribute to the ever-evolving field of Entomology.

On behalf of the ICAR-CICR, Nagpur and Entomological Society of India, I extend my heartfelt congratulations to the organizing committee. The dedication invested in assembling entomology students for several days of in-depth discussions is truly admirable. I am confident that this event will be a resounding success, fostering a spirit of curiosity, innovation, and scientific collaboration.

I wish all the participants a productive and enriching experience at the *Entomology Students' Conclave 2025*. May this event inspire new discoveries and strengthen the passion for entomology among students and researchers alike.

Director
ICAR-CICR, Nagpur

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Dr. S.N. Sushil
Director

F.NBAIR/12-4/2024-25
6th March 2025

Message

I am absolutely delighted to share this message about the Entomology Students Conclave 2025 (ESC25) at Assam Agricultural University, Jorhat, Assam. As Vice -President of the Entomological Society of India (ESI), I have derived immense joy from contributing to its diverse initiatives. Over the years, I have witnessed the remarkable growth of ESI, and it fills me with pride to see it flourishing as the premier platform for sharing cutting-edge entomological knowledge, particularly among young postgraduate students specializing in various facets of entomology.

What excites me most is ESI's recent commitment to fostering a strong sense of community among young entomologists as they embark on their professional journeys. This initiative aims to provide them with a common platform to exchange ideas, share experiences, and collaborate, thereby strengthening their collective learning and growth.

The Entomology Students Conclave 2024 (ESC24) is a testament to this vision. Bringing together over 300 enthusiastic young minds in Bengaluru, this event offered an unparalleled opportunity for young entomologists to engage in meaningful discussions, build connections, and learn from one another. Continuing with this initiative, the upcoming ESC25 will further contribute to the glory of celebrating entomology with young minds. Such initiatives are vital in shaping the next generation of entomologists and strengthening the field as a whole.

I extend my heartfelt congratulations to the Entomological Society of India, Assam Agricultural University, and ICAR-IARI, New Delhi, for organizing this incredible event. The effort put into bringing together aspiring entomologists for a few days of intensive learning and exchange is truly commendable. I have no doubt that ESC25 will leave a lasting impact, furthering entomology both as a profession and a passion. My best wishes to ESI for the success of this inspiring endeavour !

06.03.25
Dr. S.N. Sushil,
Director, ICAR-NBAIR and Vice President, ESI

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Message

I am extremely pleased that the Entomology Students Conclave 2025 (ESC2025) is being organized by the Entomological Society of India (ESI), New Delhi, in collaboration with Assam Agricultural University, Jorhat (AAU), ICAR-IARI, New Delhi at AAU, Jorhat campus. This conclave serves as an excellent platform for students, scientists, and researchers in the field of Entomology to engage in meaningful discussions, exchange ideas, and foster collaborations. Such gatherings play a crucial role in instilling a spirit of excellence and scientific inquiry, which are essential for shaping the future of entomological research and education.

In the rapidly evolving landscape of science and technology, there is a pressing need to integrate modern techniques and innovative approaches into entomological research. Advancements in molecular biology, bioinformatics, and precision agriculture have opened new frontiers for developing efficient green technologies and sustainable solutions for pest management. It is imperative that young researchers embrace these advancements to address the growing challenges posed by insect pests and their impact on agriculture, biodiversity, and public health.

Furthermore, a multidisciplinary approach that brings together various crop protection disciplines, institutions, and stakeholders is essential for achieving the common goal of sustainable pest management. Strong collaboration among entomologists, plant pathologists, agronomists, and policymakers can significantly enhance our collective efforts toward safeguarding agricultural productivity and ensuring food security.

I am confident that the discussions and deliberations at this conclave will generate valuable insights and practical recommendations for advancing entomological science and sustainable crop protection. I extend my best wishes to all the participants especially students for a highly productive and enriching event. May this ESC2025 inspire innovative research, strengthen professional networks, and contribute meaningfully to the growth of entomology in India and beyond.

Best wishes for a successful and impactful conclave

Poonam Jasrotia

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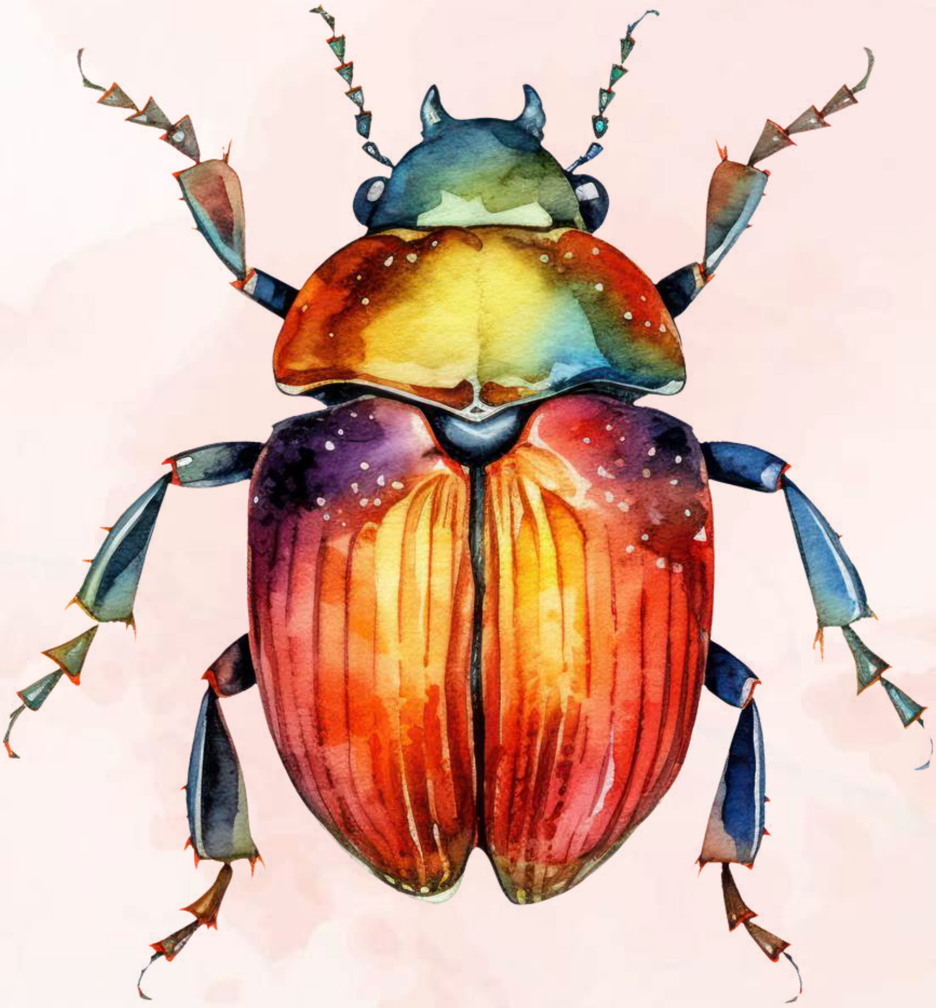

Keynote Presentation

ENTOMOLOGY STUDENTS CONCLAVE

ESC 2025

ENTOMOLOGICAL SOCIETY OF INDIA

Keynote Lecture

Ecological Chemistry of Insect-Plant Interactions

P D Kamala Jayanthi

ICAR-National Professor
Division of Entomology & Nematology, Indian Institute of Horticultural Research, Hesseaghatta Lake PO, Bangalore

Certainly, insects cannot think, but they can react. Chemical cues (semiochemicals/infochemicals) are essential for insect survival and reproduction, influencing interactions with their environment. This reliance on chemical cues presents opportunities for pest control (Kamala Jayanthi et al., 2015a; Bruce, 2010). As we celebrate ~60 years of pheromone research—dating back to 1959, when Butenandt identified bombycol (the first pheromone from silkworms), and Karlson & Lüscher coined the term "pheromone"—the application of these powerful infochemicals in horticultural pest management remains in its infancy.

Push-Pull Strategies in Pest Management

Push-pull strategies or Stimulo-Deterrent Diversionary Strategies (SDDS) manipulate insect behavior using repellents/deterrents (push) and attractants/stimulants (pull) to control pest movement. Despite their potential, these strategies remain underutilized in horticulture, primarily due to a limited understanding of chemically mediated processes in trophic interactions. Developing reliable, robust, and sustainable push-pull strategies requires a deep understanding of behavioral and chemical ecology, encompassing interactions with hosts, conspecifics, and natural enemies (Kamala Jayanthi et al., 2015a; Kamala Jayanthi et al., 2022). Additionally, advancing integrated pest management (IPM) requires interdisciplinary collaboration among biology, chemical ecology, physiology, analytical chemistry, and molecular biology (Kamala Jayanthi et al., 2015a).

Conventional Chemical Ecology Research

Insects rely on semiochemicals for communication, mate-finding, and habitat selection. However, discovering these chemicals is labor-intensive, requiring extensive behavioral and analytical studies (Verghese et al., 2013; Kamala Jayanthi et al., 2014a). Chemical ecology elucidates trophic interactions through bioassay-guided approaches, which, while effective, are time-consuming.

Keynote Lecture

Computational Reverse Chemical Ecology (CRCE)

Advances in molecular biology have enhanced our understanding of insect olfaction, paving the way for reverse chemical ecology—a method that leverages olfactory proteins as bioassay tools to screen active semiochemicals (Leal, 2017). This "Computational Reverse Chemical Ecology" (CRCE) approach has gained traction, utilizing odorant-binding proteins (OBPs) to identify behaviorally active compounds rapidly (Leal, 2005; Kamala Jayanthi et al., 2014a).

A pilot study on the Oriental fruit fly (*Bactrocera dorsalis*) used in-silico screening to assess kairomone efficiency of known attractants (Kamala Jayanthi et al., 2012). Twenty-four host cues were tested, and new attractants were identified from overripe mango fruits. Further, electrophysiologically active volatiles were screened for oviposition stimulation, revealing that 1-octen-3-ol, ethyl tiglate, γ-octalactone, and benzothiazole significantly influenced oviposition behavior (Kamala Jayanthi et al., 2014b). These findings enhance our understanding of *B. dorsalis* behavior and inform control strategies, including mass-rearing for sterile insect technique programs (Kamala Jayanthi et al., 2017).

Chemical Elicitors in IPM

Insects use precise volatile ratios for host location (Bruce et al., 2005; Kamala Jayanthi et al., 2012). Even minor alterations in volatile composition can disrupt insect orientation. Plants, in turn, have evolved defense mechanisms, including the production of herbivore-induced plant volatiles (HIPVs) that can attract natural enemies or deter pests. Exogenous application of elicitors can modulate volatile emissions, impacting insect-plant interactions and offering new IPM strategies.

Commensal Bacteria and Mate Selection

Commensal bacteria influence insect behavior, yet their role in mate selection is poorly understood. Empirical studies on *B. dorsalis* revealed that males prefer and invest more sperm in females harboring microbiota. Using 16S rDNA sequencing, *Klebsiella oxytoca* was identified as the most abundant species. Understanding the role of commensal bacteria in mate selection may lead to novel pest control strategies (Kamala Jayanthi et al., 2016b).

Innate Recognition Tunes (IRTs) in Oviposition Behavior

Insect olfactory-driven behaviors may be innate or learned. *B. dorsalis* oviposition behavior is mediated by an innate bias toward γ-octalactone, a volatile compound from ripe mango (*cv. Alphonso*). Experimental evidence suggests that oviposition site selection is guided by IRTs, which remain functional even after centuries of domestication in silkmoths (Kamala Jayanthi et al., 2014c; Kamala Jayanthi et al., 2015).

HIPVs as Aggregation Cues for Sap Feeders

HIPVs can function as both defense signals and attractants for conspecific herbivores. Studies on *Capsicum annuum* and its pest *Scirtothrips dorsalis* demonstrated that HIPVs can signal host vulnerability, potentially attracting more pests. Similarly, olfactometer bioassays with onion thrips (*Thrips tabaci*) showed a preference for HIPVs over healthy plant volatiles. GC-MS analysis revealed substantial differences in volatile profiles, highlighting the need for further research to harness HIPVs for pest management (Prasanna Kumar et al., 2017).

Future Scope

The effective application of semiochemicals in pest management hinges on identifying potential cues that manipulate mate- and host-finding behaviors. Detailed, species-specific studies will provide insights into ecological chemistry and trophic interactions, pinpointing weak links for targeted intervention. Advances in molecular and analytical technologies now facilitate the discovery of behaviorally relevant chemical cues. However, the detection and identification of semiochemicals for Indian horticultural pests remain rudimentary (Kamala Jayanthi et al., 2015a). With improved analytical chemistry and behavioral research, a systematic, multidisciplinary approach to ecological chemistry will yield powerful tools for IPM, ensuring better pest management solutions for horticultural crops.

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Keynote Lecture

Keynote Lecture

Cutting-Edge Technologies in Cotton Crop Protection

Dr Y G Prasad

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The escalating challenges posed by insect pests and diseases in cotton cultivation necessitate the urgent integration of cutting-edge technologies for effective crop protection. Traditional methods often prove inadequate, leading to significant yield losses and increased environmental impact. Recent advancements in technology are transforming cotton crop protection and the way diseases and pests are detected and managed. Breakthroughs in genetic engineering and emerging avenues such as computer vision, machine learning, precision sensor systems, unmanned aerial vehicles (UAV) and the internet of things (IoT) further enhance the capabilities of IPM by enabling precise intervention and resource optimization, leading to improved crop health and sustainability.

Precision Protection Technologies:

The integration of sensors, AI tools, machine learning approaches, drones and satellite imagery in precision agriculture enables real-time monitoring of pest and disease outbreaks. These tools help in the early detection of infestations, allowing timely intervention; site-specific pesticide application, reducing unnecessary chemical use and data-driven decision-making for sustainable pest management.

The ICAR - CICR has developed AI-enabled pheromone traps for the real-time monitoring of pink bollworm in cotton and deployed in major cotton growing districts of Punjab during 2024-202. The information from the smart traps help to provide timely alerts and pest management advisories to farmers through mobile network, ensuring effective pest control and reduced crop damage (Prasad and Rameash, 2024). The pilot scale deployment of AI smart traps in the Punjab yielded encouraging results on reduced crop damage (below economic threshold levels of 10%) due to timely pest alerts and prompt control measures, 38.6% reduction in pesticide use while keeping PBW damage under control and 18.54% increase in yield over conventional methods, highlighting the potential of AI traps to enhance cotton productivity while reducing chemical dependency. The project combines advanced AI-driven pest monitoring, environmental sustainability, and economic benefits, making it a holistic solution for PBW management in cotton farming. By offering a data-driven forewarning system, reducing chemical pesticide reliance, and cutting down cultivation costs, it ensures long-term agricultural sustainability, improved farmer livelihoods, and environmental conservation.

Deep learning techniques, particularly convolutional neural networks (CNNs), have been successfully applied for the automatic detection and classification of cotton plant diseases. These models are trained on datasets of images of healthy and diseased cotton plants and demonstrated an average of 85% accuracy in detecting cotton diseases, enabling timely interventions and reducing the need for broad-spectrum pesticides (Aarthi *et al*., 2024). Remote sensing technologies, combined with Internet of Things (IoT) devices, have revolutionized cotton crop monitoring. Satellites and drones equipped with multispectral and hyperspectral cameras provide detailed insights into crop health and pest infestations. This data is analysed using machine learning models to generate actionable recommendations for farmers, ensuring optimal crop management (Adeleke, 2024). Autonomous aerial pesticide application systems consists of swarm of UAV's featuring 20 coordinated AI-guided micro-drones with a payload of 5kg executed precision spot treatments across 50-acre fields in 90 minutes, reducing chemical usage by 65% compared to broadcast spraying and the drone fleets achieved 89% spray deposition accuracy on pest hotspots identified through IoT sensor networks (Costa *et al*., 2024)

Genetic Engineering and Molecular Approaches

Gene editing technologies, particularly CRISPR/Cas9, are breaking new ground in cotton crop protection. These technologies enable precise modifications to the cotton genome, introducing resistance traits without compromising plant fitness. RNA interference (RNAi)-mediated gene silencing, stacking Bt with RNAi, and genome editing using clustered regularly interspaced short palindromic repeats/CRISPR-associated protein, offer promising tools for identifying and managing resistance genes in insects. Additionally, CRISPR-mediated gene drives and the development of novel biopesticides present potential avenues for effective pest management in cotton cultivation. These innovative approaches could significantly enhance the sustainability and efficacy of pest resistance management in Bt cotton (Nagaraj *et al*., 2024).

Biological Control Advancements

In recent years, microbial volatile organic compounds (mVOCs) have represented a new frontier in bioprospecting and chemical ecologists consider mVOCs as potential semiochemicals that function as attractants and repellents to insects. In the era of the promotion of non-chemical agriculture, the applicability of microbial-based volatile attractants in agriculture has great potential to reduce cultivation costs and improve the environment. ICAR-CICR has developed an ecofriendly, cost-effective bacterial-based synthetic volatile attractant formulations for the key sucking pests in cotton (Prasad and Velmourougane, 2025). Large-scale field studies and multi-location evaluations proved that the attractant formulations, ICAR-CICR-BVW, ICAR-CICR-BVJ, ICAR-CICR-BVA, and ICAR-CICR-BVT achieved attraction efficiency increases of 168%, 197%, 189%, and 175% over the control, respectively, for whiteflies, jassids, aphids, and thrips pests.

Nanotechnology in Cotton Pest Management

Nanotechnology offers a promising solution for the sustainable management of cotton pests, providing cost-effective and highly efficient alternatives to conventional pesticides. Nanoparticles are engineered to deliver active ingredients in a targeted and controlled manner, reducing the amount of pesticide required and minimizing environmental impact. The development of various nanomaterials, such as mesoporous silica nanoparticles, nano-formulated pyrethrins, and chitosan-selenium nanocomposites, has demonstrated significant potential in improving pest control while minimizing environmental impact. Rough-surface hollow mesoporous silica (RHMS) nanoparticles were demonstrated in the co-delivery of double-stranded RNA (dsRNA) and insecticides against cotton pests. These facilitates insecticide loading and protects dsRNA from degradation. When tested against the cotton aphid, the RHMS/IMI/dsCYP6CY13 complex showed a 1.95-fold increase in toxicity compared to imidacloprid alone, and improved effectiveness by 19.95% (Lv *et al.*, 2023). Gelatin-copper nanoparticles showed significant insecticidal activity against the spiny bollworm (*Earias insulana*) by causing histological irregularities in the cuticle and midgut of the larvae, highlighting their potential as an eco-friendly management tool (Ammar and Azeem, 2021).

Conclusion

The convergence of biological insights and digital technologies enables precise, ecology-sensitive pest management strategies that address cotton production challenges across Indian agroecosystems. By harnessing the power of AI, UAVs, gene

Keynote Lecture

editing, nanotechnology and precision agriculture, farmers are equipped to tackle the myriad challenges associated with cotton protection. These innovations not only contribute to higher yields and improved profitability but are also pivotal in steering the cotton industry towards more sustainable and environmentally friendly methodologies. As technology continues to evolve, the future of cotton farming looks promising, fostering resilience against pests and securing stronger market competitiveness. The ongoing integration of these technologies will be indispensable in meeting the growing global demand for cotton while adhering to sustainable agricultural practices

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Keynote Lecture

Plant Protection in India: Strength, Challenges & Way Forward

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With an ever-increasing global population, and negligible concurrent increase in available land for agriculture, effective plant protection will play a critical role in ensuring food security, environmental sustainability, and economic stability in India. The efforts put forth would essentially be on minimizing the crop losses due to ravages of insect pests, diseases, weeds, nematodes, vertebrate pests etc. amounting to the tune of 10-30%. The country has made significant advancements in pest and disease management through the development of innovative technologies, integrated pest management (IPM) strategies, and the promotion of biological control. The availability of indigenous bio-control agents, extensive research institutions, and government policies supporting sustainable agriculture have strengthened the sector. Enforcement of plant protection regulations like Destructive Insects & Pests Act (1914) and Plant Quarantine Order (2003) for prevention of entry of exotic pests and implementation of the Insecticides Act, 1968 and the Insecticide Rules, 1971 for regulating production and use of pesticides are also playing a crucial role in safe guarding the Indian agriculture. However, challenges such as the overuse of chemical pesticides, emergence of pesticide resistance, climate change-induced pest dynamics, and regulatory hurdles pose significant threats. Additionally, the need for greater farmer awareness and adoption of eco-friendly pest management practices remains a major concern. Moving forward, strengthening research on biological control, enhancing extension services, promoting the use of biopesticides, and fostering public-private partnerships will be crucial. Policy reforms, capacity-building programs, and an emphasis on agroecological approaches can pave the way for sustainable plant protection in India. This paper discusses about India's overall status of plant protection, the prevailing challenges in implementation of eco-friendly pest management system, plant quarantine, responsible use of pesticides etc. and also the way forwards in addressing the challenges.

Theme I
Biodiversity and Taxonomy

ENTOMOLOGY STUDENTS CONCLAVE
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BTO-01

A comprehensive overview of Laelapid mite genera collected from Eastern India

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The family Laelapidae Canestrini, 1891 (Acari: Parasitiformes), is a beneficial group of mesostigmatid mites, diverse in terms of ecological role and morphology. They consist of both free-living predatory ones as well as species associated with various different hosts. Few free-living forms spending at least some part of their life cycle in soil, are commercially produced as predatory biocontrol agents. They are ubiquitous and comprise obligate and facultative parasites above-soil and free-living predators of small arthropods, nematodes in soil-litter ecosystem. The study of laelapid mites in India began with Oudeman's discovery in the early 1900's including the first record of arthropod-associated Laelapidae in the country, with Bhattacharyya later making significant contributions, including the report of first free-living laelapid species. This study investigates the diversity of laelapid mites in Eastern India, focusing on six genera: *Alloparasitus*, *Cosmolaelaps*, *Gaeolaelaps*, *Hypoaspis*, *Ololaelaps*, and *Pseudoparasitus*. Through extensive rapid roving surveys and detailed microscopic analyses, the findings reveal their distribution, morphological diversity and potential new species, contributing to a deeper understanding of their taxonomy. It also focuses to document and characterize the genera collected from various ecological niches in Eastern India, including forest floors, agricultural fields, and animal hosts. This research highlights Eastern India's significance as a hotspot for laelapid mite diversity and provides valuable insights into their taxonomy and biodiversity. Furthermore, it emphasizes the need for additional studies to explore their ecological roles and potential applications in sustainable agriculture and integrated pest management.

Keywords: mesostigmata; Laelapidae; biocontrol agent; soil-litter ecosystem; morphological diversity

Oral Presentation

BTO-02

A new species of the genus *Forcipula* Bolivar, 1897 (Dermaptera: Labiduridae: Labidurinae) from India

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Dermaptera of the world comprises of about 2000 species of which 286 species are known from India. A new species, *Forcipula bengalensis* sp. nov., is described from West Bengal, India. The new species is easily distinguished by the presence of a black elongated spot on the basal half of tibia, first segment of hind tarsi is slightly shorter than the combined length of second and third tarsal segments, prominent dorsal temporal pit besides both eyes and male genitalia with undulating curvature of inner and outer margins of parameres with apical tip blunt. Detailed description & illustration of the new species, an updated checklist & identification key of Indian species of the genus *Forcipula* Bolivar, 1897 are provided here along with the map of distribution data. Specimens collected by digging and hand-picking from underneath stones in Kestopur, North 24 Parganas district, West Bengal, India. The earwigs were transferred in 70% ethanol for preservation. The specimens and male genitalia observed under Leica EZ4 stereo zoom–microscope. The description and illustration made based on detailed morphological characters, unique male forceps structure and the structures of male genitalia. The photographs and measurements of body parts were taken through the Leica DMC 4500 camera, attached with multi-focus (Z-Stack) stereomicroscope Leica M205A using the software Leica Application Suite (LAS V4.12). Leg is observed under Scanning Electron Microscope. Type specimens were deposited in the National Zoological Collections of Zoological Survey of India, Kolkata. The thirteenth species of the genus *Forcipula* Bolivar, 1897 from India differs from all previous Indian species by the characteristics outlined in the key to species and holotype descriptions. Moreover, *Forcipula bengalensis* sp. nov**.** have some similarities with *Forcipula quadrispinosa* (Dohrn, 1863) and *Forcipula indica* Brindle, 1966 in the characteristics of body colouration and shape of the body. However, it differs from *F. quadrispinosa* (Dohrn, 1863) and *F. indica* Brindle, 1966 in forceps structure, unique colour of legs, antennal segments, broader pronotum, positions of abdominal spines and unique parameres of male genitalia. This study led to the new discovery of Indian Dermaptera fauna.

Keywords: earwigs; *Forcipula*; checklist; taxonomy; West Bengal

Oral Presentation

BTO-03

An integrative taxonomic study of Pleurosticti scarab beetles (Coleoptera: Scarabaeidae) of Karnataka, India

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The insect order Coleoptera (> 3,27,597 spp.), represents the most diverse group of organisms on Earth, comprising approximately one-fifth of all known animal species. The family Scarabaeidae (Coleoptera: Scarabaeoidea) exhibits remarkable diversity with over 36,387 species showcasing a wide range of adaptations and ecological roles. The phytophagous species of Scarabaeidae, commonly known as Pleurosticti, comprise about 25,303 species and represent approximately 70% of the Scarabaeidae. The Pleurosticti is represented by six major subfamilies *viz*., Cetoniinae (4750 spp.), Dynastinae (2046 spp.), Rutelinae (4973 spp.), Melolonthinae (8078 spp.), Sericinae (4131 spp.), and Sericoidinae (1325 spp.), worldwide. They play crucial ecological roles as scavengers, herbivores, and pollinators. Several Pleurosticti scarabs are important agricultural pests worldwide, some of which are of quarantine importance. The present study was aimed at integrative taxonomic approach to the study of Pleurosticti scarab beetles of Karnataka along with the development of a DNA barcode reference library and a voucher specimen bank. Over 4,200 specimens were collected from sixteen localities across four agro-climatic zones of Karnataka during 2023 and 2024 using light trapping and manual scouting methods. A morphological study revealed a total of 90 species in 30 genera, 16 tribes, and five subfamilies. The study contributed to the description of 12 new species to science. A non-destructive DNA extraction protocol was followed using DNeasy® Blood & Tissue Kit-QIAGEN and the 5' region of the mitochondrial cytochrome-c-oxidase I gene (*COI-5P*) amplified using PCR. DNA barcodes were generated for 86 species, among them, 57 species were barcoded for the first time globally. The voucher specimens were deposited in the Coleoptera Insect Museum, ICAR- National Bureau of Agricultural Insect Resources, Bengaluru, Karnataka, India. Despite progress, vast areas of Karnataka remain under-explored, and many species remain undiscovered or poorly understood which can be addressed in the coming years using robust morpho-molecular techniques.

Keywords: Scarabaeidae; barcode library; voucher specimens; Pleurosticti; Karnataka

Oral Presentation

BTO-04

Evaluation of rapid DNA extraction methods for detection of melon fly, *Zeugodacus cucurbitae* (Coquillett) (Diptera: Tephritidae)

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The fruit flies (Diptera: Tephritidae) represent highly diverse group of insects with nearly 200 species of economic importance and the melon fly, *Zeugodacus cucurbitae* (Coquillett) is one of the major polyphagous pests causing damage up to 100% and has quarantine importance. Proper and timely identification of pest species is crucial in pest management and decision taking programme but it is often very difficult for farm workers, students, quarantine officers and non-taxonomist researchers to identify the fruit flies accurately because of the homoplasy in morphological characters. To address these challenges, DNA barcoding has proven invaluable, enabling scientists to adopt molecular markers for efficient and accurate identification, making it a regular laboratory practices where high-quality DNA extraction within a short period of times plays a crucial step. The conventional DNA extraction methods (CTAB, Phenol-Chloroform *etc.*) are time-consuming and needs proper laboratory set up and also challenging for a large number of samples whereas commercial DNA extraction Kits are often feasible but economically unsuitable. To overcome these problems simple and rapid low-cost DNA extraction methods plays an important role. In our present study, we have evaluated nine low-cost rapid DNA extraction methods for the melon fly, *Z. cucurbitae* and four methods (Tween 20+NaOH solution, Phosphate Buffer Saline, Tris-EDTA buffer, Chelex+Proteinase K solution) has been found feasible for DNA barcoding and other molecular biology applications. The concentration and purity of DNA has been assessed by Fluorometric and Spectrometric methods and the DNA further used as template to amplify mitochondrial COI gene using the universal barcoding primers (LCO1490, HCO2198) to check their feasibility.

Keywords: fruit flies; barcoding; detection; identification; India

Oral Presentation

BTO-05

Exploring biodiversity: Recent discoveries and taxonomic insights of Phytoseiid mites in India

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Phytoseiid mites (Acari: Phytoseiidae) are pivotal to agricultural ecosystems due to their role as biological control agents, preying on pest mites, thrips, scales, whiteflies, and other soft-bodied arthropods. They contribute significantly to sustainable pest management strategies, reducing the reliance on harmful chemical pesticides. Despite their ecological significance, the biodiversity and taxonomy of these mites remain underexplored in many regions, including India. The present research delves into recent discoveries and advancements in understanding diversity, distribution, and taxonomic description of phytoseiid mites across India's varied landscapes. Extensive field studies conducted across various biogeographical regions, we discuss identification of new species and records, as well as significant updates to the Indian taxa. Species identification and description primarily rely on morphological analyses, supplemented by molecular techniques. Special attention given to ecological niches occupied by these mites, their interactions with host plants, and their role in managing pest populations in varied agroecosystems. The study also addresses key challenges in taxonomy, such as lack of type specimens, and advocates for integrative approaches that combine traditional morphological methods with molecular tools. It proposes the development of online platform to consolidate photographs, descriptions, and redescriptions of type species under a unified system. This research underscores the critical role of biodiversity studies in unlocking the potential of phytoseiid mites for integrated pest management (IPM) programs. Since Gupta's pioneering work in 1986, which catalogued 139 species, total number of identified phytoseiid mites in India has risen to 309. Recent study uncovered 10 new species in the Andaman and Nicobar Islands, part of the Sundaland biodiversity hotspot. This study aims to underline importance of preserving biodiversity while advancing biological pest control practices.

Keywords: biological control; Integrated Pest Management (IPM); morphology; Phytoseiidae; Sundaland hotspot

Oral Presentation

BTO-06

Faunistic studies on predatory spiders (Arachnida: Araneae) of Kangra valley

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Surveys on spider fauna in natural, paddy and tea ecosystems were undertaken, resulting in collection of 1,907 spider samples using quadrate and sweep net method. Out of them, 964, 543 and 400 from natural, paddy tea ecosystem respectively. A total of 30 spider species belongs to 19 genera and nine families were found associated. In natural ecosystem, 26 species belong to eight families namely, Tetragnathidae, Oxyopidae. Araneidae, Salticidae, Lycosidae, Sparassidae, Nephilidae and Pisauridae were associated. In paddy ecosystem, 15 species identified, belongs to six families namely, Oxyopidae, Tetragnathidae, Salticidae, Araneidae, Pisauridae and Lycosidae. Whereas, in tea ecosystem, 12 species were identified, belonging to four families namely, Tetragnathidae, Oxyopidae, Araneidae and Sparassidae. In natural and tea ecosystem, Tetragnathidae family was abundant family comprising 24.7% and 43% respectively. Whereas, in paddy ecosystem, Oxyopidae was most abundant family comprising 44%. *Oxyopes javanus* emerged as most dominant species across three ecosystems. In natural and tea ecosystem, orb web weavers dominated with 45.9%, and 29.2% respectively. Whereas, in paddy ecosystem, specialists (53.4%) were most dominant guild. In paddy ecosystems, spiders remained active throughout the cropping period, peaking in July and second fortnight of August. Mitochondrial DNA sequences decoded for seven species. *Gea jingdong* (Mi, Wang & Gan, 2024) is a new record for India. Additionally, twelve species namely, *Argiope aemula* (Walckenaer, 1841), *Leucauge celebesiana* (Walckenaer, 1841), *L. tessellata* (Thorell, 1887), *Menemerus bivittatus* (Dufour, 1831), *Neoscona odites* (Simon, 1906), *N. vigilans* (Blackwall, 1865), *Nilus phipsoni* (F. O. Pickard-Cambridge, 1898), *O. hindostanicus* (Pocock, 1901), *O. shweta* (Tikader, 1970), *Pardosa pseudoannulata* (Bösenberg & Strand, 1906), *Peucetia viridana* (Stoliczka, 1869), and *Plexippus paykulli* (Audouin, 1826) along with three genera *Carrhotus* spp., *Olios* spp., *Trichonephila* spp. seems to be new record from Himachal Pradesh. Spiders diversity was less in agroecosystems (paddy and tea) than in natural ecosystems, necessitating conservation efforts.

Keywords: diversity; Himachal Pradesh; Kangra; spider; paddy and tea ecosystems

Oral Presentation

BTO-07

History, development and recent progress of Tarsonemidae in India

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Tarsonemidae Canestrini and Fanzago (Prostigmata: Tarsonemidae) which possess great diversity in shape, size, habitat, distribution and feeding behavior are immensely important as some of them are phytophagous, causing huge yield loss of crops like *Polyphagotarsonemus latus* (Banks); *Steneotarsonemus spinki* Smiley, parasitoids of other organisms and play crucial ecological role in ecosystem. Tarsonemids are very small, mostly hyaline and occur all over world. This family is widely diverse, currently includes over 600 species in 51 genera under three sub-families and eight tribe groups worldwide. Among four most important phytophagous mite families, faunal diversity of Tarsonemidae is least explored over world. Despite being the second largest biodiverse country in Asia after China, there have been very few works from India, especially from Tarsonemidae. This issue may cause loss of many important species that may remain undetected. Taxonomic study of tarsonemids in India is limited and there is dearth of knowledge regarding their taxonomy, distribution, hosts, economic importance and diversity. Mohanasundaram first reported *Steneotarsonemus spirifex* Marchal, *Steneotarsonemus bancrofti* Michael and *Polyphagotarsonemus latus* Banks from Tamil Nadu in 1980s. Then till 2004, there were very limited reports from a megadiverse country like India. Recently, 2021 onwards, impressive progress in taxonomic study of Tarsonemidae has been noticed, which comprises discovery of 37 new species from 9 different genera (including description of a new genus *Bongotarsonemus*) and redescription of 5 important species. A database has been prepared based on updated information that reveals that 49 species belonging to 10 genera under this family group have been documented from India. Thirty-two out of thirty-seven newly described species were discovered from West Bengal alone (86 % of the total described new species of the country), which indicates two scenarios, *viz.* occurrence of rich diversity of tarsonemid fauna in West Bengal and inadequate study on these tiny creatures across entire country.

Keywords: tarsonemids; biodiversity; importance; database; India

Oral Presentation

BTO-08

Molecular and morphological characterisation of different stored grain pests using DNA barcoding and taxonomic keys

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Stored grain pests represent a significant threat to food security worldwide, by reducing both the quality and quantity of stored agricultural produce. For these pests to be effectively managed and regulated, accurate identification is essential. Hence, the study aimed to use morphological and molecular methods to characterize the stored grain pests. Stored grain pests (Order: Coleoptera, Lepidoptera) were collected from different local markets and warehouses and cultured in laboratory for further analysis. Twelve distinct stored grain pests were collected, namely *Sitophilus oryzae* from paddy, *Rhyzopertha dominica* from barley, maize and sorghum, *Tribolium castaneum* from rice, *Cryptolestes ferrugineus* from sorghum and barley, *Oryzaephilus surinamensis* from rice *Stegobium paniceum* from coriander, *Lasioderma serricorne* from coriander, *Calosubruchus analis, Calosubruchus chinensis* and *Calosubruchus maculatus* from mungbean, *Sitotroga cerealella* from paddy, *Alphitobius diaperinus* from rice. Morphological characterisation was performed through examination of key physical traits such as body shape, antennae, mouth parts under a stereomicroscope, while molecular analysis utilized DNA barcoding, particularly targeting the mitochondrial cytochrome oxidase I gene (COI). The COI gene helps to differentiate between closely related or morphologically similar species and helps to distinguish closely related or morphological similar species. In order to identify the twelve species of stored grain pests, taxonomic keys were supplied along with a redescription. Using phylogenetic analysis, the genetic relationships within the pest population were elucidated. By combining these techniques, a thorough approach to pest identification is offered, which is essential for the creation of pest management strategies that guarantee the security and safety of food.

Keywords: stored grain pests; taxonomic keys; DNA barcoding; COI; Coleoptera

Oral Presentation

BTO-09

Species composition and distribution of genus *Megachile* Latreille, 1802 (Hymenoptera: Megachilidae) in south India

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Bees belonging to the family Megachilidae are solitary species usually referred to as leafcutter bees, mason bees and resin bees. These are efficient pollinators of legumes, oilseeds and medicinal plants with very interesting pollination habits. Hitherto, 28 genera, 32 sub-genera and 239 megachilid species have been recorded in India. Most of the studies on megachilids have centred on the north and north-eastern parts of India, while most parts of south India have received little attention and only a limited species have been verified and documented. In this study, the species composition and distribution pattern of the genus *Megachile* Latreille from south India is analysed based on 4 years of specimen collections (2020 to 2024) and various published literatures. We recorded a total of 9 sub-genera *viz., Pseudomegachile* (3 species), *Callomegachile* (6 species), *Xanthosarus* (3 species), *Amegachile* (1 species), *Eutricharaea* (5 species), *Creightonella* (1 species), *Aethomegachile* (1 species), *Eumegachile* (1 species), *Megachile s.str.* (1 species) and 22 species in the genus *Megachile* from 5 states and 2 Union territories of south India. Among the 9 sub-genera, *Callomegachile* and *Amegachile* were found common in all the states. From Karnataka, a total of 7 sub-genera and 18 species were recorded, followed by 7 sub-genera and 12 species in Kerala and Tamil Nadu. 4 sub-genera and 5 species were reported from Andra Pradesh. 3 sub-genera and 3 species were reported from Telangana and Puducherry. Only one sub-genus and 1 species were recorded from Lakshadweep. The study also indicates that most areas of the south Indian states like Andhra Pradesh, Telangana and Union Territories are unexplored for bees. The results of the current study will form a basis for significant steps towards future estimates of species distribution and conservation.

Keywords: Apoidea; Megachilidae; leafcutter bees; distribution; South India

BTO-10

Taxonomic characterization of immature and adult *Maruca amboinalis* C. Felder, R. Felder & Rogenhofer, 1875 and *Omiodes analis* Snellen, 1880 (Lepidoptera: Crambidae: Spilomelinae)

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As part of our study on radiation of lepidoptera on *Pongamia pinnata* (L.) Pierre an indigenous tree of economic value, two major defoliators were documented *viz*., *Maruca amboinalis* C. Felder, R. Felder & Rogenhofer, 1875 and *Omiodes analis* Snellen, 1880 (Lepidoptera: Crambidae: Spilomelinae) in Coimbatore, Tamil Nadu, India. The larval chaetotaxy, pupal morphology (first time) and adult description based on external characters and genitalia study were undertaken. In addition, DNA barcoding was also done for additional confirmation on the identity. In *Maruca amboinalis* larva, the absence of an extra pinacula on T2 is characteristic. Pupa with antennae, maxillae, legs not glued to body and extending beyond A7 was observed. Male genitalia have slightly setose valvae, spatulate uncus and sharply pointed fibula. Aedeagus had oval shaped patch of conutus. DNA sequence PQ305627 (First submission from India) showed 99.60 per cent similarity with the DNA sequence (LC697933) of *M. amboinalis* populations from Tottori, Japan. *Omiodes analis* larval chaetotaxy was typical spilomelinae type and pupa had eight hooked cremaster spines, adults were pale brown coloured with a characteristic white distinct marking on tornus. Genitalia were described for the first time. Male genitalia have valvae with oval scobination at tip and an obtuse saccular process. Female genitalia have rounded corpus bursae and two reniform signa on opposite sides. This study will be helpful in the near future for proper identification of potential pest species so that appropriate control measures could be adopted.

Keywords: Spilomelinae; chaetotaxy; genitalia; DNA barcoding; *Pongamia pinnata*

Oral Presentation

BTO-11

Taxonomic studies of gelechiid moths (Lepidoptera: Gelechioidea) of India

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Gelechiid moths represent a significant threat to agriculture and horticulture globally, with 285 species reported to damage crops such as cereals, pulses, oilseeds, fruits, vegetables and medicinal herbs. This family comprises 5,942 species under 464 genera worldwide, with 351 species across 80 genera documented in India. The small size, cryptic behaviour and morphological similarity among species complicate their identification. Present study aimed to identify and document gelechiid moth species in India using adult morphological characteristics, focusing on wing venation and genitalia structures. The moths were collected from different locations across India using mercury vapour lamp and LepiLED during night hours and processed at the National Pusa Collection (NPC), Division of Entomology, ICAR-Indian Agricultural Research Institute, New Delhi for further examination. The wing venation and genitalia slides of male and female were prepared by following standard methodologies. Images of pinned specimens, genitalia and wing slides were taken at different magnifications using Leica EC4 digital camera mounted on Leica M205FA stereo zoom auto montage microscope and processed using Adobe Photoshop. Around, 50 species of Gelechiid moths were studied and identified, including economically important pests such as *Aproaerema modicella*, *Eustalodes achrasella*, *Helcystogramma convolvuli*, *Hypatima haligramma*, *Mesophleps iolonchа*, *Palumbina glaucitis*, *Pectinophora gossypiella*, *Phthorimaea absoluta*, *Phthorimaea operculella* and *Sitotroga cerealella* with DNA barcoding focusing on the cytochrome oxidase subunit I (COI) gene employed for these pest species. Detailed morphological descriptions were provided for moths across various genera, including *Anarsia*, *Mesophleps*, *Dichomeris*, *Helcystogramma*, *Hypatima*, *Stegasta*, *Ficulea*, *Idiophantis*, *Tricerophora*, *Istrianis* and *Gelechia* including three new species *Tricerophora* sp., *Istrianis* sp., *Stegasta* sp. and two new records *Gelechia* sp. and *Hypatima rhomboidiella*. These findings contribute to the understanding of Gelechiid moth diversity and provide critical baseline data for their identification.

Keywords: Gelechiidae; identification; morphology; genitalia; pest management strategies

Oral Presentation

BTO-12

Taxonomic studies on family Asilidae (Diptera) from Southern Karnataka, India

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Asilidae is one of the largest families of Diptera commonly referred to as 'Robber flies' or 'Assassin flies', an important general predator group in almost all zoo-geographical regions, comprising about 7798 species over 569 genera across the globe and in India 455 species distributed among 56 genera. The specimens were collected from December 2022 to July 2023 across eleven districts of Southern Karnataka, using sweep net, malaise trap, and light trap, of which, sweep netting emerged as the most effective collection method (67.85%). Peak abundance was recorded from March to June, with genus *Clephydroneura* being the most dominant one. This study documented a total of 21 species across 15 genera and six tribes, all comprehensively presented based on morphological characteristics, including antennae, thorax, wing venation, and genitalia. Special emphasis was placed on the detailed redescription of selected species, such as *Clephydroneura annulata*, *C. apicalis*, *C. duvaucelii*, *Philodicus univentris*, *Promachus maculatus*, *P. yerburiensis*, and *Microstylum bhattacharyai* to provide an in-depth understanding of their diagnostic features. High-quality photographs including genitalia illustrations of Indian robber flies were provided for the first time, along with revised/modified identification keys and updated distribution data. Eight species *viz*. *C. annulata*, *C. duvaucelii*, *P. univentris, Cophinopoda chinensis*, *Michotamia compedita*, *Ommatius ramakrishnai*, *Stichopogon eluruensis* and *Lobus martini* were documented as new state records for Karnataka, expanding the faunal list of Asilidae in the state to 74 species. This work addresses the critical gaps in asilid taxonomy and systematics, contributing valuable insights to their biodiversity and ecological roles.

Keywords: robber flies; morphology; illustration; redescription; India

Oral Presentation

BTPP-01

Diversity of a predominant termite species, *Odontotermes bellahunisensis* Holmgren & Holmgren in Assam

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North-eastern region of India, widely regarded as an integral part of biodiversity hotspot, harbours an abundance of flora and fauna. It is therefore anticipated the presence of a rich treasure in the form of termite diversity in this region. Corresponding to the fact, attempts were made to study the diversity of termites in agricultural and forest habitats of Assam. GPS based extensive survey programmes were conducted across seven different crop ecosystems *viz.*, jackfruit, citrus, tea, bamboo, sugarcane, wheat field and mango in addition to the forest ecosystem. Termite specimens were collected round the year and collections were made by transect and quadrate methods. Additionally, random collections were also made based on visual observation of termite mounds within the specified ecosystems. A total of 72 termite samples were collected from various districts of Assam representing the aforementioned eight habitats. Among the collections, 35 samples were identified as *Odontotermes bellahunisensis* highlighting its dominance across the habitats. The present study also represents the first ever systematic report on the diversity of this species from Assam. Comprehensive understanding of termite species diversity and their zoogeographical distribution will definitely help in formulating and implementing effective Integrated Pest Management strategies to address termite related challenges in Agriculture.

Keywords: agroecosystem; forest; *Odontotermes bellahunisensis;* termite; North-eastern region

Poster Presentation

BTPP-02

Diversity of coccinellids in soybean ecosystem at mid hills of Meghalaya

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The coccinellids (Coleoptera: Coccinellidae) beetles are also known as ladybird beetle are highly effective predators of aphids because both larval and adult stages voraciously consume large numbers of aphid nymphs and adults and play a crucial role in the biological control of insect pests in agroecosystems, including soybean fields. The present study investigated the diversity and abundance of coccinellid beetles in the soybean ecosystem under mid-hill conditions of Meghalaya, India at College of Post Graduate Studies in Agricultural Sciences (CAU, Imphal) Umiam, Meghalaya on soybean crop. Field trail was conducted during the cropping season (2024) to assess species composition, relative abundance, and seasonal variations in the coccinellid community. Beetles were sampled using hand net and visual observations, and species were identified based on morphological characteristics. The study recorded a rich diversity of coccinellids with 11 (9 identified + 2 Unidentified) species of ladybird beetle was observed *viz.*, *Harmonia axyridis*, *Harmonia Dimidiata, Harmonia confomis*, *Coelophora bissellata*, *Cryptogonus quadriguttatus*, *Epilachna macularis*, *Coccinella septempunctata, Menochiles sexmaculata* and *Oenopia sexareata*. Among these ladybird beetle species *Harmonia axyridis* in most common coccinellid in mi hills of Meghalaya. Where Simpson diversity index showed 0.89 (SDI), means there is an 89% chance that 2 individuals selected a random would be from different species and 11% chances to those 2 individuals selected are same coccinellids species in mid hill conditions of Meghalaya. Conservation of these beneficial beetles through habitat management and reduced pesticide use can enhance ecological sustainability in soybean cultivation.

Keywords: coccinellids; diversity; ladybird beetle; Simpson diversity index; Meghalaya

Poster Presentation

BTPP-03

Diversity of fruit flies (Diptera: Tephritidae) in mega markets of Delhi NCR region

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Fruit fly (Diptera: Tephritidae) pose significant threat to horticultural crops, causing substantial production losses and disrupting market trade. Most of the studies highlighted their importance in fields, however, horticultural commodities also spend significant time in transit and storage. Hence, understanding market diversity is crucial for effective pest management and regulation. This study aimed to understand the occurrence and diversity of fruit flies using molecular and morphological approaches in mega-markets of Delhi NCR from September to December 2024. Two mega-markets were selected from Delhi and Uttar Pradesh (UP). Fruit flies were captured at fortnightly intervals, using para-pheromone trap (Methyl eugenol, Cue lure) and bait trap (Yeast extract) and infested fruits were collected and reared. Total 3955 and 3179 flies were collected from Delhi and Uttar Pradesh (UP) markets respectively. Seven species were recorded and identified *i.e.*, *Bactrocera dorsalis*, *B. correcta, B. divenderi, B. zonata, Zeugodacus cucurbitae, Z. tau*, and *Z. scutellaris*. Species identification was done through morphological examination and also confirmed by DNA barcoding. The predominant species recorded from markets *viz. Z. cucurbitae* (55.19% and 65.27%), followed by *B. dorsalis* (35.75% and 24.91%) and *B. zonata* (7.61% and 8.65%). *Z. scutellaris* (0.15%) was exclusively recorded in UP markets, while *B. divenderi* (0.32%) from Delhi markets. Among fruits reared in laboratory, *B. dorsalis* (29.70%), *B. zonata* (270f .72%), and *B. correcta* (9.90%) emerged from guava and oranges of Delhi and UP markets. *B. divenderi* (6.93%) was emerged from oranges collected from Azadpur market, while *Z. cucurbitae* (20.79%) and *Z. tau* (4.95%) emerged from pumpkin and bottle gourd from markets of Delhi and UP. Diversity indices and species richness showed markets of Delhi had higher Shannon index (H=0.97), species evenness (J=0.12) and lesser Simpson index(D=0.44) than markets of UP (H=0.90, J=0.11, D=0.5) indicating greater species diversity in Delhi markets than UP markets. This research provides insight into mega markets that will act as source of infestation. This is the first documentation of species diversity in markets, which will help to consider markets also in area-wide management practices.

Keywords: DNA barcoding; fruit fly; mega-markets; para-pheromones; species diversity

Poster Presentation

BTPP-04

Population dynamics of insects in stored paddy

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The infestation of stored grain by insects is a significant problem worldwide, affecting grain quality, weight, commercial value, and seed viability. This study aimed to investigate the population dynamics of insects in stored paddy, focusing on their interactions and impact under different storage conditions. The study was conducted from March 2012 to February 2013 at the ICAR farm, Assam Agricultural University (AAU), Jorhat, using the paddy variety 'Ranjit', a high-yielding Sali rice variety grown widely in Assam. The paddy was stored in two different methods: jute bags and duli (split bamboo baskets), each with a 50 kg capacity. Nine insect species were recorded during the study, including the most dominant pest, *Sitotroga cerealella* (Angoumois grain moth), which showed the highest population of 22.10/100g of paddy in May. Other key pests identified were the lesser grain borer (*Rhyzopertha dominica*), rice weevil (*Sitophilus oryzae*), flat grain beetle (*Cryptolestes pusillus*), and maize weevil (*Sitophilus zeamais*). Natural enemies such as the predatory bug *Xylocoris flavipes* and parasitic wasp *Anisopteromalus calandrae* were also observed, suggesting their potential role in controlling pest populations. Insect population dynamics were influenced by factors such as temperature, relative humidity, and storage method. Significant correlations were observed between insect numbers and environmental conditions, with *S. cerealella* showing a positive correlation with temperature and morning relative humidity. Similarly, *Sitophilus oryzae* and *X. flavipes* were positively correlated with both temperature and evening relative humidity. The study highlighted the importance of monitoring insect populations in stored grain and the role of natural predators in pest management. This study identified seven major insect pests of stored paddy, including *S. cerealella* and *S. oryzae*, and recorded two natural enemies, *A. calandrae* and *X. flavipes*, for the first time in the region. The findings suggest that integrated pest management, incorporating natural predators, could help mitigate damage caused by these pests. Further research in large-scale storage facilities, with more abundant food and space resources, is recommended to develop effective pest control strategies and improve pest dynamics prediction.

Keywords: stored grain pests; insect population dynamics; natural enemies

Poster Presentation

BTVP-01

Arthropod succession in *kharif* rice at Jabalpur, Madhya Pradesh

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A field experiment was conducted during the *kharif* season of 2024-25 at the Rice Seed Production Farm, College of Agriculture, JNKVV, Jabalpur, Madhya Pradesh, to study the occurrence and succession of insect pests and their natural enemies in rice (*Oryza sativa* L., cultivar JR-206). The crop was transplanted on July 19, 2024, in a 20 m^2 plot, using a Randomized Block Design. Observations were recorded throughout the crop's growth stages, covering a duration of 110 days after transplanting (DAT). A total of 16 arthropod species were identified, including 12 insect pests and 4 natural enemies. Key natural enemies observed were spiders (5–110 DAT), dragonflies (5–110 DAT), damselflies (19–110 DAT), and ladybird beetles (43–57 DAT). Prominent insect pests recorded includes the yellow stem borer (22–110 DAT), rice leaf folder (26–110 DAT), rice grasshopper (15–110 DAT), rice caseworm (29–68 DAT), rice skipper (40–78 DAT), green leafhopper (40–89 DAT), brown planthopper (43–82 DAT), white-backed planthopper (50–92 DAT), rice butterfly (47–82 DAT), rice blue beetle (47–75 DAT), rice hispa (47–61 DAT), and rice Gandhi bug (61–78 DAT). The arthropods belonged to six orders: Hemiptera, Lepidoptera, Coleoptera, Orthoptera, Odonata, and Arachnida. Their presence was most prominent during the vegetative and reproductive stages of the crop. This study provides insights into the temporal dynamics of arthropod populations in *kharif* rice, contributing to effective pest management strategies.

Keywords: arthropods; succession; insect pest complex; crop stage; rice

Rapid Virtual Oral Presentation

BTVP-02

Biodiversity of Tephritid fruit flies (Diptera: Termitidae) in South Gujarat, India

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The individuals of Tephritidae family are commonly called “fruit flies” due to their close association with fruit and vegetables. These fruit flies hamper production and export of fruits and vegetables through quality as well as quantity loss. Thus, looking towards their economic importance an extensive survey was conducted to find out the diversity of fruit flies in six talukas namely Navsari, Jalalpore, Gandevi, Chikhli, Khergam and Vansda of Navsari district, Gujarat, India. The fruit flies were collected from infested samples of fruits and vegetables as well as from attractant traps (methyl eugenol in fruits and cue-lure in vegetables) installed at three locations of each taluka. The collected specimens were identified on the basis of morphological descriptions. Together, the present findings confirm a total of four fruit fly species *viz., Bactrocera dorsalis* (Hendel), *Bactrocera zonata* (Saunders), *Bactrocera correcta* (Bezzi) and *Bactrocera cucurbitae* (Coquillett) from the South Gujarat region. Among all species, *B. dorsalis* (53.87%) was the most abundant in all the talukas followed by *B. zonata* (19.92%), while *B. correcta* (2.91%) was not among the more common species in fruit crops. Whereas *B. cucurbitae* was most common in cucurbits with relative abundance of 23.30 per cent. Moreover, species richness index revealed that all four species of fruit flies were found in Navsari, Gandevi, Jalalpore and Chikhli taluka while, only three species were found in Khergam and Vansda taluka, where *B. zonata* was not found. In addition, studies on the Shannon-Wiener diversity index revealed a maximum diversity index in Gandevi (1.15) followed by Navsari (1.13), Jalalpore (1.11) and Chikhli (1.09) taluka, respectively. However, Vansda (0.92) and Khergam (0.87) had the lowest diversity index, respectively. Our data also address the species evenness, which was found high in Vansda (0.84) followed by Gandevi (0.83) and Navsari (0.82), while Jalalpore and Khergam showed similar results (0.80), but it was lowest in Chikhli (0.79) taluka. Overall, our results provided crucial information about host range, richness, evenness and diversity of fruit flies. In future, results of present studies will provide the primary data to address fruit flies related challenges in south Gujarat region.

Keywords: Tephritidae; fruit flies; biodiversity; richness; evenness; Gujarat

Rapid Virtual Oral Presentation

BTVP-03

Biological diversity of bugs in North Gujarat

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An exploratory study conducted in North Gujarat during 2023-2024 in four diverse ecosystems *viz.*, forest, agricultural, riverbank, and horticulture. As a result of survey, 38 bug species, belonging to 12 major families, 22 sub-families, and 37 genera, were found. Maximum number of insect species were recorded in agricultural ecosystem (32 species) followed by horticulture ecosystem (30 species), forest ecosystem (15), and the least at riverbank ecology (2). In agricultural, horticultural, and forest ecosystems- *Eysarcoris guttiger*, *Halys sulcata, Homoeocerus signatus, Cletomorpha hastata, Cletus punctiger, Rhinocoris fuscipes, Oncocephalus* sp.*, Spilostethus pandurus, and Scutellera nobilis* were frequently encountered. Three species *E. furcellata, A. phasiana, and N. meleagris*- represented the forest ecosystem under study out of the 38 species known to exist in North Gujarat. Since *H. scutelleridae* was found in horticultural ecosystem, it was habitat specific. Likewise, the presence of *L. indicus* and *D. rusticus* was limited to habitat along riverbanks. Among the 12 families mentioned above, Pentatomidae family being the most prevalent with 11 species spread across 10 genera and 2 sub-families. Families such as Dinidoridae, Alydidae, Nabidae, Pyrrhocoridae, and Miridae were represented by one sub-family, one genus, and one species only. According to the study, Polo Forest had highest species richness (11 species), Shannon's diversity index (2.08), and relative abundance (28.94) among the various forest ecosystem, whereas Danta had lowest. Among the agricultural ecosystem, Agronomy Farm had most species richness (20 species), Shannon's diversity index (2.75), and relative abundance (52.63%), while Center for Oilseeds Research had lowest. Relative abundance, species richness was compared across all riverbank ecosystems. In these environments, the evenness ratings varied from 0.96 in Sabarmati to 0.99 in Banas. Prantij has the most species richness (25 species), Shannon's diversity index (2.73), and relative abundance (65.78%) among horticulture ecosystems, while Indroda Park recorded the lowest.

Keywords: bugs; ecosystem; species; Shannon's diversity index; relative abundance

Rapid Virtual Oral Presentation

BTVP-04

Report of banana skipper (*Erionota thrax)* in Nagaland, their biology and morphometric analysis

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The banana skipper, also known as the red palmeye butterfly (*Erionota thrax* Linnaeus), is a significant pest for banana plants. In Nagaland, this butterfly has been observed infesting both banana and palm plants. The infestation was first reported in October 2024, and the number of *Erionota thrax* increased gradually, reaching its peak in December 2024. To better understand the butterfly's morphology and life cycle, a study was conducted under controlled conditions. Female butterflies lay small, pale yellow, bell-shaped eggs on the undersides of leaves, either individually or in clusters. After hatching, the larvae migrate to the edges of the leaves to start feeding, causing damage by rolling the leaves that hang from the midribs. Adult butterflies have a chocolate brown coloration and feature three yellowish-white spots on their forewings. The durations of the egg, larval, and pupal stages are approximately 5 to 8 days, 29 to 31 days, and 8 to 12 days, respectively. In terms of morphometric measurements, the average lengths recorded were as follows: the eggs measured about 2.21 mm, while the larval stages (from the first to the fifth instar) measured 4.7 mm, 7.86 mm, 15.52 mm, 37.09 mm and 47.01. The pupae were recorded at 34.00 mm, the wingspans of adults were 73.47 mm for males and 80.23 mm for females.

Keywords: banana; palm; Nagaland; biology; morphometrics

Rapid Virtual Oral Presentation

BTVP-05

Butterfly diversity and abundance in an urbanizing landscape: A study at st. john's college, Agra

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Urbanization activities, including construction and increasing human population, have the potential to alter butterfly populations significantly. These activities can impact habitat quality and availability which makes it essential to balance urban planning with conservation efforts. This study examined the significant variations in butterfly community structures as influenced by seasonal changes and urban habitat factors. A year-long survey conducted from 2023-24 at St. John's College in Agra, found that butterfly diversity peaks during spring and autumn, with marked declines in the summer and winter months. Urban areas, particularly roadsides, demonstrated lower butterfly diversity compared to more green habitats, revealing a complex relationship between urbanization and biodiversity conservation. The study highlighted the impacts of urbanization on butterfly populations, noting that construction and landscaping activities can significantly alter habitat quality and availability. It underscored the necessity of integrating conservation efforts into urban planning to mitigate these impacts. Additionally, the research indicated that butterfly abundance is heavily influenced by seasonal factors, with the highest populations occurring during post-monsoon season (September to November) and the lowest during the winter months (December to February). This seasonal fluctuation illustrated the critical role of environmental conditions and vegetation availability in sustaining stable butterfly populations. The study employed systematic surveys using the Pollard Walk method across various transects to assess species presence and abundance. A total of 42 butterfly species belongs to 5 families were recorded with seasonal variation in their abundance. The family Nymphalidae was dominant in terms of species composition. The results revealed significant variations in butterfly diversity and richness across different habitats, emphasizing the need for conservation strategies consider habitat-specific requirements. The findings position butterflies as bioindicators of ecosystem health, highlighting their importance in urban environments and the necessity of implementing conservation management practices to ensure the sustainability of butterfly populations amid ongoing urban development.

Keywords: butterfly; biodiversity conservation; Lepidoptera; Rhopalocera; urbanization

Rapid Virtual Oral Presentation

BTVP-06

Coleoptera diversity and distribution patterns in Ri Bhoi, Meghalaya: A preliminary study

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The district of Ri Bhoi in Meghalaya, situated in the northeastern region of India, is a hotspot for biodiversity due to its unique climatic and ecological conditions. This study focuses on the diversity of Coleoptera, a prominent order of insects, within this region. Through systematic field surveys conducted over several months, we collected various species of beetles from different habitats, including forests, grasslands, and agricultural areas. The aim of this research was to assess the species richness, distribution patterns, and ecological significance of Coleoptera in Ri Bhoi. A total of 110 Coleopteran species from 11 families were identified, with notable diversity in the family Carabidae (ground beetles) and Chrysomelidae (leaf beetles). The diversity indices indicated a rich assemblage, with high species richness found in the forested areas compared to more disturbed agricultural zones. The study also observed seasonal variations in beetle populations, with higher abundance during the monsoon season due to increased vegetation growth. The findings highlight the ecological role of Coleoptera as natural pest controllers, decomposers, and pollinators, crucial for maintaining the health of the ecosystem. The documentation of beetle species in Ri Bhoi adds to the growing understanding of the region's entomofauna and underscores the need for conservation efforts to protect these vital insects in the face of habitat degradation and climate change. This research contributes to the baseline data for future ecological studies in the region and offers valuable insights into the functional diversity of beetles in the Himalayan foothills.

Keywords: diversity; Ri Bhoi; Meghalaya; biodiversity; Coleoptera

Rapid Virtual Oral Presentation

BTVP-07

Contribution to the Mymaridae fauna in the new alluvial zone of West Bengal

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The Mymaridae (Hymenoptera: Chalcidoidea) is one of the most distinctive families of the Chalcidoidea superfamily, which includes the smallest known insects. As far as known, these are parasitoids of eggs laid in concealed habitats. Most of the mymarids are oophagous, their known range of hosts covers twenty-four families from six orders (Coleoptera, Diptera, Hemiptera, Odonata, Orthoptera and Psocoptera), but their host ranges can also be wider, as host records for only 1/4 of the described species are known, so far. In almost all the habitats they are common but generally overlooked due to very smaller size of 0.22-1.5 mm. Mymarids have 1490 described species under 119 genera in the world, whereas, in India, there are 232 species under 39 genera. Out of which only 22 species of Mymaridae have been reported from West Bengal. So, more study on this family is needed in this region. We have collected Mymaridae samples from different locations under the new alluvial zone of the West Bengal using yellow pan trap. The taxonomic keys from various published literatures were followed to identify the specimens. We have got five new record (belonging to the genus: *Mymar*, *Acmopolynema*, *Anaphes* and *Polynema*) and one new species (genus: *Anagrus*) of Mymaridae from this zone of West Bengal. We are trying explore the ecosystem to record more number of Mymaridae from new alluvial zone of West Bengal.

Keywords: Mymaridae; parasitoid; oophagous; yellow pan trap; West Bengal

Rapid Virtual Oral Presentation

BTVP-08

Development of loop-mediated isothermal amplification (LAMP) assay for detection of *Phthorimaea absoluta* (Meyrick) (Lepidoptera: Gelechiidae)

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The tomato leaf miner (TLM), *Phthorimaea absoluta* Meyrick, 1917 (Lepidoptera: Gelechiidae) is a destructive invasive insect that has expanded its global distribution. Rapid and accurate identification of invasive pests is essential to support subsequent management and devise control measures. To accurately diagnose *P. absoluta*, a Loop Mediated Isothermal Amplification (LAMP) assay (TLM-LAMP) was developed to amplify the target region of mitochondrial cytochrome oxidase subunit I (COI) gene. The TLM-LAMP assay can identify the *P. absoluta* within 60 minutes at 65 °C after sample extraction. Cross-reactivity analysis against three closely related non-target species, *Phthorimaea operculella* (Zeller, 1873), *Pectinophora gossypiella* (Saunders, 1844), and *Aproaerema modicella* (Deventer, 1904) confirmed species specificity. The TLM-LAMP assay showed high sensitivity to *P. absoluta* DNA up to 1×10^{-8} ng/µL and in plasmid DNA template up to 1×10^{-14} ng/µL. In addition, the TLM-LAMP assay was successful in laboratory detection of larvae, pupa, and adult stages of *P. absoluta*. We have tested the TLM-LAMP assay for field application with quick and simple crude insect extraction procedures and found double distilled water (ddH_2O) as an effective extraction solution. The new TLM-LAMP assay was validated in the field and polyhouse using moths collected from pheromone traps followed by ddH_2O crude insect extract preparation and incubation. The assay could successfully detect the *P. absoluta* within 45 minutes at 65 °C. Sensitivity, specificity, repeatability, and field compatibility of the TLM-LAMP highlights the novelty of the developed method. TLM-LAMP assay is a novel molecular tool for detection of *P. absoluta* in the laboratory and field which will help in monitoring and aiding biosecurity responses.

Keywords: cytochrome oxidase subunit I gene; rapid; LAMP; crude; on-site.

Rapid Virtual Oral Presentation

BTVP-09

DNA barcodes identify the public health important tick species in the *Rhipicephalus* sp. complex in Sirumalai, Eastern Ghats, Tamil Nadu

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Tick borne diseases are the emerging public health problems globally. In India, ticks play a major role in transmitting several important tick-borne diseases, namely Kyasanur Forest Disease (KFD), Crimean-Congo Hemorrhagic Fever (CCHF), Lyme disease and Rickettsial infections. In India, a total of 106 tick species have been described under the family Ixodidae (Hard ticks). Though the conventional taxonomical key based identification methods are considered "GOLD STANDARD" for taxonomy, many times they pose discrepancy in accurately delineating certain species of ticks, due to their overlapping morphological characteristic features and lack of well-trained taxonomists. Among tick species distributed across the states, the species under the genus *Rhipicephalus*, such as *R. sanguineus, R. microplus, R. haemaphysaloides* and *R. annulatus* are known to be involved in transmiting several potential pathogens viz, *Rickettsia conorii*, *Babesia vogeli*, *Anaplasma marginale*, *Theileria annulata* and *Babesia bigemina* to humans and cattle. Generally, several species under the genus *Rhipicephalus*, exist as a species complex. Hence, confirmation of species complexes using morphological keys alone faces serious challenges and which needs to be complemented with some of the established molecular tools such as DNA barcoding. Hence in this study, a preliminary attempt was made to determine the usefulness of the internal transcribed spacer 2 (ITS2) region of nuclear ribosomal DNA-based candidate DNA barcodes in delineating 15 specimens belonging to five species of *R. sanguineus*, *R. microplus, R. haemaphysaloids*, *R. annulatus* and *R. bursa* collected from the field in Tamil Nadu. The results of the PCR amplification, sequence analysis and neighbor joining phylogenetic tree demonstrated three different distinct phylogenetic clades with a sub-clade of *R. annulatus* in the *R. sanguineus* clade. The results of DNA barcoding analysis also suggest the chances of possible misidentification of *R. haemaphysaloids* as *R. simus* and *R. sanguineus* species identification by morphological keys alone, because of its similarity of body size, scutum pattern, coloration, basis capitula, palps, coxal spines, leg morphology, festoons, adanal plates *etc.*,

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In addition to the species complex, there can be a chance misidentification of species due to the intra-species variation across different geographical regions and phenotypic plasticity. From the preliminary results of the present study evidently recommends the usefulness and inclusion of DNA based barcoding tools along with conventional morphology-based keys in identifying ticks particularly species complex like of *Rhipicephalus* species

Keywords: DNA barcodes; ticks; ITS2; *Rhipicephalus* sp; hard ticks

BTVP-10

Faunistic studies on family Cecidomyiidae from Karnataka, India

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Cecidomyiidae generally known as 'gall midges', produce abnormal plant growths called as galls or cecidia, is the sixth largest family under order Diptera which constitutes 6,651 species in 832 genera globally while Indian fauna represented by 398 species under 125 genera. Gall midges were collected using malaise trap, sweep net, light trap and rearing (damaged plant parts and insect hosts) from six agro-climatic zones of Karnataka. Among the six agro-climatic zones, highest per cent was recorded from Eastern dry zone. Rearing and malaise trap were found to be good method for collecting gall midges by comparing different collection methods for the specimens collected at GKVK, Bangalore. A total of 204 specimens of gall midges were collected and examined. Of which, 21 species of 18 genera belonging to eight tribes and three subfamilies have been documented and described along with high-quality photographs including genitalia illustrations, revised/modified identification keys and updated distribution data. Maximum number of cecidomyiids collected belonging to the genus *Lestodiplosis*. Gall midges were collected by rearing of infested economically important plants *viz*., Brinjal (*Asphondylia beguni*), Chilli (*Asphondylia gennadii),* Jasmine *(Contarinia maculipennis),* Rice (*Orseolia oryzae*), Mango (*Procontarinia* sp.) and Jackfruit (*Lestodiplosis* sp.). Predatory gall midges *Triommata coccidivora* and *Diadiplosis* sp. were collected from mealybugs *Pseudococcus longispinous* and *Phenacoccus madeirensis,* respectively. The study documented, two species *Neolestremia nagari*, *Lasioptera bryoniae* and three genera *viz*., *Diadiplosis, Trisopsis* and *Lestodiplosis* for first time from Karnataka and species *Lestremia calcuttaensis* and three genera *viz*., *Peromyia*, *Micromyia* and *Wasmanniella* were recorded for the first time from South India.

Keywords: gall midges; morphology; identification; redescription; India

Rapid Virtual Oral Presentation

BTVP-11

Field-validated detection of agriculturally important insects associated with crucifers: A deep learning approach

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Insects play a pivotal role in agricultural ecosystems, functioning both as pests and beneficial organisms such as natural enemies and pollinators. Timely identification and management of these insects are crucial for sustainable crop production. Leveraging advancements in convolutional neural networks, our study introduces a YOLOv5l-based deep learning model for accurate identification of agriculturally important insects associated with cruciferous crops and damage symptoms. To ensure robust data collection, we implemented a novel field imaging protocol, capturing 2,730 high-quality images from various fields and polyhouses using various devices. The images photographed by keeping cameras or smartphones at a distance of 25-30 cm between lens and affected portion. The cameras were kept straight, focusing on several pest-affected regions, their top as well as the bottom-views were captured. After proper identification by the experts, the images were pre-processed and evaluated across five YOLOv5 variants- nano (n), small (s), medium (m), large (l), and extra-large (x). The models were further tested on unseen images from different locations, with YOLOv5l emerging as the top-performing variant, achieving remarkable metrics: an average accuracy of 99.5%, precision of 92.0%, recall of 83.0%, and an F1-score of 0.873. YOLOv5l also demonstrated optimal inference speed, making it a highly efficient and scalable option for deployment. By coupling the YOLOv5l model with AI-powered mobile applications, we envision empowering farmers with rapid insect identification and actionable pest management recommendations.

Keywords: agriculture; artificial Intelligence; cruciferous crops; identification, YOLOv5.

Rapid Virtual Oral Presentation

BTVP-12

From dawn to dusk: Insect diversity in the Aonla ecosystem

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Medicinally important cross-pollinated Aonla crop attracts a wide range of insect to its flowers, underscoring the importance of analyzing the diversity of floral visitors. Therefore, current study aimed to assess the species richness and diversity indices of insect floral visitors within the Aonla ecosystem. Observations were conducted in the Aonla Orchard, Regional Research Station, Aruppukottai (9°55'N, 78°09'E). Data collection involved recording the number of insects visiting the inflorescences over 5-minute intervals at two-hour time period from 0600 to 1800 hours. Sampling was carried out on five randomly selected Aonla trees over twenty non-consecutive days during the flowering period, from the first week of February to the last week of April 2023 and subsequently the diversity indices were calculated. The Species richness was recorded at its maximum in 0600 – 0800 h and 1400 – 1800 h (17). Relative Abundance reached its maximum in 1600 – 1800 h (37.28 %). Shannon H index (2.03), Shannon Equitability index (1), Simpson index (0.21), Simpson Reciprocal Index (4.63), Dominance index (0.78), Buzas and Gibson's Index (0.44), Equitability Index (0.71), Berger Parker Index (0.42), Inverted Berger Parker Index (2.90) was maximum in 0600 – 0800 h. Margalef Index (2.13), Menhinick's index (0.36), Gini Coefficient (0.68) reached its maximum in 1600-1800 h. The study reveals that the highest abundance of floral visitors occurred during the evening hours, while peak diversity was recorded in the morning hours. Future research could investigate the specific contributions of each floral visitor to pollination and crop yield, assess the impacts of climate change on floral visitor populations, examine the role of floral volatiles in attracting visitors, and evaluate the effects of pesticide exposure on visitor populations.

Keywords: aonla; aruppukottai; diversity; insect; richness

Rapid Virtual Oral Presentation

BTVP-13

Insect pest and predator complex in tea ecosystem of Lakhimpur district

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An evergreen perennial woody plant, Tea (*Camellia sinesis* (L) O. Kuntze) is cultivated for its leaves that provide a quality beverage worldwide. Assam is the largest tea producing state in India which contributes to 50% of overall tea production in the country. There are various pest and predator are associated with tea plantation. The pest damage in tea can often lead to a significant impact on productivity. Tea with perennial foliage is infested by about 167 insect species in the North Eastern Tea growing regions of India. If the major pest effecting the tea plant are known then we can make special efforts for its control. The present study generates a baseline data of different species of insect pest and predator in tea ecosystem of Lakhimpur District and correlation between predator-pest were workout. The survey was carried out at koilamari tea estate (27.19'24" N, 94.3'4" E) and dejoo tea estate (27.2837' N, 94.0205'E) of Lakhimpur district (Assam). The study was carried out during the month of February to July of 2024. Insect collecting net was used to catch the aerial insect and also insects are collected through hand picking method. After collecting the insect during the survey, they were preserved by dry preservation or wet preservation method. The collected insects were calculated and their diversity index, richness and evenness were determined. A total of 53 species belonging to 34 families and 10 orders were observed under the study. Maximum number of species was observed in order Lepidoptera (13) followed by Hemiptera (6), Araneae (5), Coleoptera (4), Diptera (4), Orthoptera (3), Hymenoptera (3), Dictyoptera (2) and Odonata (1). Among 53 species 16 are pests and 34 are predators. Among the pests *Helopeltis theivora* was found to be highest (56.3%) and among predators *Leucauge decorata* was found to be highest (15.28%) in the garden. The diversity of predator was observed to be more than pest and are negatively correlated (-0.512). The present study suggested high potential in natural enemies to check pest population at lower levels, restricting damage in the tea gardens. Therefore, to achieve quality tea, in situ conservation and maintainance of natural enemies in the tea ecosystem is desirable along with reduction in the use of insecticide.

Keywords: tea; *Camellia sinesis*; pest; predator; Lepidoptera; Hemiptera

Rapid Virtual Oral Presentation

BTVP-14

Integrating geometric morphometrics in medical entomology to differentiate *Aedes* (Diptera: Culicidae) vectors

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Mosquito (Diptera: Culicidae) vectors, are crucial in transmitting various infectious diseases, including malaria, dengue, Zika, and chikungunya. It enhances the effectiveness of surveillance and addresses the challenges posed by invasive species. An emerging tool, geometric morphometrics (GM) measures phenotypic differences using landmark coordinates, facilitating species identification, including distinguishing cryptic species complexes and intraspecific variations along with evaluation of population variations influenced by environmental factors and other conditions. This study employed wing geometric morphometrics (GM) to differentiate three vector mosquito species: *Aedes aegypti*, *Aedes albopictus*, and *Aedes vittatus*. After digitizing landmarks, the metric data underwent complex analyses, including Generalized Procrustes Superimposition (GPA), Principal Component Analysis (PCA), Canonical Variate Analysis (CVA), and Discriminant Function Analysis (DFA), effectively distinguishing the three species. The first two principal components of the PCA (PC1 = 32.94% and PC2 = 21.69%) collectively explained 54.64% of the variation in wing shape among the species. CVA revealed three distinct clusters, one for each species. Pairwise cross-validation using DFA achieved a 95% reclassification accuracy. The significant distinction among the three species *Ae. aegypti*, *Ae. albopictus* and *Ae. vittatus* showed that GM is a cost-effective method for the rapid species identification of mosquitoes in different geographical areas. This method is based on shape and size variation in the wings, which makes it an appropriate method to differentiate between closely related species. By integrating this method researchers can improve monitoring strategies and respond more effectively to public health challenges posed by mosquito populations.

Keywords: mosquito; vectors; vector-borne-diseases; *Aedes* mosquito; geometric morphometrics

Rapid Virtual Oral Presentation

BTVP-15

Record of four species of subfamily predatory Asopinae (Hemiptera: Heteroptera: Pentatomidae) from Punjab and its diversity estimation

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The Pentatomidae family of the insect order Hemiptera represents one of the largest families within the suborder Heteroptera, encompassing approximately 900 genera and 5000 species worldwide. Globally, this family is recognized by ten sub-families such as Phyllocephalinae, Podopinae, Serbaninae, Edessinae, Pentatominae, Cyrtocorinae, Stirotarsinae, Aphylinae, and Asopinae. Only four subfamilies have been reported to exist in India, such as Asopinae, Pentatominae, Phyllocephalinae, and Podopinae. Out of these four subfamilies, Asopinae has predatory behaviour. The present study examined morphological characteristics and diversity estimation of four species of the subfamily Asopinae, such as *Andrallus spinidens* (Fabricius, 1787), *Eocanthecona furcellata* (Wolff, 1811), *Perillus bioculatus* (Fabricius, 1775), and *Zicrona caerulea* (Linnaeus, 1758) collected from different districts of Punjab, India. Several agro-ecosystems of Punjab, such as cotton, maize, mustard, citrus, bajra, vegetables, pulses, rice, turmeric, and soybean, surveyed during the year 2023-2024. Genitalia dissections conducted on both male and female bugs along with the examination of various morphological characteristics. Morphometric measurements of different body parts of insects were documented, such as total body length, width of head, width of vertex, width of pronotum, length of head, lengths of five antennal segments (AS1, AS2, AS3, AS4, and AS5), and lengths of four labial segments (LS1, LS2, LS3, and LS4), respectively. The Shannon Index (H) was utilized to estimate the diversity of these predatory bug species. In Punjab's agroecosystems, *E. furcellata* exhibited greater evenness, whereas *P. bioculatus, A. spinidens* and *Z. caerulea* demonstrated lower evenness. The diversity of predatory bugs in districts of Punjab exhibited similar patterns, with *E. furcellata* demonstrating greater evenness, while *A. spinidens* showed lesser evenness within the same ecosystem. The study of subfamily Asopinae holds significance due to its predatory behaviour in ecosystem.

Keywords: Asopinae; biocontrol; diversity estimation; evenness; morphometrics.

Rapid Virtual Oral Presentation

BTVP-16

Entomological investigation of trombiculid mites on rodents/shrews in Dindigul district and Tamilnadu

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Chigger mites (Trombiculidae) are the primary vectors of scrub typhus, a zoonotic disease caused by *Orientia tsutsugamushi*. Despite their critical role in disease transmission, there is limited information on the distribution and diversity of these mites in South India. This study presents the findings of an entomological survey conducted across five ecological zones in Dindigul district, Tamil Nadu, to document the diversity of trombiculid mites and assess their infestation on rodents and shrews. A total of 150 Sherman and Wonder traps were set up, capturing 25 small mammals belonging to four species: *Suncus murinus*, *Rattus rattus*, *Tatera indica*, and *Bandicoota bengalensis*. The rodent infestation rate was found to be 80%, with a chigger index of 26.6. Morphological identification of 665 chigger mites revealed 17 species: *Walchia rustica*, *W. lupella*, *Trombicula hypodermata*, *Schoengastiella ralagea*, *S. taufflieb*i, *S. sicata*, *Leptotrombidium deliense*, *L. rajasthanense*, *L. dehradunense*, *L. indicum*, *L. insigne*, *L. discrepans*, *L. bhattipadense*, *L. jayewickremei*, *L. imphalum*, *L. kulkarni*, and *L. pseudogliricolens*. Among these species, *Leptotrombidium deliense* was the most frequently found, and *Suncus murinus* was the host most commonly infested with chigger mites, with 12 individuals captured. Notably, *Walchia rustica*, *W. lupella*, *Schoengastiella ralagea*, *S. taufflieb*i, *Leptotrombidium discrepans*, *L. bhattipadense*, and *L. pseudogliricolens* are being reported for the first time in Tamil Nadu. These findings highlight the rich diversity and high infestation rates of trombiculid mites in Dindigul district. This survey emphasizes the need for continued research and monitoring to better understand the ecology of chigger mites and their role in the transmission of scrub typhus.

Keywords: trombiculid mites; scrub typhus vectors; rodent host; vector ecology; morphological taxonomy

Rapid Virtual Oral Presentation

BTVP-17

A study of trombiculid mites at rodents/shrews in Palani hill, Western Ghats, South India

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At the elevation of 2500mt height at Western Ghats region in the Palani hills, A surveillance was made to observe trombiculid mites. The purpose of this study is to find out vector responsible for the spread of Scrub Typhus among the people in the Kodaikanal region. Being the Kodaikanal city and adjacent region is visit by people from various places, which may increase the chance of the spread of pathogen from mites. So, this study was undertaken. Trombiculid mites were collected primarily from rodents and shrews. For collection live traps were used. A total of 60 traps were placed and 19 rodents/shrew belonged to 5 species were collected. They were identified as *Tatera indica* with 9 mites (12.68%), *Suncus murinus* with 26 mites (36.62%) followed by *Bandicota indica* with 6 mites (8.45%). Six species of trombiculid mites *Leptotrombidium rajesthanense, Herpetacarus schlugeri, Trombicula hypodermata, Schoengastiella herulata, Schoengastiella galarea, Schoengastiella ralagia* were collected from 71 mites. These chigger mites may play a role in the transmission of Scrub Typhus disease in human. Strengthening surveillance system for trombiculid mites is very important for implementing effective control measure and preventive measures for scrub typhus in hilly area.

Keywords: Trombiculidae; ectoparasite; chigger-mites; scrub typhus; rodents

Rapid Virtual Oral Presentation

BTVP-18

Study on pest complex of brinjal in Manipur

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The experiment was conducted during 2023-24 in the Central Farm, Central Agricultural University, Imphal, Manipur to study the insect pest complex of brinjal. A local variety of brinjal was transplanted and raised with recommended management practices. Numerous pests predominated in the brinjal crop from the seedling to harvesting stages, and the amount of damage they inflicted varied from season to season based on environmental circumstances. Eight insect species were identified as being connected to the brinjal crop at various phases of crop growth during the insect pest succession study. One week following transplantation, the crop was attacked for the first time, and it persisted until it was harvested. Aphids, jassids, white flies, leaf rollers, fruit and shoot borer, epilachna beetles/hadda beetle, leaf webbers and grass hoppers were among the pests that were observed attacking the crop. The main pest among them was identified as the brinjal shoot and fruit borer (*Leucinodes orbonalis*), aphids (*Aphis gossypii* Glov.), epilachna beetles (*Epilachna viginitioctopunctata* F.), and leaf hoppers (*Amrasca biguttula biguttula* Ishida) which cause crop damage. Four major predators recorded as natural enemies to insect pests of brinjal are the coccinellid beetle, syrphid fly, green lacewing and spider.

Key words: brinjal; pest complex; predators; Manipur; India

Rapid Virtual Oral Presentation

BTVP-19

Taxonomic studies on tribe Archipini (Lepidoptera: Tortricidae) from India

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Archipini small to medium-sized micromoths belonging to the family Tortricidae with over 500 species in 150 genera. These moths are primarily distributed in the Holarctic, Afrotropical, and Oriental regions, with fewer species occurs in Neotropical region. From India, 87 species in 28 genera have been recorded. Although commonly known as leaf rollers, their feeding habits vary diverse such as seed feeders, fruit borers, stem borers, gall makers, and flower webbers of agricultural/ horticultural/ forest plants. Archipini moths exhibit typical characteristics of the Tortricidae family, in most species, the costal margin of the forewing is sinuous, forming a bell-like shape when at rest. The forewings often have a convex costa, with or without a costal fold in males. The chorda is rarely present, while the M-stem is ill-defined or absent. Male genitalia typically feature a large tegumen, prominent uncus, hairy socii, well-developed gnathos and gnathal arms, an elongated valva with a variable costa, and an aedeagus with a cluster of deciduous cornuti. Female genitalia possess a dagger-shaped signum, often with a capitulum or reduced. As part of our ongoing study on Indian Tortricidae, we have studied and described/redescribed 21 species under 15 genera of Archipini. Among them, *Choristoneura ribhoiensis* sp. nov. and *Terthreutis subrectangulus* sp. nov. are new to science. Additionally, we have reported five new country records for India: *Clepsis laetornata*, *Diplocalyptis ferruginimixta*, *Diplocalyptis operosa*, *Isodemis proxima* and *Isodemis solea*. We have also examined several pest species of Archipini, including *Archips machlopis* (Mango, Litchi), *Chirapsina hemixantha* (Apple), *Homona coffearia* (Tea leaf roller), and *Planostocha cumulata* (Sapota). For each species we provided detailed descriptions, diagnostic characters, digital illustrations of the adult habitus, wing venation, and genitalia, along with distributional data and host records. This study significantly enhances the taxonomic understanding of Indian Archipini.

Keywords: microlepidoptera; new species; new record; pests; India

Rapid Virtual Oral Presentation

Theme II
Integrated Pest Management

ENTOMOLOGY STUDENTS CONCLAVE

ESC 2025

ENTOMOLOGICAL SOCIETY OF INDIA

IPMO-01

Automated detection and classification of tea pest infestations using mask R-CNN for sustainable tea cultivation

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Tea is one of the most popular beverages worldwide; however, these crops are susceptible to various pests, and all have a unique pattern of damage. This study primarily focuses on two sucking pests tea thrips, *Scirtothrips dorsalis*, and tea greenflies, *Empoasca flavescens*. These pests have significantly impacted tea crops in recent years, and their infestations have led to diseases such as Fusarium dieback. In this study, we have deployed the modern machine learning advanced model Mask Region-based Convolutional Neural Network (Mask R-CNN) to classify the infestation pattern. Early detection and classification of infestation levels are crucial for effective pest management. This study employs a Mask R-CNN to identify and classify the early, moderate, and severe infestations of tea thrips and tea greenflies with high precision. The model uses three main classes—1. Thrips, 2. Greenfly, and 3. Combined Thrips and Greenfly—each further subdivided into three subclasses: Early Infestation, Moderate Infestation, and Severe Infestation. The system achieved a remarkable 98.5% accuracy in detecting and categorizing pest infestation levels across the dataset collected from tea gardens. This technique has the potential to detect pests automatically using either aerial or mobile devices. This advanced deep learning approach will help in minimizing crop loss and early pest detection.

Keywords: mask R-CNN; tea plantations; pest detection; sustainable agriculture; integrated pest management

Oral Presentation

IPMO-02

Comparative evaluation of trapping techniques and fruit fly diversity for effective pest management across ecosystems

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Fruit flies (*Tephritidae: Diptera*) are major invasive pests causing significant damage to horticultural crops, particularly high-value fruits and vegetables. Effective management strategies include parapheromone traps and food baits for mass trapping. This study evaluates the performance of synthetic methyl eugenol (ME) and Dorso-lure (DL) traps in mango orchards, along with eight food-based baits in sponge gourd fields, under varying environmental conditions. The ME and DL traps captured four fruit fly species: *Bactrocera dorsalis*, *B. zonata*, *Zeugodacus cucurbitae*, and *B. correcta*, with *B. dorsalis* dominating (96.92%). The biodiversity assessment in mango orchards revealed a Margalef richness index of 0.3735, a Simpson index of 0.947, and a Shannon index of 0.1504, indicating low species diversity. ME traps were significantly more effective (89.02%) than DL traps (10.97%). In sponge gourd fields, food baits attracted two species: *Z. cucurbitae* (98.78%) and *Z. tau* (1.22%). The Margalef index was 0.1815, and the Berger-Parker Dominance Index was 0.9879, demonstrating the overwhelming dominance of *Z. cucurbitae*. Among the tested baits, pumpkin bait was the most effective, capturing 89.02% of fruit flies. The observed sex ratio for food bait captures was 1:1.9 (male: female), highlighting a higher proportion of females. This study provides insights into the efficiency of different trapping methods and fruit fly diversity across ecosystems. ME traps proved to be the most effective in mango orchards, while pumpkin-based food baits showed promising results in cucurbit fields. These findings can help optimize fruit fly management strategies, minimizing pest infestations and reducing economic losses in horticultural production.

Keywords: fruit flies; parapheromone traps; food baits; biodiversity; pest management

Oral Presentation

IPMO-03

Diversity of insect pests and natural enemies associated with King chilli (*Capsicum sinense* Jacq.) ecosystem

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King chilli (*Capsicum chinense* Jacq.) is an important vegetable cum spice crop cultivated to a wide extent especially in Assam, Nagaland Manipur and Arunachal Pradesh of north eastern region of India. It is highly cultivated in this region because of its high pungency and aroma. King chilli is greatly affected by number of insect pests from germination to harvesting. The present study was conducted at Jorhat, Assam during rabi season to find out the insect pests and natural enemies associated with the crop. A total of 13 pests were recorded among which 12 species belong to the class Insecta and one from the class Arachnida. Among the insect pests order sucking pests were most dominant. Cotton aphid (*Aphis gossypii*) was found to be most dominant among all the insect pests from seedling to harvesting stage. The study revealed six natural enemies that were associated with the crop.

Keywords: King chilli; Insecta; Arachnida; natural enemy; cotton aphid

Oral Presentation

IPMO-04

Eco-friendly management of blister beetle, *Lytta* sp. in pearl millet

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Pearl millet *Pennisetum glaucum* (L.) is the most important staple food crop and threatened by at least 150 insect species globally, with pest distribution and damage varying by location. The blister beetle, *Lytta* sp. is a major pest that causes significant damage during the flowering stage. Adult beetles devour the pollen and stigma, leading to grain abortion and panicle sterility. An eco-friendly approach to managing the blister beetle infestation was studied at the Regional Agricultural Research Station at Vijayapura, Karnataka, during the *Kharif* season of 2022-23. The treatments were imposed when the beetle incidence was at its peak and the number of beetles present per 5 randomly selected earheads was recorded post treatments. In our study, among all the treatments tested (*Lecanicillium lecanii* (2×10^8 CFU/ml), *Metarhizium rileyi* (2×10^8 CFU/ml), NSKE 5%, Agniastra 3%, Cypermethrin 10% EC, Malathion 5% D (Standard check), Emamectin benzoate 5% SG and Untreated (Control) chemical insecticides proved to be significantly superior in reducing the blister beetle incidence compared to the control. Emamectin benzoate @ 0.2 g/L was more efficient in reducing (82.71%) blister beetle incidence. It was followed by Cypermethrin at 0.5 ml/L and Malathion at 8 kg/acre, which reduced beetle incidence by 78.57% and 75.3%, respectively. Botanical treatments, such as NSKE 5% and agniastra 3%, reduced beetle incidence by 55.10% and 40.70%, respectively. The microbial pesticide *Lecanicillium lecanii* at 2 ml/L led to a 47.25% reduction in beetle incidence. This study demonstrates the effectiveness of chemical insecticides like cypermethrin, emamectin benzoate, and malathion in controlling blister beetles. It also highlights the potential of biorational and microbial pesticides as affordable and accessible pest control solutions for resource-poor farmers.

Keywords: pearl millet; Vijayapura; blister beetle; *Lytta* sp.; insecticides

Oral Presentation

IPMO-05

Effect of dates of planting and application of oil cakes on soil insect-pests of potato in rainfed upland situation

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This study investigates the impact of various planting dates and oil cakes (neem, mustard and castor) on soil-borne insect pests and potato tuber damage in NBPZ of Assam during the 2022-23 rabi season. Potato (*Solanum tuberosum*), a vital crop with nutritional and industrial value, faces significant yield losses due to insect pests such as cutworms, white grubs, red ants and wireworms. The experiment conducted at Biswanath College of Agriculture, utilized a factorial randomized block design (RBD) with 12 treatment combinations including control with three oil cakes as treatment *viz.*, C_1 = mustard oil cake (MOC), C_2 = neem oil cake (NOC) and C_3 = castor oil (COC) and three planting dates *viz.*, early (D_1), normal (D_2) and late (D_3) planted on 1st week of October, November and December, 2022, respectively. Results indicated that early planting (October) significantly reduced pest damage compared to normal (November) and late (December) planting. Among the oil cakes, neem oil cake (NOC) was the most effective in controlling pest populations and minimizing tuber damage. The study highlights the potential of neem-based products for sustainable pest management, reducing environmental pollution and pesticide residue. The findings suggest that early planting combined with neem oil cake offers the best strategy for managing soil pests and enhancing potato yield in NBPZ of Assam, emphasizing the need for integrated pest management strategies in potato cultivation.

Keywords: oilcakes; NBPZ; soil-borne insect pests; RBD; castor oil

Oral Presentation

IPMO-06

Evaluation of certain eco-friendly management modules against diamondback moth (*Plutella xylostella*) on cabbage, *Brassica oleracea* L. var *capitata*

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Cabbage is originated in Mediterranean region and domesticated first in Western Europe. This crop is affected by various insect pest, can cause about 52-100% yield loss among which diamondback moth (*Plutella xylostella*) is the most important key pest. This pest can be controlled by chemical insecticides which is risky towards human health and the environment. Therefore, the experiment was conducted to manage this pest through eco-friendly management practices. Initially, application of wood ash @150 kg/ha + mustard oil cake @150 kg/ha was done prior to transplanting (Module I). M_1 + neem oil @ 5 ml/l was done at 15 and 30 days after transplanting as a foliar spray (Module II). M_1 + neem oil @ 5 ml/l was done at 15, 30 and 45 days after transplanting as a foliar spray (Module III). M_1 + jatropha oil @5 ml/l was done at 15 and 30 days after transplanting as a foliar spray (Module IV). M_1 + jatropha oil @5 ml/l was done at 15, 30 and 45 days after transplanting as a foliar spray (Module V). Application of clothianidin 50 WDG @0.3 g/l and chlorantraniliprole 18.5 SC @0.3 ml/l of water was done at 15 days after transplanting (Module VI) and an untreated control plot was kept uninterrupted. Among all the modules, module VI was found to be very effective against diamondback moth with a minimum number of larvae per plant was recorded to be 0.73 with a significant reduction of 89.18% larval population over control. However, among the eco-friendly modules, module III was found to be very effective in managing diamondback moth with a minimum number of larvae per plant was estimated as 2.16 with a significant reduction of 68% larval population over control followed by module V, module II, and module I, respectively. The current study showed that, neem oil and jatropha oil in combination with wood ash and mustard oil cake in managing diamondback moth infestation on cabbage crop is more effective.

Keywords: diamondback moth; ecofriendly management; jatropha oil; neem oil; mustard oil cake

Oral Presentation

IPMO-07

Exploring the natural farming-based bio-inputs against major soil insect pests of potato

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Natural farming in India has markedly transformed from a grassroots movement across various states to a more organized, state-driven initiative. The study was conducted to determine the effectiveness of natural farming based bio-inputs against soil insect pests. For this, both field and laboratory experiments were carried out to evaluate the major natural farming based bio-inputs against major soil insect pests of potato. The experiment was conducted with five different treatments *viz.*, tuber treatment with *beejamrit* @ 200 ml/L+ soil drenching with *jeevamrit* @ 200 L/acre at sowing, 1st and 2nd earthing up (T_1), T_1 + soil drenching with *brahmastra* @ 25 ml/L of water at 1st and 2nd earthing up (T_2), T_1 + soil drenching with *agneyastra* @ 25 ml/L of water at 1st and 2nd earthing up (T_3), T_1 + soil drenching with *dashparni* @ 25 ml/L of water at 1st and 2nd earthing up (T_4), T_1 + soil drenching with *neemastra* @ 100 ml/L of water at 1st and 2nd earthing up (T_5) and were compared with Organic Package of Practices (T_6) and control (T_7). Treatments were evaluated on the basis of per cent tuber damage (weight and number basis), yield and yield attributing characters as well as B:C ratio. Among the seven different treatments, significantly lowest per cent of tuber damage on both weight and number basis (11.31 and 14.12, respectively) was recorded in T_4 plots. During the experimental period, the maximum tuber damage was caused by oriental army ants (55.56-63.57%) followed by white grubs (20.66-26.67%) and cutworms (15.56-18.79%). In terms of various yield attributing characters, the plots treated with T_6 recorded significantly superior results at 1st and 2nd earthing up and at harvest. Among the tested treatments, the maximum total and marketable yield was recorded in T_6 (134.28 and 114.79 q/ha) followed by T_4 (106.50 and 95.19 q/ha). The lowest non-marketable yield of 11.31 q/ha was recoded in T_4 treated plots with a highest B:C ratio of 2.77.

Keywords: bio-inputs; cutworm; *dashparni*; oriental army ants; white grub

Oral Presentation

IPMO-08

Impact of various IPM modules on the management of fruit borer, *Helicoverpa armigera* in chilli

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Chilli, *Capsicum annuum* L., holds immense significance in India, both culturally and economically. It is an important spice crop valued for its pungency, flavour and health benefits. In Assam, chilli cultivation is not only a source of income but also an integral part of the local cuisine and traditional practices. Among the various pests affecting chilli, the fruit borer, *Helicoverpa armigera* is one of the most destructive insect. This polyphagous pest causes significant economic losses by feeding on the flowers and fruits of the plant, leading to direct yield reduction and reduced marketability. The larvae bore into the fruits causing internal damage and making them unfit for consumption or sale. This study was undertaken to evaluate the efficacy of various IPM modules against *H. armigera* in chilli. The study was conducted at Biswanath College of Agriculture, Biswanath Chariali, Assam during *Rabi* 2022-2023. Data was recorded at 9,11,13 and 15 Weeks After Transplanting (WAT) of chilli plants. Seven IPM modules including combinations of cultural, biological and chemical methods were compared to an untreated control using Randomized Block Design. Among the treatments, it was observed that M_4 (0.86) comprising of polyethene mulch +marigold + neem cake @ 250 kg/ha recorded the lowest mean population followed by M_7 (0.87) which consisted of marigold + *Beauvaria bassiana* @ 5g/l. The highest mean population was observed in M_8 (2.19) which was untreated control. The highest per cent reduction over control was seen in M_4 (60.73) followed by M_7 (60.27) which was statistically at par with each other. The data on per cent fruit damage revealed M_8 and M_5 comprising of straw mulching + garlic extract at 10 ml/l to exhibit the highest fruit damage at both 13 WAT (9.83 and 9.23%) and 15 WAT (11.28 and 9.14%). Lowest per cent fruit damage was observed in M_4 at 4.31% (13 WAT) and 4.85% (15 WAT). This research contributes valuable insights into pest management strategies that can be utilized by farmers to mitigate losses from fruit borer infestations.

Keywords: chilli; insect pest; IPM module; fruit borer; integrated pest management

Oral Presentation

IPMO-09

Incidence and management of lepidopteran defoliators in Castor

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Castor, *Ricinus communis* L. is a rainfed crop and its seeds contain up to 42% extractable oil. However, India is the leading producer with 87% of world production. This crop is affected severely by Castor semilooper, and shoot and fruit borer cause yield losses up to 30-50 and 42.3 per cent, respectively. A field experiment was carried at GKVK, UAS, Bangalore, during 2021-22 and fortnightly observations were made on ten randomly selected DCH-177 hybrid plants from germination to harvest. Result shown that, Castor semilooper, *Acanthodelta janata* L. was at its peak activity (0.22 larvae/plant) during 33rd standard meteorological week (SMW) while castor spiny caterpillar, *Ariadne merione* (Cramer) (1.50 larvae/plant) and tussock caterpillar, *Olene mendosa* Hübner (0.67 larvae/plant) reached their maximum populations at 31st SMW. Shoot and capsule borer, *Conogethes punctiferalis* (Guenée) activity reached its peak during 33rd SMW at capsule development stage (6.21% bored capsules). A tachinid parasitoid, *Carcelia illota* (Curran) was observed on castor spiny caterpillar. *Brachymeria lasus* (Walker) was seen parasitizing pupa of capsule borer, *Brachymeria* sp. and *Chelonus blackburni* Cameron on lepidopteran larvae. Larval-pupal or larval parasitoid, *Microplitis maculipennis* Szépligeti was seen parasitizing castor semilooper larvae in field conditions. The population of castor semilooper was reduced to zero after 15 days of spraying flubendiamide 39.35% SC, spinosad 2.5% SC, emamectin benzoate 5% SG, chlorantraniliprole 18.5% SC and quinalphos 25% EC except profenophos 50% EC (77.29% reduction over control). Chlorantraniliprole and flubendiamide gave 100% reduction of spiny caterpillar population followed by emamectin benzoate (79.04%). The highest seed yield of 1280 Kg/ha was recorded in emamectin benzoate followed by flubendiamide (1270 Kg/ha) while the lowest yield (530 Kg/ha) was from untreated plots. The cost-benefit ratio was highest in emamectin benzoate (1:1.95) whereas the lowest value was recorded by chlorantraniliprole (1:1.19). Against defoliators, emamectin benzoate @ 0.3g/l and flubendiamide @ 0.25ml/l were effective while, profenophos @ 1ml/l was less effective. With the data on seasonal occurrence of insect pests, new molecules can be tested at their peak incidence.

Keywords: castor; semilooper; emamectin benzoate; flubendiamide; chlorantraniliprole

Oral Presentation

IPMO-10

Influence of nitrogen and pesticide applications on *Thrips tabaci* and *Alternaria porri* interaction in onion under field conditions

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Thrips tabaci and *Alternaria porri* are key pests limiting onion production globally, including in India. While laboratory studies have explored their interactions, limited field-based research exists, particularly under Indian agro-ecological conditions. This study aimed to investigate the effects of nitrogen application rates and pesticide treatments on the interaction between *T. tabaci* and *A. porri* in onion and their impact on yield. Field experiments were conducted during 2023-24 at the Research Farm, Anjanthali, Maharana Pratap Horticultural University (Haryana), using a split-split plot design with three nitrogen levels (80%, 100%, and 120% of the recommended dose of nitrogen [RDN]); four pesticide treatments (insecticide only, fungicide only, both, and untreated control); and two onion varieties (Red 3 and Hisar onion 2). Observations included the thrips population, *A. porri* disease severity, and bulb yield. Results revealed that thrips populations increased with higher nitrogen levels, whereas *A. porri* disease severity remained unaffected. However, both pests were positively associated, significantly reducing bulb yield. Combined insecticide and fungicide application effectively reduced thrips populations and disease severity, with significant differences observed across pre- and post-spray intervals (3, 7, and 14 days after spray). Increasing nitrogen by 20% (120% RDN) and pesticide application significantly improved bulb yield, although higher nitrogen levels exacerbated thrips infestation. This study highlights the need for integrated pest and nutrient management strategies to mitigate pest-pathogen interactions and optimize onion yield. The findings provide critical insights into pest dynamics and disease management under field conditions, contributing to sustainable onion production.

Keywords: thrips; purple blotch; insect infestation; disease severity; onion yield

Oral Presentation

IPMO-11

Larval frass: A natural oviposition deterrent inducing behavioral changes in *Spodoptera litura* (Lepidoptera: Noctuidae)

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The tobacco cutworm, *Spodoptera litura* (Fab.), is a highly polyphagous and destructive insect pest of cultivated crops. Larval frass consists of a mixture of waste materials from the insect's body, plant material and microorganisms that play a crucial role in determining its odour. The study examined the oviposition deterrent effects of larval frass from *S. litura* and *S. frugiperda* (Smith) on gravid females of *S. litura*. Larval frass obtained from *S. litura* fed on castor leaves and *S. frugiperda* fed on maize leaves were extracted using water and tested at five concentrations (1.25 %, 2.5 %, 5 %, 10 % and 20 %). Results indicated a significant decrease in the number of eggs laid by gravid females as frass concentration increased. For *S. litura* frass, females laid the highest number of eggs (309.6 eggs/female) at 1.25 per cent concentration. In comparison, 20 per cent frass concentration recorded the lowest number of eggs (99.67 eggs/female), corresponding to an oviposition repellence of 89.12 per cent. Similarly, *S. frugiperda* frass showed a decrease in egg laying from 586.9 eggs/female at 1.25 per cent concentration to 422.5 eggs/female at 20 per cent concentration, with an oviposition repellence of 50.44 per cent. The control group (untreated surfaces) exhibited significantly higher egg counts (916.33 eggs/female). These findings confirm that larval frass effectively deters oviposition in gravid females and highlight its potential application in eco-friendly pest management strategies. Female moths aim to reduce larval competition and enhance offspring survival by avoiding egg-laying on frass-treated surfaces.

Keywords: larval frass; *Spodoptera litura*; *S. frugiperda*; oviposition deterrent; eco-friendly

Oral Presentation

IPMO-12

Nano-emulsions as novel seed protectants: Comparative efficacy against *Rhyzopertha dominica* in stored wheat

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Wheat, a staple cereal, ranks second globally in production after maize. However, post-harvest losses caused by the Lesser Grain Borer, *Rhyzopertha dominica*, present a critical challenge in stored wheat management. While plant-based oils are considered safer alternatives to synthetic pesticides, their effectiveness as seed protectants requires further enhancement to achieve optimal pest control. This study investigated the efficacy of oils and their nano-emulsions in managing *R. dominica* populations in stored wheat. Wheat seeds were treated with 1% (v/w) concentrations of neem oil, karanj oil, castor oil, and eucalyptus oil, alongside their corresponding nano-emulsions. Population growth of *R. dominica* was monitored monthly for six months. Nano-emulsions demonstrated stable physicochemical properties, with hydrodynamic size ranging from 37.04 to 64.07 nm, zeta potential between ±30.90 and ±54.90 mV, kilo count per second from 271.70 to 305.60, and a polydispersity index of 0.318 to 0.397. Among the treatments, neem oil nano-emulsion exhibited the highest efficacy, significantly reducing adult emergence (40.20 adults) after 180 days of storage, followed by karanj oil nano-emulsion (45.29 adults). In contrast, untreated seeds recorded the highest emergence (350.44 adults). These findings underscore the potential of nano-emulsions as advanced tools for sustainable pest management and highlight the need for refining oil-based formulations to further enhance their efficiency in protecting stored grains and minimizing post-harvest losses.

Keywords: nano-emulsions; oils; lesser grain borer; *Rhyzopertha dominica;* wheat

Oral Presentation

IPMO-13

Organic management modules against insect pests in *Oryza sativa*: A comparative study of efficacy

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Application of cow-based botanicals in plant protection needs validation and scientific evaluation. This study was conducted to evaluate the efficacy of various organic management modules against insect pests in rice (TN-1) during *Kharif*, 2023 at Department of Entomology, OUAT, Bhubaneswar, Odisha and ICAR-NRRI Cuttack. Seven treatments, including untreated control, were tested. Soil application of Jivamrit (fermented product with cow dung, cow urine, lime, jaggery, pulse powder, and soil in water) and *Trichogramma japonicum* used in all treatment plots except untreated control. The organic formulations included Neem oil 1500 ppm, Brahmastra (cow urine + crushed leaves of neem + karanj + custard apple + castor + datura) and Neemastra (cow dung + cow urine + neem leaves). The results reflected that, the treatment "Jivamrit @250l ha^{-1} + *T. japonicum* @1 lakh ha^{-1} + Neem oil 1500 ppm @1.5l ha^{-1}" was superior in regulating insect pest damage resulting reduction of 54.68% in dead heart, 54.05% in white ear head, 68.99% in leaf folder infestation, 48.49% in hispa infestation, and 58.32% in green leaf hopper population over control with maximum grain yield (4.29 tonnes ha^{-1}). Subsequently, the treatment constituting "Jivamrit @250l ha^{-1} + *T. japonicum* @1 lakh ha^{-1} + alternate spray of Neem oil 1500 ppm @1.5l ha^{-1} and Brahmastra @250l ha^{-1}" achieved reduction of 45.55% in dead heart, 49.56% in white ear head, 63.16% in leaf folder infestation, 40.81% in hispa infestation, and 43.7% in green leaf hopper population over control and 4.17 tonnes ha^{-1} grain yield. Laboratory bio-assay revealed 83.34% mortality of leaf folder in petriplate and 76.67% mortality in whole plant assay with leaf area consumption (312.67 mm^2 in petriplate and 386.67 mm^2 for whole plant assay) in Brahmastra at 10% concentration which is statistically at par with its higher dose (20%). This present study demonstrated the potential of Neemastra and Brahmastra in rice pest control and appreciable grain yield.

Keywords: jivamrit; neemastra; brahmastra; eco-friendly; TN-1

Oral Presentation

IPMO-14

Overcoming insecticide resistance in *Helopeltis theivora*: Synergists as a pathway to effective pest management

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Helopeltis theivora, a major pest in Indian tea plantations, has developed resistance to commonly used insecticides like thiamethoxam and deltamethrin, posing significant challenges to pest management strategies. Overusing and misusing these chemical pesticides have enhanced resistance development in field populations across Eastern India. To address this issue, synergists were evaluated as enzyme inhibitors when administered with chemical insecticides to restore the toxicity or efficacy. Our earlier investigations showed a significant correlation between higher production of monooxygenases, esterases, and GST in *H. theivora* resistant to deltamethrin and thiamethoxam. In the present situation, where the generation of new groups of insecticides and their commercialization is not economical, it is postulated that the possibility of developing new formulations using the existing insecticides with synergists needs to be explored. Therefore, the present study aimed to evaluate the synergistic property of piperonyl butoxide (PBO) and diethyl maleate (DEM) in combination with deltamethrin and thiamethoxam on resistant field populations of *H. theivora*. Laboratory bioassays, conducted using the leaf dip method, assessed the synergistic effects of these compounds on resistant field-collected populations of *H. theivora*. The results demonstrated that synergists significantly increased the toxicity of thiamethoxam and deltamethrin. When combined with thiamethoxam, PBO and DEM enhanced toxicity with synergistic ratios (SR) of 3.89 and 2.24 times, respectively. Similarly, deltamethrin combined with PBO and DEM exhibited increased toxicity by 9.64-fold and 5.68-fold, respectively. Notably, the application of synergists alone did not cause mortality, highlighting their role in reducing insecticide detoxification activities by blocking detoxifying enzymes. The potential inhibitory effect of PBO on esterases and DEM on GST activity has been well documented in the insect system. These findings underscore the potential of synergists in resistance management. By enhancing the efficacy of existing insecticides, synergists offer a sustainable solution for IRM strategies for *H. theivora*.

Keywords: resistance; synergists; piperonyl butoxide; diethyl maleate; esterase; GST

Oral Presentation

IPMO-15

Species diversity of fruit flies and their management using different shaped traps of methyl eugenol in cucumber

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Cucumber belonging to the family Cucurbitaceae is one of the most cultivated and important cucurbit vegetable in Nagaland. Among the various pests attacking cucumber, fruit flies are considered as the most damaging. Nagaland has highly favorable climatic conditions for reproduction, development and incidences of various insect species. Therefore, the present study aimed to find the diverse species of fruit flies attacking and causing significant damage to the crop. The result of the present study recorded the presence of seven species of fruit flies *viz., Bactrocera dorsalis*, *B. divenderi*, *B. aethriobasis*, *B. tuberculata*, *B. bhutaniae*, *Zeugodacus tau* and *Z. cucurbitae* infesting cucumber crop. Fruit flies (Diptera: Tephritidae) being polyphagous, multivoltine and all its developmental stages are concealed making it difficult to be controlled by chemical pesticides. Thus, pheromone traps along with various food-based bait traps are been given prior importance to manage the incidences of fruit flies. The study also focuses on the management of fruit flies using methyl eugenol traps of three different shapes *viz*., cylindrical, spherical and triangular. Among the different shaped traps, cylindrical shape was most preferred by all the species except *B. aethriobasis*, *Z. tau* and *Z. cucurbitae* which preferred spherical shape. Management of fruit flies using methyl eugenol lure proved to be promising and potential management tool. Therefore, it is imperative that future detail study is made on the above-mentioned line of work in order to bring out a sustainable pest management of fruit flies to boost profitable crop production.

Keywords: fruit fly; traps; methyl eugenol; shape; cucumber

Oral Presentation

IPMPP-01

Eco friendly pest management of local chilli (*Capsicum annum* L.)

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Chilli (*Capsicum annum* L.) belongs to Solanaceae family and it is an important spice crop grown in India for the demand of its pungent fruits, both green and ripe which add pungency to the food. India is the major producer, consumer and exporter of chilli in the world. Karnataka produces the highest production of chilli 673.81 Metric Tonnes (Horticulture Statistics, 2017-18) in the country. In Nagaland, the production of chilli is 44.50 Metric Tonnes (Horticulture Statistics, 2017-18). A field experiment was conducted in the experimental farm at New colony, ward-7, Chumukedima, Nagaland from February to May 2021 in order to study the eco friendly pest management of local chilli (*Capsicum annum* L.). The study was conducted in Randomized Block Design with five treatments including one control having four replications. The treatments used were *Beauveria bassiana* (0.1 ml/L of water), Tobacco leaf extract (68 g/L of water), Neem oil (2 ml/L of water) and Ginger Garlic paste (50 g/L of water). The incidence of aphids, whiteflies, thrips and fruit borer were observed to be the important pests while others were negligible. Among the treatments, the highest total mean percent reduction in the population of the pests was observed with Neem oil (T3) and lowest with Tobacco leaf extract (T2). The total mean reduction of pests population with neem oil application are observed in aphids (56.08%), whitefly (61.76%), thrips (53.09%) and fruit borer (57.37%). Therefore, it was concluded that among all treatments, application of Neem oil at 2ml/L was found to be very effective in the reduction of all the major pests of chilli.

Keywords: chilli; pests; eco-friendly; treatments; management

Poster Presentation

IPMPP-02

Effect of different dates of sowing of foxtail millet (*Setaria italica* L.) on the incidence of insect pests

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A field experiment was conducted at Instructional cum Research (ICR) Farm, Assam Agricultural University (AAU) Jorhat to study the effect of different dates of sowing of foxtail millet (*Setaria italica* L.) on the incidence of insect pests. The different dates of sowing are 10th January (T_1), 17th January (T_2), 24th January (T_3), 31st January (T_4), 7th February (T_5), 14thFebruary (T_6) and 21st February (T_7). During the experiment it was revealed that the highest population of coreid bug (2.85), pentatomid bug (2.28), stink bug (2.47) and stem borer (2.77) were recorded in T_6 i.e. in the plot sown in 14thFebruary while the lowest population were recorded in crop sown on 17thJanuary for coreid bug and stem borer and 10thJanuary for pentatomid bug and stink bug. Based on observations on predators like coccinellids and spiders it was revealed that highest population (1.80) and (0.40) were recorded on 17 January (T_2), however the lowest population (0.42) and (0.28) were recorded in crop sown on 14th February (T_6) respectively. The observations on yield attributing parameters revealed that, the plots sown on 17th January recorded the highest weight of panicle (6.18g), length of panicle (16.37g), filled grain per panicle (1022) and lowest chaffy grains per panicle (13.52) and the plot sown on 14thFebruary recorded the lowest weight of panicle (5.26), length of panicle (14.42), filled grain per panicles (802) and highest chaffy grains per panicle (48.4). Among all the treatments, the maximum yield was recorded in T_2 (11.23 q/ha) with a C: B of 1:1.93 followed by T_1(10.76 q/ha) and lowest was recorded in T_6 (7.29 q/ha).

Keywords: foxtail millet; pest complex; natural enemies; incidence; population

Poster Presentation

IPMPP-03

Insect-pests of Toria (*Brassica campestris* var. *toria*) and their management practices in Meghalaya

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Rapeseed-mustard is a major oilseed crop grown in India next to soybean in terms of production and first in terms of oil yield among all oilseed crops. Toria (*Brassica campestris* var. *toria*) is a short-duration irrigated oilseed crop with a growing season of 90-92 days. It is mostly grown in India during the *Rabi* season and has an oil content of 37 to 49%. The insect-pests associated with rapeseed-mustard can be grouped into the following categories- key pest: Aphid, *Lipaphis erysimi*; major pests: Painted bug, *Bagrada cruciferarum*, Sawfly, *Athalia lugens proxima*, and Leaf miner, *Chromatomyia horticola*; minor pests: Cabbage butterfly, *Pieris brassicae*, Bihar hairy caterpillar, *Spilosoma obliqua*, green peach aphid, *Myzus persicae*, and Flea beetle, *Phyllotreta Cruciferae*. Insect-pests causes severe crop losses in agriculture worldwide. Therefore, it is necessary to identify the pest and their damaging stages to control the economic crop yield losses effectively. Currently, insect-pests management mainly relies on chemical pesticides which have a long-term impact on the environment, biodiversity, animal and human health. The use of pesticides can also lead to the outbreak of secondary pests making the crops more susceptible to insect-pests. However, bio-intensive approaches result in pest management that is both environmentally friendly and cost-effective. Furthermore, bio-intensive management may not have any negative effect on the populations of pollinators. Hence, the present study was undertaken to investigate the population dynamics of major insect pests of toria and to evaluate their bio-intensive management practices. The experiment is carried out in the experimental field of CPGS-AS, Umiam, Meghalaya.

Keywords: bio-intensive management; insect-pests; rapeseed-mustard; toria; oil content

Poster Presentation

IPMPP-04

Management of *Megalurothrips usitatus* (Bagnall) in mungbean with neem extracts under organic conditions

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Megalurothrips usitatus (Bagnall) is a well-known polyphagous pest infesting mungbean grown in summer season as a cash crop in the wheat–rice cropping system in North West India. Thrips incidence leads to flower shedding and fewer pods, causing yield losses of up to 80%. In severe cases, there may be crop failure, highlighting the need for effective management to ensure higher production. Chemical pesticides have been extensively used to control thrips, leading to insecticide residues, pest resurgence, resistance and deadly effects on non-target creatures. Neem-based formulations are reported to manage young nymphs, inhibit the growth and development of older nymphs and reduce egg-laying by adult thrips. In this study, the foliar spray of neem-based extracts at the flowering stage was evaluated to eliminate thrips in summer mungbean. To prepare Neem Seed Kernel Extract (NSKE) and Neem Seed Kernel Leaf Extract (NSKLE), freshly ground neem seeds and leaves were taken in water (1:2 for NSKE and 1:1:4 for NSKLE) and subjected to two preparatory methods: One is hot, while other is cold. Extracts were sprayed at varied doses (15, 20 and 25 ml/L) in 10 m^2 plots at the pest incidence stage, and population data was recorded at 1, 3, 5 and 7 days. Yield data was also recorded at the end. Over a 7-day period, NSKE (Cold) @ 25ml/L outperformed all other treatments with 61 % reduction over control. The yield for the same was 56.35 % higher than the control. In conclusion, neem extracts proved to be effective in managing *M. usitatus* and enhancing mungbean yield, offering a sustainable solution for organic farming.

Keywords: *Megalurothrips usitatus*; neem; organic; mungbean; NSKE

Poster Presentation

IPMPP-05

Studies on population dynamics and management of shoot and fruit borer (*Leucinodes orbonalis* Guenee) in brinjal (*Solanum melongena* L.)

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Brinjal (*Solanum melongena* L.) is one of the widely grown vegetable crops and its cultivation has been experiencing increased biotic and abiotic stresses due to climate changes. Many pests have expanded their horizons and developed resistance to pesticides which often leads to the resurgence of pests. Therefore, a study was carried out to study the population dynamics and the management of brinjal shoot and fruit borer. The field experiments were carried out in the rabi season in 2022 at Aalo, West Siang, district, Arunachal Pradesh. The observations were recorded based on shoot, and fruit damage. After three weeks of transplanting, the pest invaded the crop, i.e., the population of *L. orbonalis* was recorded in the 8th standard meteorological week (SMW), and its population peaked at 12th SMW after transplanting. Thereafter, its population started declining slowly in consequent observations. The fruit infestation was first observed on the 11th SMW after transplanting. During the 15th SMW, the highest percentage of fruit infestation of brinjal shoot and fruit borer was reported. Thereafter the fruit started declining slowly in consequent observations *i.e.*, after the 16th to 21st SMW. The maximum temperature, minimum temperature relative humidity, and rainfall showed a non-significant positive or negative correlation. It indicates that the weather parameters did not correlate with the pest infestation of the shoot in brinjal. The bio-efficacy of insecticides and bio-pesticides, neem oil @ 3%, spinosad @ 0.10 ml/l, *Bacillus thuringiensis* @ 2 g/l and Indoxacarb @ 2 ml/lit, against the brinjal shoot and fruit borer on brinjal, were evaluated. The observations recorded after the first and second spray on shoot and fruit infestation in case of reduction over control revealed that spinosad was most effective against *L. orbonalis,* among the pesticides followed by indoxacarb, *B. thuringienesis*, and neem oil, respectively.

Keywords: brinjal; *Leucinodes orbonalis;* insecticides; bio-pesticides; *Bacillus thuringiensis*

Poster Presentation

IPMVP-01

AI-driven framework for stored grain pest detection as a baseline approach in insect pest management

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Stored grain pest detection and management are imperative to ensure food safety and security, particularly in an agro-economic country like India, where significant post-harvest losses occur due to insect pests. This study introduces an AI-driven methodology for integrated pest management by leveraging convolutional neural networks (CNNs) for pest identification. Given the constraints of a relatively small image dataset, VGG16—a transfer learning (TL) model—was chosen for its superior performance, achieving 99.8% accuracy along with the best precision, recall, and F1 score among tested models. Advanced deep learning architectures such as VGG19, InceptionV3, and Xception were also evaluated, with accuracies of 99.2%, 93%, and 95.8%, respectively. Preprocessing techniques and hyperparameter optimization were employed to enhance model efficiency. The study also explored traditional machine learning approaches, including Support Vector Machine (SVM), K-Nearest Neighbors (KNN), and Naïve Bayes (NB), using morphological pest features. CNN outperformed these models, achieving 98% accuracy compared to SVM (81%), KNN (76%), and NB (33%). While CNN required higher computational resources, its superior accuracy underscores its suitability for real-world pest identification applications. A practical implementation of this framework, a web application named "Grain Shield," was developed using Flask and VGG16. This user-friendly tool enables farmers to identify pests in real-time and supports adopting sustainable pest management practices. Despite the promising results, the study acknowledges limitations such as the dataset's constrained scope and real-time deployment challenges. Future work aims to expand the dataset, include a broader range of pest species, deploy the tool on public platforms, and integrate pest management recommendations. This research highlights the potential of integrating AI and TL to combat post-harvest grain losses, demonstrating how intelligent pest management strategies can support food security and agricultural sustainability.

Keywords: stored grain pests; pest management; food security; convolutional neural networks; transfer learning;

Rapid Virtual Oral Presentation

IPMVP-02

An overview of Stem Borers Infesting Rice in Andhra Pradesh

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Rice crop is predominantly damaged by stem borers causing dead hearts and white ears. In recent times it is documented that in rice growing regions of Andhra Pradesh there is a diversification in the cropping systems and the stem borers damage is above ETL warranting immediate chemical interventions. Hence, roving surveys were carried out in four rice growing coastal districts of Andhra Pradesh *viz.,* Vizianagaram, Srikakulam, West Godavari and Nellore where different rice based cropping systems (RBCS) like Rice - Millet, Rice - Pulse, Rice - Maize, Rice-Sugarcane and Rice - Rice were in vogue. Through destructive sampling of infested rice tillers their relative abundance was studied. The field collected immature stages of stem borers were reared to adults and examined for their morphological characteristics to ensure accurate species identification. Yellow stem borer (YSB), *Scirpophaga incertulas*, Pink stem borer (PSB), *Sesamia inferens*, Dark headed striped borer (DHSB), *Chilo polychrysus*; Gold fringed stem borer (GFSB) *Chilo auricilius* were causing significant damage to rice cultivated in these RBCS. Our studies found out that infestation by these stem borer species varied across seasons and locations. Though YSB remained as the most dominant species, GFSB was localised to small areas of high-altitude regions; DHSB and PSB were polyphagous in occurrence. All the stem borers are internal feeders and cause similar symptoms but differ in the nature of damage they cause which is very much distinct from one another. PSB, GFSB and DHSB displayed gregarious behaviour in late instars except for YSB larvae, which remained solitary. While larvae and adults of YSB and PSB were easily distinguishable, identifying DHSB and GFSB proved more challenging. Hence, the morphological characters of egg, larvae, pupae and adult moths were studied. The findings were further validated through molecular studies. These findings would help in accurate identification of stem borers at species level which would help in devising effective pest management strategies.

Keywords: rice; stem borers; identification; damage; cropping systems

Rapid Virtual Oral Presentation

IPMVP-03

Bioactive essential oils for potential management of *Nilaparvata lugens* in rice

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Nilaparvata lugens is a major pest of rice, causing significant yield losses through direct feeding and virus transmission leading to hopper burn (Baehaki and Mejaya, 2015; Gajbhiye et al., 2017; Elanchezhyan et al., 2020). India suffers severe yield loss to the tune of 70–100% due to repetitive outbreaks of *N. lugens* in Odisha, Punjab, Haryana, New Delhi, Telangana, Andhra Pradesh and Tamil Nadu, estimating to a monetary value of US$ 2000 million (Guru-Pirasanna-Pandi et al., 2021). Using synthetic pesticides continuously may lead to minor pest resurgence, resistance issues, besides export related hindrances (Dharshini and Siddegowda, 2015). In the present study, ten widely available essential oils (EOs) were tested for their potential insecticidal action against 3rd nymphal instar of *N. lugens*. All the tested oils showed promising activity in controlling *N. lugens*. Among these, EOMD was found to be the most effective with the LC_{50} 1118 ppm after 96 h exposure. EOAC and EOCT were also found effective with their respective LC_{50} 1428 and 3171 ppm after 96 h treatment. The present findings referred potential exploitation of the oils for efficient management of the pest, ensuring immense possibilities of their adoption in integrated pest management (IPM) and organic farming. The identified bioactive EOs will be taken up further for product development and field trials.

Keywords: essential oils; *Nilaparvata lugens;* rice; IPM; plant volatiles

Rapid Virtual Oral Presentation

IPMVP-04

Comparative evaluation of intercropping system for *Helicoverpa armigera* pest management in tomato crop

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Intercropping is the agricultural practice of growing multiple crops in proximity during the same growing season. This is emerged as an effective strategy for managing *Helicoverpa armigera* in tomato cultivation. The integration of various crops alongside tomatoes approach enhanced biodiversity, which disrupted pest populations and improved soil health. As pest pressure increase due to climate change and monoculture practices, intercropping presents an environment friendly alternative to chemical pest control methods by promoting natural pest deterrents through companion planting. Field experiments were conducted during 2023-2024 at Garden of St. John's College, Agra to evaluate the impact of intercropping on *H. armigera* infestations in tomato crops. The experimental layout followed a randomized block design with five treatments replicated across five plots, including sole tomato cropping (control) and intercropping systems with garlic (1:1 row ratio), onion (1:1 row ratio), turmeric (1:1 row ratio), and cauliflower (1:1 row ratio). Each plot measured 2 × 2 meters, ensuring uniform soil preparation and fertilization protocols. Drip irrigation systems maintained adequate soil moisture throughout the study period. Sole tomato cropping exhibited the highest *H. armigera* egg density and larval count. Garlic and onion intercropping significantly reduced egg density and larval count. Turmeric intercropping showed moderate reductions. Cauliflower demonstrated indirect benefits, reducing pest numbers. The study suggests that the effectiveness of garlic and onion as intercrops produce sulfur-containing compounds, which act as natural repellents. These crops likely interfered with the olfactory cues used by *H. armigera* moths to locate tomato plants. Turmeric, with its aromatic compounds, and Cauliflower, as a trap crop, contributed to pest diversion and reduced pest pressure on tomatoes. The incorporation of high-value intercrops such as garlic and onion further enhances the economic viability of the system, offering farmers a dual benefit of pest control and additional income.

Keywords: *Helicoverpa armigera*; IPM; intercropping; tomato; entomology

Rapid Virtual Oral Presentation

IPMVP-05

Comparative evaluation of sampling techniques for accurate assessment of thrips populations in onion

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Thrips are significant pests of onion crops that cause considerable damage by feeding on the leaves. This feeding reduces photosynthesis and hinders plant growth. Their small size, rapid reproduction, and ability to hide within the folds of leaves make them challenging to control, and they are more likely to develop resistance. Since thrips feed in concealed areas, their presence often goes unnoticed during the early stages of crop growth, resulting in population buildups that are difficult to manage. The goal of this study was to identify the most effective method for monitoring thrips populations (both adults and nymphs) in onions. The researchers compared seven different sampling techniques: yellow and blue sticky traps, aspirators, visual counting with a hand lens, whole plant removal followed by visual counting, whole plant removal with ethanol washing and laboratory counting, and the funnel method. The ethanol method proved to be the most efficient, capturing the highest number of thrips per plant (mean ± standard error = 19.35 ± 3.11) with a statistical significance ($F = 15.06$, $p < 0.0001$). This was followed by whole plant removal with visual counting (14.32 ± 2.07), visual counting using a hand lens (10.60 ± 1.84), and the funnel method (11.06 ± 1.77), which were statistically similar. In contrast, blue sticky traps (2.62 ± 0.30), aspirators (2.39 ± 0.40), and yellow sticky traps (1.55 ± 0.20) were found to be the least effective methods. This study emphasizes the importance of selecting appropriate sampling methods for accurate thrips assessment. Less labor-intensive methods, such as sticky traps, may underestimate thrips populations, leading to an underestimation of pest pressure in onion fields.

Keywords: thrips; sticky traps; visual observations; population estimation; sampling

Rapid Virtual Oral Presentation

IPMVP-06

Diversity and abundance of insects in castor of southern Telangana zone

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Biotic communities are essential for ecological functions and ecosystem services in which insects, representing about 66% of known species, are the most diverse animal group, with an estimated 5.5 million species. They play critical ecological roles, including herbivory, carnivory, pollination, pest control, and detritus feeding. While only 0.5% of insect species are agricultural pests causing 18% of global crop damage, predatory insects, such as ground beetles, play a crucial role in reducing pest populations. Additionally, 72% of crops depend on insect pollination, contributing 9.5% to global crop yields, highlighting their indispensable role in agriculture and ecosystems. This study assessed insect diversity in castor fields at IIOR Narkhoda farm, documenting 11,439 individuals across 12 orders, 44 families, and 64 species. The most diverse order was Diptera, with 15 species from 10 families, followed by Hemiptera (11 species, 9 families) and Hymenoptera (10 species, 7 families). Other notable groups included Coleoptera (9 species, 5 families), Orthoptera (6 species, 4 families), Lepidoptera (5 species, 2 families), and Odonata (3 species, 2 families). Single-family representation was recorded in Dermaptera, Mantodea, Collembola, Ephemeroptera, and Thysanoptera. These insects included pests, pollinators, predators, soil dwellers, and detritivores.Biodiversity indices varied across orders. Diptera had the highest Shannon-Wiener index (H = 2.191) and Simpson diversity index (1-D = 0.878), reflecting its richness and dominance. Lepidoptera recorded the lowest Shannon-Wiener index (H = 0.524) and Simpson index (1-D = 0.341). Pielou's evenness was highest in Orthoptera (e = 0.984) and lowest in Hemiptera (e = 0.250). Hemiptera exhibited the highest relative abundance (RA = 81.18%), while Mantodea showed the lowest (RA = 0.06%). Species richness was highest in Diptera and lowest in Odonata (R = 0.346). This study highlights the ecological and agricultural significance of insect diversity in castor ecosystems, emphasizing their roles in pest control, pollination, and nutrient cycling.

Keywords: insect family; diversity; abundance; castor; Telengana

Rapid Virtual Oral Presentation

IPMVP-07

Effect of silicate fertilizer on the incidence, larval activity, and larval weight of rice yellow stem borer *Scirpophaga incertulas* (walker) (lepidoptera: crambidae)

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The results of the field experiment on the effect of silicate fertilizer *ie*. diatomaceous earth (DAE), calcium silicate and rice husk biochar in rice against the rice yellow stem borer, *Scirpophaga incertulas* (Walker) conducted during *Kharif*-2024, at Department of Agricultural Entomology, College of Agriculture, V.C. Farm, Mandya, revealed that the basal application of diatomaceous earth at 0.6 t ha^{-1} significantly reduced the average infestation (dead heart) to 3.05% during vegetative stages (recorded at 10 days interval from 30 to 80 days after transplanting (DAT)) and 5.40% (white ear head) at reproductive stages (recorded at 100 and 120 days after sowing), and also recorded significant reduction on feeding tunnel of larvae during maximum dead heart (4.29 cm at 50 DAT) and white ear head (3.83 cm at 100 DAT). Further, DAE (0.6 t ha^{-1}) treated rice plot shows improved yield attributing characters *viz.,* length of panicle (25.80cm), number of grains per panicle (246.51), test weight (23.14 g), increased grain yield (57.11 q/ha) and straw yield (63.28 q/ha) compared to other silicon sources as well as untreated control. Similarly, the application of diatomaceous earth (0.6 t ha^{-1}) recorded significant reduction in larval number (17.41/ 100 tillers) and larval weight of all the instar (I-1.81, II-3.46, III-4.67 and IV-11.00 g /larvae, respectively) compared to the larval number (50.22/100 tillers) and weight of larvae (I-2.82, II-7.86, III-8.25 and IV-17.80 g /larvae, respectively) of untreated control. Basal application of other silicon fertilizer like Calcium silicate and rice husk biochar were observed to be less efficacious than DAE, but recorded significant trends in decreasing percent infestation and number of larvae with increasing in dosages. Additionally, DAE at 0.6 t ha^{-1} was found to be superior in recording higher net return and C:B ratio (2.93) compared to other treatments including untreated control.

Keywords: rice; YSB; induced resistance; silicon; diatom earth

Rapid Virtual Oral Presentation

IPMVP-08

Efficacy of different plant products against rice weevil or *Sitophilus oryzae*

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An experiment was conducted on bioassay of botanicals against the stored grain pest like *Sitophilus oryzae* in stored grain facility and laboratory of ZRS north lakhimpur in the year of 2024. Treatment *viz.*leaves of *Polygonum hydropiper , Ageratum conyzoides, Dillenia indica, Azadirachta indica ,* seeds of *Solanum nigrum* and oil of Margosa were air dried in shade, ground to coarse powder was extracted with ethanol. The extracts were filtrate used of filter paper. Stock solutions were prepared and diluted by addition of distilled water After dilution, 50 insects were added in the stock solution after 5 seconds, they were taken out with the help of a brush and kept in a tube and it's covered with muslin cloth. The mortality or repellency data i.e.; dead and alive insects were recorded for 3days at an interval of 24, 48 and 72 hours for each observation. There were, 6 treatments was replicated 3 times. The data recorded for percent mortality of different treatments were subjected to statistical analysis. Efficacy of volatile oil, powders, seed and water extracts were tested on the basis of per cent mortality and final adult population of *Sitophilus oryzae*. Volatile oil of Margosa or neem oil resulted in (100.00%) mortality after 24 hours. Seed of *Solanum nigrum* was proved to be effective to some extent resulting in (84.47%) mortality followed by powders of *Polygonum hydropiper* (57.7%), *Ageratum conyzoides* (44.4%) , *Dillenia indica* (41.1%) and *Azadirachta indica* (31.1%) respectively after 72 hours. Water extracts of different plant parts had no effect on mortality of the pest, but *Solanum nigrum* was found to be effective reducing adult population (84.47%) after 72 hours. These findings suggest that effective botanical insecticides like Margosa oil could be a viable strategy for managing *Sitophilus oryzae* in stored rice.*Solanum nigrum* prepared seed part of the plant have also showed significant decrease in *Sitophilus oryzae* population. Since such organic pesticides can be easily prepared, that will be a management for a practice convenient for the society.

Keywords: *Sitophilus oryzae; Polygonum hydropiper; Solanum nigrum; Dillenia indica;* Margosa oil*; Azadirachta indica; Ageratum conyzoides*

Rapid Virtual Oral Presentation

IPMVP-09

Emergence of invasive whiteflies (hemiptera: aleyrodidae) as a new threat to betelvine production in west bengal, india

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Betelvine (*Piper betle* L.) is a perennial dioecious evergreen creeper and a significant socio-economic crop of India. As betelvine is cultivated inside the artificially erected close structure known as '*Bareja*' or '*Boroj*', this humid, shaded environment is particularly susceptible to insect pests, including a range of whitefly species. While native whiteflies such as *Singhiella pallida* Singh, *Aleurocanthus rugosa* Singh and *Aleurocanthus bucktoni* Sundararaj and Pushpa are already known to pose challenges to betelvine cultivation in West Bengal, the recent emergence of two invasive whitefly species, the Rugose Spiraling Whitefly (*Aleurodicus rugioperculatus* Martin) and Bondar's Nesting Whitefly (*Paraleyrodes bondari* Peracchi), has significantly exacerbated the pest burden. These invasive species are characterized by their polyphagous nature, feeding on a wide variety of host plants, and their rapid spread across diverse geographical regions. The present study navigates through the characterization of different life stages of these invasive whiteflies and their impact on betelvine production in West Bengal. Field observations taken at the experimental betelvine *borojs* of Bidhan Chandra Krishi Viswavidyalaya, Nadia, revealed a significant increase in the population densities of both *A. rugioperculatus* and *P. bondari* during the months of March and April, coinciding with the peak growing season for betelvine. The infestation levels were substantial, with joint infestation rates reaching up to 20% of the vines of within *boroj* surveyed. The whiteflies lay eggs on the underside of the leaves in characteristic manners, and nymphs and adults feed there on leaving honeydew on leaves of lower strata of the vine which invites sooty moulds. Infested leaves and leaves with sooty mould become unfit for consumption and marketing. Betelvine is here recorded as a new host of these two invasive whitefly species. This research also contributes to SDG 2 (Zero Hunger), 8 (Decent Work and Economic Growth) and 15 (Life on Land) by laying a path towards securing biodiversity, formulating sustainable pest management practices and enabling food security.

Keywords: invasive species; *boroj;* sucking pest; *Piper betel*; new host

Rapid Virtual Oral Presentation

IPMVP-10

Evaluation of bio-intensive ipm module against brown plant hopper (*nilaparvata lugens stal.*) of rice

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Biointensive Integrated Pest Management (BIPM) takes both environmental and economic factors into account when planning and managing farming systems. It also addresses public concerns about food safety and the environment. Its benefits include spending less on chemical pesticides, reducing environmental harm on and off the farm, and using more effective and long-lasting pest control methods. The present investigation was carried out at Students' Instructional Farm, A.N.D.U.A. & T., Kumarganj, Ayodhya, (UP) during Kharif, 2022. Eight BIPM modules and untreated control were evaluated for the management of Brown Plant Hopper, among them $\mathbf{T_3}$ - *Cyrtorhinus lividipennis* (200 – 250 bugs/ha) + *Beauveria bassiana* @ 4 ml/l + Azadiractin 1500 ppm@3ml/l treated plots were found most effective against Brown Plant Hopper. The highest yield 43.95 q/ ha was obtained from the most effective treatment of Brown Plant Hopper. The lowest yield 36.87 q/ha was obtained from the $\mathbf{T_9}$- untreated plot. Thus, the Biointensive Integrated Pest Management (BIPM) approach was found to be more advantageous than conventional farming practices, as evidenced by a higher benefit-cost ratio.

Keywords: brown plant hopper; *Nilaparvata lugens; Beauveria bassiana; Cyrtorhinus lividipennis*; BIPM

Rapid Virtual Oral Presentation

IPMVP-11

Evaluation of biorationals against invasive thrips, *Thrips parvispinus* (Karny) (Thysanoptera: Thripidae) in chilli

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Chilli is an important cash crop in India, which is used both in green and ripe forms to enhance the flavour, colour, and pungency of food. Chilli crop faces significant yield loss ranging from 50 to 90 per cent due to insect pests. In India, the recent invasion of *Thrips parvispinus* (Karny) has caused widespread damage to chilli crops up to 95% with an average count of 18.20 thrips per flower. Managing this invasive thrips is found to be highly essential, hence, the present study was conducted during Rabi, 2023, in the pot culture yard of the Department of Entomology, Annamalai University, Chidambaram, to evaluate the bio-efficacy of five different biorationals against the invasive thrips, *T. parvispinus*. The experiment employed a Completely Randomized Design (CRD) with eight treatments, such as T_1 - Five leaf extracts @ 5%, T_2 - Ginger + garlic + green chilli extracts @ 3%, T_3 - Herbal insect repellent @ 3%, T_4 - Turmeric powder + lime extract @ 5%, T_5 - Notchi + neem + green chilli extracts @ 5%, T_6 - Azadirachtin @ 1500ppm, T_7 - Untreated control (water spray) and T_8 - Absolute control and replicated five times. The efficacy of biorationals was assessed at 1, 3, 5, 7, and 14 days after application. All treatments significantly outperformed the control. Among the tested biorationals, five-leaf extracts (5%) and a combination of ginger, garlic, and green chili extracts (3%) demonstrated the highest efficacy, with the maximum population reduction (61.21% and 60.97%, respectively). These were followed by herbal insect repellent (3%) and azadirachtin (1500 ppm). The least effective treatment was turmeric powder + lime extract (5%), which recorded a minimum population reduction (44.29%). The findings suggest that these eco-friendly biorationals could be potential alternatives to synthetic insecticides for managing *T. parvispinus*, emphasizing their role in sustainable pest management practices.

Keywords: botanicals; invasive thrips; management; mortality; no-choice assay

Rapid Virtual Oral Presentation

IPMVP-12

Evaluation of different power sources efficiency used in light traps against major phototactic insect pests of *kharif* season

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The present study was conducted during the 2024 *kharif* season (July–October) in the paddy fields of the Krishinagar Experimental Farm, Adhartal, JNKVV, Jabalpur, Madhya Pradesh. Two types of light traps were evaluated: T_1 – Electrical Light Trap and T_2 – Solar Light Trap. Each trap featured a 50 cm diameter funnel with three baffle plates made of transparent acrylic sheets and a 15-watt ultraviolet (UV) light. The solar light trap was equipped with a 60×45 cm solar panel generating 40 watts, charging a 12-volt (30A) battery to power the UV light. Both traps operated daily from sunset to sunrise, with collections observed every morning. Fourteen species, including *Nephotettix virescens, Leptocorisa acuta, Helicoverpa armigera, Creatonotus gangis, Spodoptera litura, Nezara viridula, Asota ficus, Perina nuda, Theretra oldenlandiae, Euproctis similis, Mythimna separata, Spilarctia obliqua, Melanitis leda ismene,* and *Amsacta moorei*, were consistently trapped and analyzed. Weekly mean data were subjected to paired and independent sample t-tests. Species such as *Nephotettix virescens* (17.80%), *Spilarctia obliqua* (34.06%), *Creatonotus gangis* (11.08%), *Perina nuda* (24.24%), *Helicoverpa armigera* (21.78%), *Spodoptera litura* (12.50%), *Leptocorisa acuta* (35.44%), and *Asota ficus* (26.23%) exhibited significantly higher captures in the electrically powered light trap compared to the solar-powered trap. The results indicate that the electrical light trap outperformed the solar light trap for most species due to its ability to maintain a consistent power supply, ensuring continuous illumination and improved insect attraction. In contrast, the solar light trap's efficiency was likely hampered by its battery's inability to sustain consistent power throughout the night. Increasing the solar light trap's battery capacity could enhance its performance, potentially making it comparable to the electrical light trap.

Keywords: baffle plates; electrical and solar light trap; trapping efficiency; phototactic insects

Rapid Virtual Oral Presentation

IPMVP-13

Evaluation of safer pest management modules based on companion cropping in cabbage

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Cabbage, *Brassica oleracea* var. *capitata* (Linn.) is a popular winter vegetable in India. The crop is prone for infestation by a number of insect pests consisting majorly tobacco caterpillar (*Spodoptera litura* F.), diamond back moth (*Plutella xylostella* L.) and aphid (*Myzus persicae*. Sulzer). In India, chemical control, till date is the widely utilized and popular weapon to fight against the pest menace but these are known to produce a number of unintended effects like health hazards, impact on environment, pest resistance etc. Hence, a study was conducted at Jaguli Instructional Farm, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal to assess the effectiveness of multiple pest management modules against the important pests of cabbage during *Rabi* 2022-23 and 2023-24. In a randomized block design (RBD) set up, cabbage variety Green Express was grown along with various intercrops such as coriander, basil, onion, safflower and radish and also as monocrop in six different treatments and four replications. In addition to diversified cropping systems, biopesticides (*Bacillus thuringiensis var. kurstaki and Lecanicilium lecanii*) and safer chemical pesticides were also applied in all the treatments excluding the control one. The results indicated that cabbage intercropped with coriander significantly reduced the incidence of pests such as *P. xylostella*, aphids and *S. litura* compared to other intercropping methods including the untreated check. Intercropping with onion, safflower and basil also performed well in deterring population build-up of DBM and aphids. In contrast, a higher occurrence of insect pests, particularly *P. xylostella*, was linked to intercropping with radish plants. Intercropping cabbage with non-host plants such as coriander, basil, onion, safflower, radish and providing additional support with biopesticides and safer chemicals can reduce the use of harmful chemical pesticides. These findings underscore the potential of intercropping as an effective strategy for safer pest management and enhancing cabbage productivity in agricultural system.

Keywords: cabbage; intercrop; biopesticides; coriander; DBM

Rapid Virtual Oral Presentation

IPMVP-14

Exploring the carry over niches of stem borer complex: a holistic perspective on rice ecosystem resilience

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The present experiment was carried out at Murjhad Farm of College of Agriculture, Waraseoni, Balaghat, and farmer's field of Balaghat district, M.P. during *Kharif* 2021 to *Kharif* 2023 to evaluate the off-season survival strategies of the stem borer complex, focusing on rice stubbles and weeds as alternate hosts. It aims to uncover ecological insights for improved pest management. The results revealed that, the overall mean larval population of *S. incertulas, S. inferens and S. innotata,* recorded during November to January 2021-23 ranged from 16.58 to 65.17, 8.25 to 16.83 and 2.25 to 8.92 larvae/450 samples/Village. The overall mean larval population of *S. incertulas, S. inferens and S. innotata*, recorded during May to July 2021-23 ranged from 22.08 to 70.33, 4.79 to 14.00 and 1.58 to 6.67 larvae/450 samples/village. The overall mean pupal population of stem borer complex recorded during November to January 2021-23 ranged from 0.00 to 9.50 pupae/450 samples/Village. The overall mean pupal population of stem borer complex recorded during May-July 2021-23 ranged from 0.00 to 8.83 pupae/450 samples/Village. Among all three species of stem borer complex, only *S. inferens* was recorded in weeds with mean larval population ranging between 0.54 to 4.13 larvae/110 sample/Village during November to January 2021-23. The overall mean larval population of *S. inferens* recorded during May to July 2021-23 ranged from 0.21 to 2.00 larvae/110 samples/Village. This study examines the dynamics of the stem borer complex in rice ecosystems, focusing on its seasonal behaviour and the role of alternate host plants in pest persistence. By integrating ecological, agronomic, and economic perspectives, we propose sustainable pest management strategies, including crop diversification, resistant varieties, and IPM. Our findings offer valuable insights for researchers, farmers, and policymakers, contributing to sustainable rice production and food security in the face of pest challenges.

Keywords: carry over niches; off season survival; *Scirpophaga incertulas*; *S. inferens; S. innotata*; alternative host as stubbles and weeds

Rapid Virtual Oral Presentation

IPMVP-15

Population dynamics of major sucking pests of okra [*Abelmoschus esculentus* (L.) Moench] in relation to weather parameters and it's ecofriendly management

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Among the vegetable crops grown in India, okra (*Abelmoschus esculentus* L.) is an important crop grown throughout the year. Throughout its growth and developmental period, Okra crop suffers from number of biotic and abiotic stresses. Among the biotic stresses, it is attacked by a number of phytophagous insect-pests during different growth stages. Among insects number of sucking pests such as thrips, jassids, whitefly and aphids cause severe yield loss. Apart from this, whitefly transmits important viral disease i.e. bhendi yellow vein mosaic. Indiscriminate use of synthetic insecticide causes pest resistance, pest resurgence, chemical residues, destruction of beneficial fauna and environment. Thus, alternative control method is required which is safe for human beings as well as environment. Keeping the importance of the crop sucking pests incidence in view study was undertaken on the topic entitled "Population dynamics of major sucking pests of Okra [*Abelmoschus esculentus* (L.) Moench] in relation to weather parameters and it's ecofriendly management." Experiment was conducted at Agricultural Research Station (ARS), Institute of Agricultural Science (IAS) Farm, SOADU, Chhatabara, Khurdha during summer 2022-23. Effect of different weather parameters on incidence of white fly and it's natural enemies was studied using simple correlation analysis. Management study was conducted against white fly as their significant incidence and damage was found highest in the experimental plot. Among the treatments tested, significantly maximum reduction of the whitefly population was found in chemical insecticides i.e. imidachloprid and spinosad followed by microbial bio pesticides i.e. *Verticillium lecanii* and *Beuveria bassiana* and botanicals. Though chemicals showed maximum efficacy over control in case of white fly incidence in okra microbial bio pesticides showed better efficacy against whitefly and less reduction of natural enemies in the field which was eco-friendly, suststainable and efficient as compared to chemical control.

Keywords: population dynamics; sucking pests; weather parameters; bio-pesticides; okra

Rapid Virtual Oral Presentation

IPMVP-16

Spectral vegetation indices for early detection and quantification of brown planthopper infestation in rice

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This study focuses on assessing the efficacy of spectral vegetation indices (SVIs) for predicting the severity of brown planthopper (BPH) *Nilaparvata lugens* infestations in three rice varieties: Pusa Basmati 1509, Pusa Basmati 1121, and TN 1 (susceptible check). The aim is to facilitate early detection and improve pest management strategies in rice cultivation. Glasshouse pot experiments were conducted at ICAR-Indian Agricultural Research Institute, New Delhi, during the Kharif season of 2022. After 20 days of BPH infestation, canopy reflectance data were captured using a handheld ASD FieldSpec spectroradiometer. Pre-processed spectral data were used to calculate a variety of SVIs to evaluate plant physiological responses to BPH-induced stress. Linear regression analyses were performed to identify correlations between SVI values and BPH infestation severity. We identified key spectral vegetation indices, including the Structural Independent Pigment Index (SIPI), Plant Senescence Reflectance Index for Chlorophyll B (PSND CHLB), Anthocyanin Reflectance Index 1 (ARI1), and Plant Senescence Reflectance Ratios (PSSR A and PSSR B), which demonstrated significant correlations with BPH severity (R^2: 0.5–0.9). In addition, four novel BPH-specific indices were developed, demonstrating high accuracy and strong positive correlations with infestation levels. These newly developed indices outperformed existing ones in detecting stress and quantifying BPH damage. This study highlights the value of hyperspectral remote sensing techniques in early detection and precise quantification of BPH infestation in rice. The identified and newly developed indices provide effective tools for pest stress assessment, enabling timely pest management interventions. By integrating these tools into rice farming, significant reductions in yield losses and improved crop management can be achieved, promoting sustainable agricultural practices. Additionally, integrating machine learning models with hyperspectral data could further enhance the predictive accuracy and operational efficiency of pest detection in rice crops.

Keywords: *Nilaparvata lugens;* rice; spectral vegetation indices; hyperspectral remote sensing; pest management

Rapid Virtual Oral Presentation

IPMVP-17

Studies on population dynamics of major insect pests of soybean [*Glycine max* (L.) Merrill]

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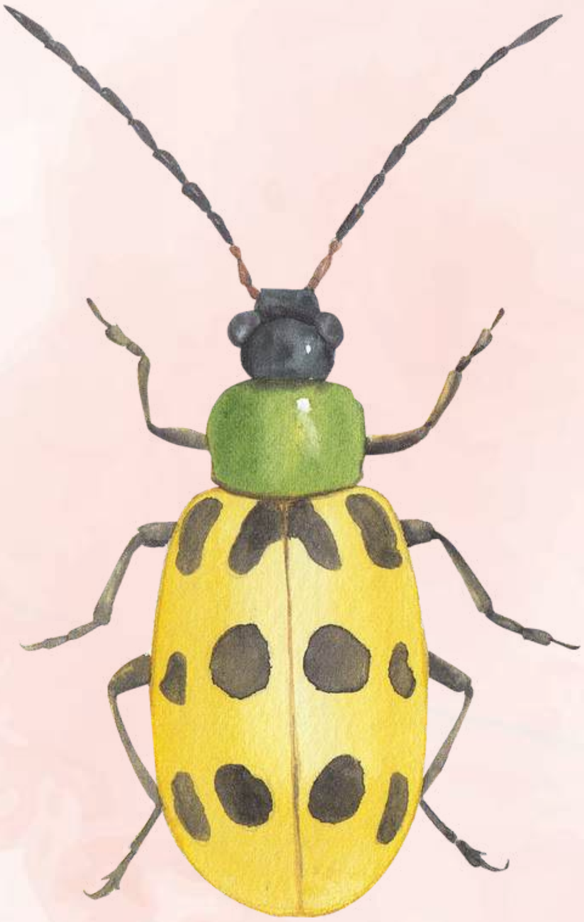
An experimental trial was conducted to study the population dynamic of major insect pests of soybean at College of Agriculture, JNKVV, Jabalpur (MP) during *kharif* season 2024-25. The result revealed that the incidence of whitefly was first observed on the crop during 29th standard week (SW) with 0.81 adult whitefly/cage/plant and attained its peak population (5.02 adult/cage/plant) during 36th SW. Jassids population was first recorded during 29th SW (0.19 jassids/cage/plant) and reached its highest (3.83 jassids/cage/plant) during 37th SW. The first appearance of leaf folder and green semilooper was recorded during 31th SW (0.64 and 0.43 larvae/mrl, respectively) and attained its peak at 37th and 38th SW with 8.33 and 6.21 larvae/mrl, respectively. The first appearance of both tobacco caterpillar and Bihar hairy caterpillar was recorded during 32th SW (0.81 and 1.48 larvae/mrl, respectively) and peak population were observed with 6.19 and 8.95 larvae/mrl at 37th and 38th SW, respectively). The first incidence of stem fly was recorded during 30th SW (10%) which reached its peak (100%) during 40th SW. Correlation studies between weather parameters and insect pests was revealed that whitefly and Jassids population was exhibited significantly negative correlation with evaporation whereas, the incidence of stem fly was exhibited significantly positive correlation with maximum temperature and sunshine hours while, significant negative correlation with morning and evening RH, evening vapour pressure and rainy days.

Key words: insect pests; population dynamics; soybean; correlation; weather parameters

Rapid Virtual Oral Presentation



Theme III
Biological Control

BCO-01

Biology and feeding potential of the ladybird beetle, *Cheilomenes sexmaculata* (Fabricius) (Coleoptera: Coccinellidae) on sugarcane aphids

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Nine aphid species have been reported on sugarcane, with *Melanaphis sacchari* (Zehnt) and *Melanaphis indosacchari* (David) being the most prevalent. These aphids cause damage both directly by feeding on the plant and indirectly by transmitting the sugarcane mosaic virus. The coccinellid beetle, *Cheilomenes sexmaculata* (Fabricius) is widely found and preys on both the nymphs and adults of the aphids. This study was focused on the biology and feeding capacity of the beetle on *Melanaphis sacchari* (Zehnt). The study was conducted in Hi-Tech laboratory 2023 at SRI, Pusa, reared *Cheilomenes sexmaculata* on sugarcane aphids (*Melanaphis sacchari*), observed egg laying, hatching, larval development, pupation, and adult longevity. Data on egg count, hatching percentage, and adult longevity were recorded. Evaluated the feeding efficiency of *Cheilomenes sexmaculata* on sugarcane aphid (*Melanaphis sacchari*) with consumption rates recorded at 24, 48 and 72-hour intervals. Study on biology of *Cheilomenes sexmaculata* indicated the mean incubation period of eggs of *Cheilomenes sexmaculata* was 2±0.81 days. The mean total larval developmental period was 8.8±1.46 days. Mean pupal period recorded was 3.1±1.06 days. The total lifecycle for male was 32.1±4.1 days, and for female was 38.3±4.4days. The adults of *Cheilomenes sexmaculata* consumed 83.33±0.88 sugarcane aphids in 24 hr while during 48hr and 72 hr the consumption rate was 84.00±0.57 and 85.33±0.57 sugarcane aphids respectively. The overall mean per day consumption rate of adults of *Cheilomenes sexmaculata* was 84.22±0.59. The current study demonstrated that *C. sexmaculata* has a strong feeding capacity on sugarcane aphids, suggesting it could effectively control the pest in field conditions, though further research is needed to confirm this.

Keywords: Sugarcane; lady bird beetles; aphid; potential; control

Oral Presentation

BCO-02

Diversity and occurrence of insect pests of linseed and their natural enemies

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Linum usitatissimum L., commonly known as linseed or flax, is the important oilseed crops cultivated in India and 3rd most important oilseed crop in Bihar. Linseed crop was highly prone to biotic stress especially budfly which accounts for 40-80 % loss in seed yield. A study has been conducted in the linseed crop, to know the diversity of linseed pests and their natural enemies on three varieties namely Neelum, Sabour Tisi-1 and Neela at research farm, Bihar Agricultural University, sabour during 2021-22. The study revealed that budfly (*Dasyneura lini* Barnes), capsule borer (*Helicoverpa armigera* Hubner), semilooper (*Plusia orichalcea* (Fabricius), melon thrips (*Thrips palmi* Karny), Green bug (*Nezara viridula* Linnaeus) were recorded as the major pests and natural enemies such as lady bird beetles (*Coccinella septempunctata* and *Micraspis discolor*) and lynx spider (*Oxyopes* sp.) were recorded as the dominant natural enemies. Budfly infestation was recorded high at maturity stage in Neelum (29.67%), followed by Sabour tisi-1 (14.67%) and Neela (11.33 %). In the case of capsule borer and semilooper the population ranges from 0.33 to 2.33 caterpillar/ m^2 and 0.33 to 1.00 caterpillar/m^2 the tested varieties. Thrips showed an increasing pattern of population till 12th Standard Meteorological Week (SMW) with a population range of 0.33 to 14 nymphs/m^2. Similarly, 0.33 to 1.67 nymphs/m^2 were recorded in cases of green bug and the highest infestation was recorded in Neela. The natural enemies viz., lady bird beetle and *Oxyopes* spider were reported to have peak populations during 7th and 11th week of the experiment. This was concluded, that Neelum was highly susceptible to budfly, thrips, and capsule borer followed by sabour tisi-1 and Neela. But in case of semilooper and green bug, Neela was reported as more susceptible followed by Neelum and Sabour tisi – 1.

Keywords: budfly; capsule borer; standard meteorological week; neelum; sabour tisi -1;

Oral Presentation

BCO-03

Effectiveness of *Chrysoperla carnea* in controlling aphids in chilli under glasshouse conditions

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Green lacewings, *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae) are effective generalist predators of aphids. The study on effectiveness of *Chrysoperla carnea* against aphids were investigated in chilli under glasshouse condition was carried out during 2023-24. In the study, two applications of the second instar larvae of *C. carnea* was done at different release rates under glasshouse condition in chilli against aphids. The influence on aphids as well as yield of chilli due to *C. carnea* were assessed. The results revealed that among all the treatments, two releases of second instar *C. carnea* larvae at the rate 6 larvae/m^2 at 20 days interval was highly effective in reducing the population of *A. gossypii* almost by 89% in chilli. No statistical differences were observed among the treatments in aspects of yield. From the study, it was concluded that release of 6 larvae/m^2 twice at 20-days interval was enough for effectively controlling the aphid population.

Keywords: biocontrol; *Chrysoperla carnea*; aphids; chilli; glasshouse

Oral Presentation

BCO-04

Efficacy of *Beauveria bassiana* and fipronil in managing rice yellow stem borer (*Scirpophaga incertulas* Walker)

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In order to evaluate the efficacy of different concentrations of *Beauveria bassiana* and fipronil against the yellow stem borer, *Scirpophaga incertulas* Walker, in rice; the investigations were carried out. Seven treatments *viz.*, T_0 Control, T_1 *Beauveria bassiana* 2x10^8 (3ml lit^{-1}), T_2 *Beauveria bassiana* 2x10^8 (4ml lit^{-1}), T_3 *Beauveria bassiana* 2x10^8 (5ml lit^{-1}), T_4 *Beauveria bassiana* 3x10^7 (3ml lit^{-1}), T_5 *Beauveria bassiana* 3x10^7 (4ml lit^{-1}), T_6 *Beauveria bassiana* 3x10^7 (5ml lit^{-1}), and T_7 Fipronil (0.3g lit^{-1}) were laid out in randomized block design with three replications. The observation on per cent infestation and dead heart along with yield of crops in different treatments were recorded at 3, 7 and 14 days after each application to assess the impact of the treatments on pest population. Subsequently, treatments were applied at 20-days intervals, with a total of three applications during the experimental period. The findings revealed that among the insecticidal treatments, T_7 Fipronil 0.3g lit^{-1} was the most efficacious treatments in reference to per cent infestation, per cent white ear head and per cent dead heart observed followed by T_6 *Beauveria bassiana* 3x10^7 (5ml lit^{-1}**).** However, the applications of treatments such as T_1 *Beauveria bassiana* 2x10^8 (3ml lit^{-1}), T_2 *Beauveria bassiana* 2x10^8 (4ml lit^{-1}), *Beauveria bassiana* 2x10^8 (5ml lit^{-1}), *Beauveria bassiana* 3x10^7 (3ml lit^{-1}), *Beauveria bassiana* 3x10^7 (4ml lit^{-1}) for the management were also found effective but with reduced efficacy. In terms of yield, the highest was obtained in T_7 Fipronil 0.3g lit^{-1} treated plots (38.37 q ha^{-1}), followed by T_6 *Beauveria bassiana* 3x10^7 (5ml lit^{-1}) (36.41 q ha^{-1}).The results clearly indicate that the efficacy of *Beauveria bassiana* and Fipronil against Rice Yellow Stem Borer (*Scirpophaga incertulas*) is directly reflected in the obtained yield, with more effective treatments leading to higher yields.

Keywords: *Scirpophaga incertulas*; *Beauveria bassiana*; dead heart; fipronil; per cent infestation; rice

BCO-05

Efficacy of *Metarhizium anisopliae* (Metschnikoff) Sorokin ICAR SBI Ma 08 strain against tomato fruit borer *Helicoverpa armigera* (Hübner) (Lepidoptera: Noctuidae)

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Huge financial loss can result from *Helicoverpa armigera* induced damage, which can cause yield losses of 50% to 90%. The emergence of insecticide resistance, however, has made it so that conventional control methods like chemical insecticides are no longer consistently effective. This suggests the need for a more integrated strategy to achieve effective control and reduce its financial impact on the agricultural industry. An essential part of integrated pest management is biological control using entomopathogens (IPM). *Metarhizium anisopliae* (Metschnikoff) Sorokin is one of the best promising microbial control agents against insect pests. The pathogenicity of the *M. anisopliae* (Metschnikoff) Sorokin ICAR SBI Ma 08 strain was investigated against the tomato fruit borer *H. armigera*. The median lethal concentration (LC_{50}) of *M. anisopliae* ICAR SBI Ma 08 strain against the larvae of *H. armigera* with a fiducial limit of 7.4×10^4 to 5.3×10^6 conidia/mL was measured as 6.3×10^5 conidia/mL. 4.45 days was to be the median lethal time (LT_{50}) value. At 1×10^9 conidia/mL concentration, the ICAR SBI Ma 08 strain resulted in an 99.82% mortality rate in second instar *H. armigera*. The identity of the fungi at molecular level was confirmed by partial sequencing of the ITS region. The amplified product length ranged in 516 bp. The nucleotide sequences of this isolate were deposited in the NCBI database and the accession numbers was obtained (OR462161). Conidia effectiveness in field spraying crucial for mycoinsecticide commercial success. Following a field study, this strain can be utilised to control *H. armigera*.

Keywords: *H. armigera; M. anisopliae;* pathogenicity; median lethal concentration; bio-control

Oral Presentation

BCO-06

Evaluating the virulence of *Metarhizium anisopliae* against different developmental stages of pink bollworm *Pectinophora gossypiella*

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The pink bollworm, *Pectinophora gossypiella*, is a major pest of cotton, causing significant yield losses. In the present study, the virulence of the green muscardine fungus, *Metarhizium anisopliae* (strain TMBMA1), was evaluated against different developmental stages of pink bollworm under in vitro conditions. Eight conidial suspensions (ranging from 1×10^3 to 1×10^{10} conidia/mL) along with a water control were tested against eggs, second and third instar larvae, and pupae to assess stage-specific susceptibility. Results indicated that larval stages were significantly more susceptible to *M. anisopliae* than other developmental stages, exhibiting the highest mortality rates across treatments. Additionally, egg hatchability and pupal emergence were analysed across different conidial concentrations. These findings suggest that *M. anisopliae* has the potential to be an effective biocontrol agent against pink bollworm, particularly targeting its larval stages.

Keywords: EPF, cotton pest management, sustainable management, biocontrol, entomopathogen

Oral Presentation

BCO-07

Host preference and predatory potential of *Micromus timidus* Hagen (Neuroptera: Hemerobiidae) on *Aphis gossypii* Glover

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Brown lacewings, belonging to the family Hemerobiidae, represent the third largest family within the order Neuroptera. A study was conducted to investigate the host range, biology, and feeding potential of *M. timidus* on *A. gossypii*. To determine the host range, *M. timidus* larvae and adults were provided with 12 aphid species (*Aphis craccivora* (Koch), *A. craccivora*, *A. gossypii*, *Aphis nerii* Boyer de Fonscolombe, *Brevicoryne brassicae* (Linnaeus), *Ceratovacuna lanigera* Zehntner, *Greenidea artocarpi* (Westwood), *Hyperomyzus carduellinus* (Theobald), *Macrosiphum* sp., *Pseudoregma bambucicola* (Takahashi), *Rhophalosiphum maidis* (Fitch), *Uroleucon compositae* (Theobald)), *Planococcus citri* (Risso), *Ceroplastodes cajani* Cockerell, eggs of *Corcyra cephalonica* (Staint) *Spodoptera litura* (Fabricius), all stages *Tetranychus urticae* Koch. They accepted nine aphid species but did not feed on *B. brassicae, A. craccivora* on gliricidia and *P. bambucicola*. Further, *M. timidus* not fed on mealybugs, scale insects, lepidopteran eggs and red spider mites. A detailed study of the biology and feeding potential of *M. timidus* on *A. gossypii* revealed an incubation period of 3.63 days. The total larval period of 6.00 days and total pupal period of 5.56 days. The total development time from egg to adult was 15.20 days. Male and female adults had recorded lifespans of 36.70 and 39.70 days, respectively, with an average lifespan of 38.20 days. On emergence, the female spent 7.00 days before egg deposition and continued ovipositing for about 30 .60 days and lived for 2.10 days without ovipositing. On average, a female laid 390.50 eggs, with peak egg-laying observed on the 10th day *i.e.,* 25eggs/female. The total larval consumption of 124.57 aphids, averaging 20.31 aphids per day. Adult *M. timidus* fed on 8.74 aphids per day, with a total consumption of 1335.10 aphids during their lifespan of 38.20 days.

Keywords: *Micromus timidus*; brown lacewings; host range; biology; feeding potential

Oral Presentation

BCO-08

Influence of temperature, UV radiation and UV protectants on pathogenicity of Entomopathogenic Fungi *Cordyceps javanica* (Frieder and Bally) against tobacco caterpillar *Spodoptera litura* (Fabricius) (Lepidoptera: Noctuidae)

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The work was conducted to study the influence of temperature, UV radiation and UV protectants on pathogenicity of EPF *Cordyceps javanica* against *S. litura* at Biological Control Laboratory, COA, Dapoli, DBSKKV, Dapoli. The results demonstrated that temperature fluctuations significantly affected fungal virulence. At control (27±3°C), the cumulative mortality of *S. litura* reached maximum with 63% due to temperature fluctuation with shortest LT_{50} and LT_{95} values (5.7 and 19.1 days, respectively), while at constant temperatures in the optimal range of 25-30°C with % mortality rates (55.00-61.00%) and LT_{50} and LT_{95} values with 6.0-6.6 and 19.3-21.8 days, respectively. At temperature 20°C, % mortality slightly inhibited while at higher temperatures 35-40°C fungal virulence severely reduced with prolonged LT_{50} and LT_{95} periods indicating slower mortality rates and at 40°C, spore viability almost completely inhibited. UV irradiation treatment showed an inverse relationship with fungal efficacy; the maximum per cent mortality occurred with 63%t when the culture without exposed to UV radiation with shortest LT_{50} and LT_{95} values 5.7 and 19.1 days, respectively and as exposure duration increased, spore viability and virulence decreased from 60- 9% with increased LT_{50} and LT_{95} values 6.2-9.5 and 19.3-30.8 days, respectively. After 75-90 min of UV exposure, the fungus displayed significantly reduced virulence, with the longest LT_{50} and LT_{95} values. Among UV protectants, sunflower oil provided the highest protection, with maintaining fungal virulence and ensuring shortest LT_{50} and LT_{95} values, followed by soybean oil, humic acid sodium, egg albumen powder, humic acid potassium and sodium alginate. While deshi cow ghee offered the least protection, resulting in the longest LT_{50} and LT_{95} periods.

Keywords: Entomopathogenic Fungi (EPF); *Cordyceps javanica*; *Spodoptera litura*; temperature; UV radiation

Oral Presentation

BCO-09

Isolation and characterization of novel Bt isolates from Sikkim, India and its bioactivity against cabbage butterfly, *Pieris brassicae* (Linnaeus) (Lepidoptera: Pieridae) (Linn)

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The cabbage butterfly, *Pieris brassicae* (Linnaeus) (Lepidoptera: Pieridae) is an important oligophagous and destructive pest that attacks cabbage and other cruciferous crops causing a significant loss to the production and market value of the produce. Therefore, the management of this pest is crucial for which the adoption of *Bacillus thuringiensis* (Berliner) (*Bt*) is an effective, ecofriendly and sustainable approach as compared to the conventional methods. Our study focused on isolation and characterization of *Bt* strains from Sikkim and checking their insecticidal activity against cabbage butterfly using leaf dip method of bioassay. A total of 21 samples were collected from different regions of Sikkim and analyzed for the presence of *Bt* by the sodium acetate method. The colonies having white, creamy white, with rough and smooth margin were selected and streaked on nutrient agar plate and kept in incubation for sporulation. A total of 7 *Bt* colonies showed the presence of crystals or parasporal bodies under phase contrast microscopy confirming the presence *Bt***.** For molecular characterization, the samples showing the crystals, were screened by PCR using a set of universal primers and cry 1 specific primers, in which all the 7 samples yielded positive result by showing the bands at 689-701 bp. Further screening and bioassay studies will confirm the potential toxicity of these 7 novel *Bt* isolates against cabbage butterfly.

Keywords: *Bacillus thuringiensis*; *Bt* isolates; leaf dip; *Pieris brassicae;* parasporal bodies

Oral Presentation

BCO-10

Isolation and evaluation of *Metarhizium anisopliae* for sustainable management of radish flea beetle

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Phyllotreta spp. (Coleoptera: Chrysomelidae), commonly known as flea beetles, are significant pests of Brassicaceae crops including canola (*Brassica napus*), cabbage (*Brassica oleracea var. capitata*), and radishes (*Raphanus sativus*). These oligophagous insects cause damage at both the grub and adult stages and their pest status has notably increased in India, especially in radish-growing regions. This study focused to isolate and evaluate the efficacy of an indigenous entomopathogenic fungus (EPF) from radish-growing regions in Krishnagiri, Dharmapuri, and Coimbatore districts of Tamil Nadu against *Phyllotreta striolata*. Soil samples were collected and EPF was isolated using the *Galleria melonella* bait method. One EPF isolate, *Metarhizium anisopliae*, was morphologically and molecularly characterized. Morphological analysis revealed olive-green mycelial growth with cylindrical spores and molecular characterization confirmed the identity of the fungus. The isolate was designated as TNAU ENT Ma DP1, and its sequence was submitted to the NCBI database with accession number PQ267956. The pathogenicity of TNAU ENT Ma DP1 in adult *P. striolata* was assessed in the laboratory mortality was observed starting at 72 h post-inoculation (HAI) and continued through 168 HAI at 48-hour intervals. Mortality rates increased with higher spore concentrations, with the highest mortality of 87.5% observed at 168 HAI for a spore concentration of 1×10^8 conidia/ml. Efficacy tests revealed a concentration-dependent increase in adult mortality with an LC_{50} value of 5.20×10^3 conidia/ml and an LT_{50} value of 80.49 hours. These findings suggest that *M. anisopliae* TNAU ENT Ma DP1 is a promising biocontrol agent for *P. striolata*. This isolate offers the potential for use in integrated pest management (IPM) strategies as an eco-friendly alternative to chemical pesticides in radish and other Brassicaceae crops.

Keywords: flea beetle; *Phyllotreta striolata;* radish; entomopathogenic fungus; *Metarhizium anisopliae*

Oral Presentation

BCO-11

Laelapid Mites: Promising biocontrol agents in integrated pest management systems

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Biological control is an underlying pillar of integrated pest management (IPM). In many parts of the world, augmentative biological control of insect and mite pests is common practice as part of the IPM strategy. Predatory mites, mainly from the family Phytoseiidae, play the leading role among the biocontrol agents occupying more than 60% of the market share. In comparison, soil-dwelling predatory mites particularly laelapids are relegated as minor players in the field of commercial biological control. They are at the top of the trophic web in the soil agronomic system, and feed on a wide range of prey, especially edaphic pests or pests that spend part of their life in the soil. Many of the species feed on nematodes, collembolans, insects, larvae, eggs and other mites. Their small size and fast population development make them relatively easy to rear and transport to the end users. Among the Laelapidae, the mites belonging to the genera *Gaeolaelaps, Cosmolaelaps*, *Stratiolaelaps, Androlaelaps,* etc., are particularly useful in controlling a wide range of agricultural and veterinary pests, ranging from fungus gnats in greenhouses to the red mite in poultry houses. Mites of the genus *Gaeolaelaps* and *Stratiolaelaps* have been commercialized to some extent in the world. There are a number of rearing techniques that have been studied, but their practical application and efficiency in field conditions have not yet been evaluated, especially in our country. There exists a huge research gap in this area. Therefore, focus of our study is to explore the potential of these mites by assessing their biotic potential and host-preference by life table studies. This will improve rearing techniques for mass multiplication and field release for pest management leading to robust, reliable and affordable solutions to the farmers.

Keywords: Laelapidae; life table study; biological control; host preference; IPM

Oral Presentation

BCO-12

Molecular characterization of the circulating Nucleopolyhedrovirus (NPV) in Assam and optimization of its propagation in a cell line

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Tea is a major beverage and significant crop in India. A lepidopteran pest, *Hyposidra talaca* poses a significant threat to tea plantations. Nucleopolyhedrovirus (NPV), is an entomopathogenic virus which is highly specific and eco-friendly biocontrol agent. The study aims to characterize the circulating strains of NPV in Assam and to optimize its propagation in cell line for downstream application as biopesticide. Cadavers of *H. talaca* were collected from 10 regions of Assam and screened for NPV by amplifying Polyhedrin (395-635 bp) and Lef-8 (50883 to 51107bp) region *via* Sanger sequencing. Eleven NPV samples found positive from six distinct study regions were analysed. One PCR-positive sample, BF19A-06 (GenBank PQ624770), was isolated using Sf9 cells. Pairwise alignment of the Polyhedrin region of BF19A-06 showed 100% identity to that of 6 samples and 99.09% to 4 samples. For the Lef-8 region, BF19A-06 shared 98.12% identity with other samples. The derived amino acid sequence for BF19A-06 of the Polyhedrin region showed substitution in $K_{168}I$ (CACF-04, Cachar) and $T_{185}A$ (HF4-17, Jorhat). Similarly, Lef-8 region exhibited numerous substitutions, most prominent is the replacement of Cysteine with Phenylalanine at the 16,997 position and the substitution of Threonine with Isoleucine at the 17,000 positions across the majority of sequences. Phylogenetic analysis further revealed distinct sub-clades among NPV isolates, indicating genetic diversity among the circulating NPV strains. The BF19A-06 isolate in the Sf9 cell line was confirmed through the observation of occlusion bodies using SEM and changes in the cell structure with nuclear staining observation. A primary cell line was developed from the midgut tissues of *H. talaca*. The cell line demonstrated stable growth and extended viability; however, the growth rate is slow. Optimization efforts are underway to improve its growth. Future studies on cell line derived virions-based bioassay may open-up avenues on species-specific pest management, offering a sustainable alternative to chemical pesticides for an integrated pest management.

Keywords: Nucleopolyhedrovirus; occlusion bodies; sustainable downstream application; biopesticide

Oral Presentation

BCO-13

Native entomopathogenic nematodes: A potential biocontrol for banana leaf and fruit scarring beetle

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A pathogenicity test of two native species of entomopathogenic nematodes (EPNs) *viz., Steinernema kushidai* and *Heterorhabditis bacteriophora* were carried out against banana leaf and fruit scarring beetle, *Basilepta subcostatum* under laboratory conditions in Assam Agricultural University, Jorhat. The EPNs were inoculated at six different doses *viz.,* 50, 100, 150, 200, 250 and 300 infective juveniles (IJs)/adult and compared with water sprayed control. The pathogenicity of these EPNs were measured in terms of percent mortality of the insects at different time intervals (24, 48, 72, and 120 hours). The results revealed the entomopathogenic ability of the EPNs against the test insect. The IJs of *S. kushidai* induced 95 per cent mortality, while *H. bacteriophora* induced 90 per cent mortality at a dose of 300 IJs/adult after 120 hours compared to 30 per cent mortality in control treatment. The lowest LD_{50} and LT_{50} values obtained for *S. kushidai* were 97.31 IJs/adult and 53.91 hours, respectively, while those of *H. bacteriophora* were 153.20 IJs/adult and 62.16 hours, respectively. Both the EPNs were pathogenic against *B. subcostatum*. However, *S. kushidai* was more pathogenic than *H. bacteriophora* against *B. subcostatum* based on LD_{50} values.

Keywords: biocontrol; *Basilepta subcostatum*; *Steinernema kushidai*; *Heterorhabditis bacteriophora*

Oral Presentation

BCO-14

Screening of indigenous *Bt* isolates from Meghalaya against *Spodoptera frugiperda*

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Maize (*Zea mays* L.) ranks as India's third most significant cereal crop. The fall armyworm (*Spodoptera frugiperda*), a destructive polyphagous pest, inflicts 21–53% yield losses in untreated fields. Conventional pest control faces issues like resistance and environmental risks. Therefore, the present investigation was undertaken to assess the adoption of *Bacillus thuringiensis* (*Bt*) in pest management with the objective to isolate and characterize diverse isolates of *Bt* from Meghalaya and evaluating their toxicity against FAW. A total of 150 samples were collected from 60 locations across 15 blocks within six districts of Meghalaya. Two isolation methodologies *viz.,* Sodium acetate method and Enrichment Method were adopted in which the sodium acetate method proved more efficient in isolating *Bt*. *Bt* isolates were confirmed through morphological, microscopic and molecular analyses. Most isolates exhibited circular colonies with creamy white color, raised elevation, rough texture, and entire margins. Parasporal bodies were observed in 35 isolates confirmed by CBB staining and phase contrast microscopy. Molecular identification was carried out using universal primers for 16S rRNA gene (27F and 1492R primers) and for *cry* gene (cry1, cry2, cry3, cry4 and cry9 primer) and for *vip* gene (vip 3A specific primers). Among the isolates, those containing *cry* and *vip* genes including reference strains 4D1 and 4J3, were subjected to bioassay studies based on LC_{50} value. Bioassay results indicated that none of the 24 (*cry* gene isolates) were effective against FAW. However, among six *Bt* (*vip* gene) isolates tested, one isolates achieved 100% mortality by the 4th day of toxin exposure. Therefore, the results of the study confirmed the comparative efficacy of vip toxin over the cry toxin against FAW. The findings of the experiment highlight the potential of *vip* gene-containing *Bt* isolates as effective management strategy for enhancing toxicity against FAW as compared to *cry* gene.

Keywords: *Bt*; *cry*; fall armyworm; Meghalaya; *vip*

Oral Presentation

BCO-15

Bio-intensive management of two tailed/stripped mealybug, *Ferrisia virgata* Cockerell in red pulp dragon fruit (*Hylocereus polyrhizus*)

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Pitaya, often known as dragon fruit, belongs to the *Hylocereus*/*Selenicereus* species and is mostly infested by mealybugs. Mealybug specimens collected and brought to insect culture laboratory to rear and study the morphological characters. Then, a field experiment was conducted to study the abundance, damage severity and management of two tailed/stripped Mealybug, *Ferrisia virgata* Cockerell by using biopesticides and botanicals such as Neem oil @ 1.5 %, Neem oil @ 3 %, Neem seed kernel extract 5%, Pongamia oil @ 3 %, Tobacco decoction 2%, Fish oil rosin soap @ 12.5 g/lit, Fish oil rosin soap @ 25 g/lit, fish oil rosin liquid @ 0.1 %, fish oil rosin liquid @ 0.2%, *Metarhizium anisopliae* 1.15% WP and *Beauveria bassiana* 1.15% WP replicated thrice in randomized block design. Pre-treatment count on the pest population was recorded at 5 randomly selected poles (4 plants/pole) in a row before application of treatments. Post treatment counts were recorded on 1, 3, 5, 7, 10 and 15 days after spraying. Results obtained as, fish oil rosin soap (FORS) @ 25 g/lit was significantly effective compared to other treatments. It recorded the highest per cent mealy bug mortality of 72.38 on 3 DAT followed by 68.96 % in fish oil rosin liquid (FORL) @ 0.2 %, 63.86 % in Fish oil rosin soap @ 12.5 g/lit, 59.66 % in FORL @ 0.1 %. On 15 DAT, FORS @ 25 g/lit recorded 88.62 % mortality followed by FORL @ 0.2 % (79.67 %). In remaining treatments, the per cent mortality ranged from 49.29 to 59.26 %. The tobacco decoction 2%, *Metarhizium anisopliae* 1.15% WP and *Beauveria bassiana* 1.15% WP were found moderately effective while, treatments of Neem oil @ 1.5%, Neem oil @ 3% and NSKE 5% were found less effective in reducing mealybug population.

Key words: Dragon fruit; fish oil rosin soap; neem oil; mealybug; mortality

Oral Presentation

BCO-16

Synthesis and characterization of zeolite-chitosan nanocomposite mVOCs dispenser for management of stored grain pests

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Chitin and chitosan can be purified from fish scales which are freely available in local market. Demineralization is done in Lactobacillic acid fermentation 24 hrs and neutralized the acid by adding 2 N NaOH solution and thoroughly wash in water. Decolorization is done in 3 % H_2O_2, NaOCl (5 %) at pH <7. Isolated Chitin kept in air tight bottles. The obtained chitin was discolored using acetone and then was placed in NaOH 50 % solution for 4 hrs at 100 °C under reflux conditions to obtain chitosan with a high acetylation degree (above 90 ℃). The obtained product was finally washed with distilled water and dried for 24 hrs. Zeolite was purified from biomass fly ash (BFA) through Hydrothermal synthesis indirect carbonation with 0.3 M HCl 250 rpm for 1 hr followed by alkali treatment 2 M NaOH at 250 rpm for 4 hrs. at room temperature. Sediment was subjected to subsequent heat treatment 250℃ for 6 hrs washing and drying. Two types of nanocomposite dispenser were synthesised Binder (Chitosan) and binder free. The binder free nanocomposite was synthesised hydrothermally subjected to autoclaving for 20 minutes and binder conjugated nanocomposite was synthesised through phase inversion methods using citric acid as a crosslinker with Chitosan. mVOCs was harvested from liquid mass culture from different entomopathogens like *Beauveria bassiana*, *Metarizhium robertsii*, *Trichoderma* spp., *Cordyceps militaris*, *Bacillus thuringiensis* and *Penicillium* spp. Synthesised Zeolite was cauterized through SEM, XRD and XRF and BET and BDDT for construction of absorption isotherms using R statistics PUPAK package. Final nao dispenser will be characterised with Y tube Olfactometer assays and following parameters will access Volume of food staff exposed (Kg), Number of insects exposed (Nos.): 1-7 days old, Mortality assessment (adult), Percent infestation (%) and Per cent weight loss (Kg).

Keywords: dispenser; BET; langmuir isotherm; XRD; S_{BET}

Oral Presentation

BCPP-01

Bio-efficacy of different bio-formulations against mustard aphid (*Lipaphis erysimi* Kalt.) Hemiptera: Aphididae

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An experiment was conducted during the Rabi season 2023–2024 on the mustard crop to test the efficacy of selected bio-formulations against the fecundity of the mustard aphid (*Lipaphis erysimi* Kalt). Selected plant extracts (*Lantana camara*, tobacco (*Nicotiana tabacum*)), and bio-formulations (neem oil, castor oil, neem and karanj oil), and a synthetic pesticide (dimethoate 30% EC) were used in a comparative study in reducing the population of mustard aphid. Under laboratory conditions, the leaf dip method and leaf spray method were carried out for the LC_{50} study, and the mortality of aphids was observed at 24, 48, and 72 h. After imposition of treatment, the mortality rate was recorded as 100% in *L. camara* and tobacco extract at 48 h, neem oil, and Karanj oil showed 100% mortality at 24 h, while the castor oil showed 100% mortality at 48 h, followed by dimethoate 30% EC, showed 100% mortality in 72 h. In field conditions, an RBD trial was carried out to test the efficacy of the promising plant extracts and oil formulations. Each treatment was replicated three times, and observations were recorded on the basis of the 1st and 2nd sprays under field conditions. After the 1st and 2nd sprays, the results indicated that castor oil was more effective (92.5%) than neem oil (90%), and neem and karanj oil (81%). Furthermore, the treatments using tobacco showed 86.3%, *L. camara* showed 85.1%, and dimethoate 30% EC showed a 98% reduction in aphid population. It was concluded through the study that all the plant extracts and bio-formulations demonstrated efficacy in controlling mustard aphids when compared to the untreated control. The bioformulations using neem oil, castor oil, and a combination of neem and karanj oil proved to be particularly effective in reducing the population of mustard aphids.

Keywords: plant extracts; bio-formulation; bio-efficacy; IPM; aphid

Poster Presentation

BCPP-02

Collection, isolation, and morpho-molecular characterization of entomopathogenic fungi from naturally infected insect cadavers

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Microbial bio-pesticides, especially entomopathogenic fungi (EPF), show considerable potential as alternatives to chemical insecticides and are effectively target various insect life stages over twenty insect orders. The present study involves collection, isolation, and morpho-molecular identification of EPF from naturally infected insect cadavers *i.e.,* Hairy caterpillar (*Spilosoma obliqua*), Amaranthus leaf-footed bug (*Cletus* sp.) and Cicada (*Terpnosia* sp.), collected from Yelagiri Hills (Tamil Nadu), UAS GKVK (Bangalore) and Kodige falls (Chikkamagaluru), respectively during 2024. After sporulation at 24-48h at 27±2 °C, fungus was isolated from the cadavers by using a sterile loop onto Potato Dextrose Agar (PDA) amended with 0.05% chloramphenicol and incubated at 25 ± 1°C for 10-14 days. Pure culture was established, microscopic characters were examined, and photographed (Leica MC170 HD). Based on the cultural morphological characters the genera were identified as *Isaria, Beauveria, and Metarhizium. Isaria* exhibited a pinkish-white, cottony appearance with dense mycelia at the centre, forming a light-yellow pigment with a concentric ring pattern. The conidia were oval to spindle-shaped, measuring approximately 3.48-4.92x1.54-2.11µm whereas, *Beauveria* exhibited white to cream-white colony and pale to yellow pigmentation on the reverse side of plate with conidia ranging from 2.4-3.5x1.75-3.01µm in length. On the other hand, *Metarhizium* produced cylindrical conidia with round ends, including ellipsoidal microconidia (3.4-6.9 x 2.3-3µm) and banana-shaped macroconidia (11.6-23.1x 2.8-4µm). The colonies were characterized by a light green colour, distinguishing them from the darker *Metarhizium anisopliae*. Further molecular confirmation was carried out using an internal transcribed spacer region (ITS) and the species were confirmed as *Isaria javanica, Beauveria bassiana and Metarhizium cylindrosporum* based on phylogeny. The obtained sequences were submitted to the NCBI gene bank and accession numbers were obtained. Further, the identified EPF can be exploited for the ecofriendly management of lepidopteran and hemipteran pests of agricultural importance.

Keywords: entomopathogenic fungi; *Isaria*; *Beauveria*; *Metarhizium*

Poster Presentation

BCPP-03

Diversity of insect bio-control agents against *Eriosoma lanigerum* in apple orchards of dry temperate region of Himachal Pradesh

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Apple is a major crop of Himachal Pradesh as it holds 5000 crore economy of the state and Kinnaur, Lahaul & Spiti, Chamba districts are well-known dry temperate regions of Himachal Pradesh for their export quality apple production. But apple production in this region is affected by sundry of insect-pests. Among these insect-pests woolly apple aphid, *Eriosoma lanigerum* (Hausmann) is a major pest that causes damage to apple crops both aerial as well as underground parts. Therefore, a survey of apple orchards in these districts was conducted in the year 2023 and the diversity of natural enemies associated with woolly apple aphid was recorded. The study recorded various predators and parasitoids belonging to different orders *viz.* Coleoptera, Diptera, Neuroptera and Hymenoptera feeding on woolly apple aphid. The predators including various coccinellids *viz. Coccinella septempunctata*, *Hippodamia variegata*, *Oenopia conglobata*, *Oenopia sauzeti*, *Oenopia kirbyi*, *Coccinella undecimpunctata*, *Cheilomenes sexmaculata* and *Harmonia dimidiata*; various syrphids *viz. Eupodes corollae*, *Episyrphus balteatus* and *Scaeva pyrestri*; and green lacewing *Chrysoperla zastrowi sillemi* were observed in this region. A parasitoid, *Aphelinus mali* was also found parasitizing woolly apple aphid colonies. The presence of these diverse natural enemy populations in this dry temperate zone showed the ability of the beneficial insects to suppress the population of woolly apple aphid. Hence efforts are required to conserve the population of these biocontrol agents for sustainable crop production.

Keywords: apple; natural enemy conservation; parasitoid; predator; woolly apple aphid

Poster Presentation

BCPP-04

Vulnerability assessment at different stages of *Spilarctia obliqua* (Walker) against *Steinernema abbasi*

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The investigation on "Vulnerability assessment at different stages of *Spilarctia obliqua* (Walker) against *Steinernema abbasi"* was carried out during the year 2022-23, at the Insect Pathology Laboratory of Department of Entomology, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar (Uttarakhand). *S. obliqua* is a polyphagous insect pest that feeds on at least 126 species of plant including cereals, pulses, oilseeds, vegetables, etc. and also on non-cultivated plants and weeds. In India, this insect is a serious pest and its damage depends on the severity of the infestation, sometimes leading to epidemic outbreaks. The major crops affected are soybean (up to 77% yield loss), green gram (32.97% yield loss), and jute (up to 70% yield loss). To mitigate this problem, several management practices are used in present days, and biological control is one of the best tools to manage insect pests since they are more sustainable in terms of the environment as well as for non-target organisms. Entomopathogenic nematodes are a promising prospect in this field and *Steinernema* species are one of the most important entomopathogenic nematodes which are effective against insect pests. Virulence studies of *S. abbasi* were conducted by checking the efficacy of *S. abbasi* against different larval instars and pupae at different concentrations i.e., 500, 1000, 1500, 2000, 2500 and 3000 IJS/ml. It was found that the initial instar of 10 and 15-day-old larvae were most susceptible to nematode as compared to the older instar of 20 and 24 days at the highest concentration of 3000 IJs/ml. The older larvae were found resistant towards EPNs may be because of the presence of the hairs all over the body which did not allow the entry of nematode inside the body. The pupae were also found susceptible to the EPN as pupae failed to emerge as a moth. The above findings concluded that *S. abbasi* can be utilized as a potential bio-control agent and further research can be carried out to increase its efficiency.

Keywords: *Steinernema*; EPN; *Spilarctia obliqua*; virulence; insect-pests

Poster Presentation

BCVP-01

Bio-efficacy of biopesticides against aphid, *Hyadaphis coriandri* (Das) infesting fennel

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Fennel (*Foeniculum vulgare* L.) is a large seed spice crop. The production of fennel is affected by various insect pests and among them, aphid, *Hyadaphis coriandri* (Das), cause the most significant damage. Hence, seven biopesticides were evaluated against aphid-infested fennel. The treatment of *Lecanicillium lecanii* 1.15 WP @ 0.004% (0.99 Aphid index) and neem seed kernel extract 5% (1.02 A.I.) found the most effective in reducing the *H. coriandri* on fennel than all the tested biopesticides. The treatments of *Beauveria bassiana* 1.15 WP @ 0.004% and *Metarhizium anisopliae* 1.15 WP @ 0.004% stood next in order of efficacy by recording 1.11 and 1.20 aphid index, respectively. Further it was followed by lantana leaf extract 10% (1.27 A.I.). Of the evaluated biopesticides, Datura leaf extract 10% and Nafatia leaf extract 10% recorded 1.37 A.I. were found least effective among all biopesticides. Significantly highest aphids (2.07 A.I.) was recorded in control plots. The treatments of neem seed kernel extract at 5% (14.97 q/ha) and *L. lecanii* 1.15 WP @ 0.004% (14.67 q/ha) produced higher seed yields of fennel compared to the control plot (8.52 q/ha), as these biopesticides were found effective against aphids. Treatments of Datura leaf extract 10% (11.30 q/ha) and Nafatia leaf extract 10% (11.89 q/ha) found poor in yield performance as they were inferior in managing the aphid. The net realization was found higher, *i.e.*, 39055 ₹/ha and 37238 ₹/ha, in NSKE and *L. lecanii* 1.15 WP @ 0.004%, respectively. The treatments of Datura leaf extract 10% recorded the lowest (16833 ₹/ha) net realization. Neem seed kernel extract 5%, Lantana leaf extract 10% and *L. lecanii* 1.15 WP @ 0.004% have ICBR ratios of 1:8.54, 1:7.76, and 1:5.93, respectively.

Keywords: fennel; aphid; biopesticide; *Lecanicillium lecanii*; Neem

Rapid Virtual Oral Presentation

BCVP-02

Bioefficacy of indigenous strain of entomopathogenic nematode (*Heterorhabditis* spp.) against invasive pest fall armyworm, *Spodoptera frugiperda*

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Pest management in agriculture is a critical challenge. Conventional chemical pesticides, although effective, have led to severe environmental and ecological concerns, including pesticide resistance, non-target toxicity, and biodiversity loss, and soil and water contamination. To mitigate these adverse effects, there is a growing demand for sustainable and selective pest control alternatives, particularly biological control agents such as entomopathogenic nematodes (EPNs). Nematodes from families *Steinernematidae* and *Heterorhabditidae*, act as effective biocontrol agents due to their symbiotic association with *Xenorhabdus* and *Photorhabdus* bacteria, respectively. These bacteria induce septicemia, causing rapid mortality of insect pests while ensuring environmental safety and sustainability. This study evaluates the pathogenicity of a locally isolated EPN strain, *Heterorhabditis* spp. (PKV-Guava), against different larval instars of *Spodoptera frugiperda* under laboratory conditions. Results indicate that *Heterorhabditis* spp. (PKV-Guava) exhibited significant pathogenicity across all larval instars, with mortality rates increasing with juvenile concentration. The second instar larvae were most susceptible, showing a maximum mortality of 74.28% at a concentration of 50 IJs/20µl. third instar larvae exhibited the highest mortality of 94.28% at 50 IJs/20µl, with progressively lower mortality at decreasing concentrations. Similarly, fourth instar larvae showed a maximum mortality of 80%, while fifth and sixth instar larvae displayed a slightly lower susceptibility, with maximum mortality rates of 77.14% each at 50 IJs/20µl. Third instar larvae exhibited the highest mortality of 94.28% at 50 IJs/20µl, with progressively lower mortality at decreasing concentrations. Similarly, fourth instar larvae showed a maximum mortality of 80%, while fifth and sixth instar larvae displayed a slightly lower susceptibility, with maximum mortality rates of 77.14% each at 50 IJs/20µl. Overall, third, and fourth instar larvae demonstrated greater susceptibility to *Heterorhabditis* spp. (PKV-Guava) compared to the later instars. These findings suggest that EPNs can be effectively utilized as biological control agents, particularly when targeting younger larval stages of *S. frugiperda*.

Keywords: *Heterorhabditis*; indigenous; EPN; bioefficacy; septicemia

Rapid Virtual Oral Presentation

BCVP-03

Biosynthesis of silver nanoparticles using fungal extract of *Aspergillus* species and their potential mosquito larvicidal property

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Vector-borne diseases like dengue fever, and malaria spread by mosquitoes cause millions of infections and deaths worldwide each year. This paper discusses the larvicidal potential of microbially synthesized silver nanoparticles (AgNPs) based on *Aspergillus* species. AgNPs were subjected to a 1 mM silver nitrate ($AgNO_3$) solution. To verify the synthesis of AgNPs, visual inspection was combined with the use of transmission electron microscopy (TEM) with chosen area electron diffraction, X-ray diffraction (XRD), Fourier transform infrared spectroscopy, and UV–vis spectroscopy. TEM and XRD studies were used to establish the average size of the AgNPs. Biosynthesized AgNPs demonstrated significant larvicidal effectiveness against vector mosquitoes. Silver nanoparticles were effectively synthesized using Aspergillus fungal extract. The produced silver nanoparticles were characterized using FTIR, XRD, TEM, and UV-Vis spectra. In UV spectra, the maximum absorption peak was 420 nm. X-ray diffraction analysis confirmed the crystalline nature of synthesised AgNPs. The average size was 7-12 nm, according to TEM analysis. The LC_{50} and LC_{90} values obtained were 0.173mg/L and 10.290mg/L respectively which concludes that the synthesised silver nanoparticles can be used as potential larvicide for vector mosquitoes.

Keywords: biosynthesis; nanoparticles; vectors; larvicidal; anti-microbial

BCVP-04

Diversity and relative abundance of predators and parasitoids of *Spodoptera frugiperda* (Smith) in the maize ecosystem

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Maize (*Zea mays* L.), a major cereal crop belonging to the Poaceae family, is heavily damaged by the invasive insect pest *Spodoptera frugiperda* (J.E. Smith) in India. The present study was conducted to investigate the diversity and relative abundance of predators and parasitoids of *S. frugiperda* infesting Kharif maize in the Marathwada region of Maharashtra. Observations were recorded at weekly intervals from randomly selected maize quadrats maintained under unsprayed conditions. The results revealed a total of seventeen species of predators and parasitoids across six insect orders: *Hymenoptera, Diptera, Hemiptera, Coleoptera, Dermaptera*, and *Araneae*. The highest number of predators and parasitoids were found in the *Hymenoptera* order, followed by *Coleoptera*. The highest abundance was observed in *Hymenoptera* (52.94%), including families such as *Trichogrammatidae, Ichneumonidae, Braconidae,* and *Scelionidae*. This was followed by *Coleoptera* (17.64%), which included *Coccinellidae* and *Carabidae*; *Hemiptera* (11.76%), with families *Pentatomidae* and *Reduviidae*; *Diptera* (5.88%), represented by *Tachinidae*; *Dermaptera* (5.88%), represented by *Forficulidae*; and *Araneae* (5.88%). The present findings not only enhance the understanding of the diversity of predators and parasitoids but also provide valuable insights for formulating an Integrated Pest Management strategy for the Maize ecosystem.

Keywords: Maize; *Spodoptera frugiperda*; predators; parasitoids; diversity

Rapid Virtual Oral Presentation

BCVP-05

Eco-friendly management of sucking insect pests of green gram (*Vigna radiata* L.)

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This field experiment was conducted during *Kharif* 2022 at the Crop Research Centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh. This study aimed to evaluate eco-friendly management strategies against sucking insect pests of green gram and assess their cost-effectiveness. The experiment utilized a Randomized Block Design with three replications and seven treatments. Major sucking pests, including whitefly (*Bemisia tabaci*), aphid (*Aphis craccivora*), and jassid (*Amrasca biguttula* Ishida), were observed weekly from the second week of August to the fourth week of October. Whiteflies peaked at 9.3 individuals per cage per plant in the first week of October, with a significant positive correlation with rainfall (r = 0.679). Aphids peaked at 9.5 individuals per 10 cm apical shoot in the last week of September, showing a significant negative correlation with rainfall (r = -0.700). Jassids peaked at 9.0 individuals per cage per plant in the fourth week of September, with significant positive correlations with evening RH (r = 0.619) and rainfall (r = 0.697), and a significant negative correlation with maximum temperature (r = -0.024). Among the treatments, Imidacloprid 17.8 SL @ 1 ml/lit was the most effective in controlling all pests, followed by Neem oil 3% @ 3 ml/lit, which was on par with NSKE 5% @ 50 g/lit. For whiteflies and aphids, *Verticillium lecanii* (1×10^8 spores/ml @ 5 g/lit) was on par with *Beauveria bassiana* (2×10^8 spores/ml @ 2.5 ml/lit), while for jassids, Karanj oil 2% @ 20 ml/lit was on par with *V. lecanii*. All treatments were significantly superior to the untreated control. The highest cost-benefit ratio (CBR) was observed in Imidacloprid (1:13.84), followed by *B. bassiana* (1:7.27), Neem oil (1:6.52), NSKE (1:3.70), and *V. lecanii* (1:2.71). The lowest CBR (1:0.57) was recorded for Karanj oil. This study highlights the efficacy of eco-friendly pest management practices and provides a sustainable roadmap for managing sucking pests in green gram, emphasizing cost-effectiveness and environmental safety.

Keywords: whitefly; aphid; *Verticillium lecanii*; *Beauveria bassiana*; neem; karanj

Rapid Virtual Oral Presentation

BCVP-06

Efficacy of biopesticides on duration of eggs and morphometry of adult female of *Chrysoperla zastrowi sillemi* (Esben-Peterson) in subsequent generation

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Efficacy of biopesticides *Bacillus thuringiensis, Lecanicillium lecani*, *Beauveria bassiana*, *Metarhizium anisopliae*, Azadirachtin and synthetic insecticide fipronil were recorded on the egg duration and morphometry of adult female of *Chrysoperla zastrowi sillemi* in the subsequent generation after one round treatment of larvae in the previous generation by two different methods: residue deposit method and diet contamination method under laboratory condition. In residue deposit method and diet contamination method, the egg duration varied from 3.27 to 3.33 days and 3.20 to 3.27 days respectively. In the residue deposit method, maximum egg duration was observed in *B. thuringiensis* treatment which is at par with the untreated control while minimum duration was observed in fipronil treatment. In the diet contamination method, treatments *L. lecani and M. anisopliae* showed maximum duration which is at par with the untreated control while the lowest can be seen in fipronil treatment. In the residue deposit method, the adult female length and breadth ranged from 8.68 to 9.50 mm and 1.71 to 1.84 mm respectively, and the maximum length and breadth were observed in *B. thuringiensis* and the minimum was observed in fipronil. In the case of the diet contamination method, the adult female length and breadth ranged from 8.54 to 9.54mm and 1.80 to 1.85mm respectively and the maximum length and breadth was observed in treatments *L. lecani* and minimum was observed in fipronil. The result derived from the experiment showed that the *microbial pesticides* have little or no effect on the duration of egg and morphometry of adult females of *Chrysoperla zastrowi sillemi* in the subsequent generation.

Keywords: biopesticides; *Chrsoperla*; residue deposit; diet contamination; morphometry

Rapid Virtual Oral Presentation

BCVP-07

Efficacy of entomopathogenic fungi *Metarhizium anisopliae* against white grubs *Holotrichia serrata* in lab condition

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The Laboratory experiment was conducted on the "Efficacy of entomopathogenic fungi *Metarhizium anisopliae* against white grubs *Holotrichia serrata* in Lab Condition infesting sugarcane *in vitro*" during 2024 in the Biocontrol laboratory, Department of Entomology, College of Agriculture, SVPUA&T., Meerut. The *H. serrata* species of white grub is one of the major pests in sugarcane causing severe damage to Kharif crops by its larval stages which live inside the soil and cause quantifiable losses in the crops. Their infestation has been reported across the country and incidence is increasing every year. The current suppression strategy is mainly strategized with the use of chemical pesticides; however, none of them are found effective by farmers in lowering their population below ETL. The biological factors that influence populations of white grubs' complex are relevant to the potentiality of the biological control with soil fungi. *M. anisopliae* is an entomopathogenic fungus that causes disease in various insect pests. In laboratory bioassay studies the entomopathogens like, *M. anisopliae* different combinations were tested for their combine efficacy against third instar grubs of *H. serrata* in Lab Condition. The treatment *M. anisopliae* @ 75 gm was found most effective in managing the white grub, *H. serrata* with the treatment of *M. anisopliae* @ 75 gm recorded 65.28, 76.59, and 89.65 percent grub mortality at 7, 10 and 15 DAT respectively where untreated control recorded 5.28, 8.35 and 13.21 percent grub mortality respectively.

Keywords: entomopathogenic fungi; white grub; sugarcane; bio efficacy

Rapid Virtual Oral Presentation

BCVP-08

Enhancing biological control: Unravelling the impact of salicylic acid on maize volatile emissions and *Spodoptera frugiperda*-parasitoid interactions

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Effective biological control of *Spodoptera frugiperda* (Smith) (Lepidoptera: Noctuidae), a major pest of maize, relies on the attraction and efficiency of natural enemies such as parasitoids. This study investigates the role of chemical elicitors in modifying maize volatile emissions and their subsequent impact on parasitoid attraction to *S. frugiperda* when applied exogenously. We hypothesize that chemical elicitors such as salicylic acid (SA), enhance plant defense responses by altering the blend of volatile organic compounds (VOCs) released by maize, thereby improving the recruitment of parasitoids. Using controlled laboratory and field experiments, we applied SA to maize plants and analysed the resulting changes in volatile emissions using gas chromatography-mass spectrometry (GC-MS). Additionally, we monitored the behaviour of the egg parasitoid, *Trichogramma pretiosum* Riley and its parasitism rates in treated and untreated maize. Our results demonstrate that treated maize released a distinct VOC profile, leading to a significant increase in parasitoid attraction and parasitism of *S. frugiperda*. These findings suggest that the exogenous application of SA can enhance biological control strategies by promoting a more robust natural enemy response through modified plant volatile emissions. This eco-friendly approach offers a promising tool for sustainable pest management in maize production systems.

Keywords: chemical elicitors; salicylic acid; volatile emission; *Spodoptera frugiperda*; parasitoid attraction

BCVP-09

Evaluation of entomopathogenic nematode *Heterorhabditis indica* for efficacy against *Spodoptera frugiperda* (Smith) (Lepidoptera: Noctuidae)

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The fall armyworm, *Spodoptera frugiperda* (Smith) (Lepidoptera: Noctuidae), a highly polyphagous and invasive pest, was first reported in India in 2018 and has rapidly disseminated, causing substantial agronomic damage to maize. The present study evaluates the virulence and reproductive potential of a native strain of entomopathogenic nematode, *Heterorhabditis indica* (CICR-HI-MN strain), isolated from the mango rhizosphere. Different larval instars of *S. frugiperda* were reared on a chickpea-based semi-synthetic diet under controlled laboratory conditions. Bioassays were performed against various larval instars, employing a completely randomized design with ten treatments and five replications per treatment. The reproductive potential assay was conducted using the White Trap method, and observations were recorded using a stereo zoom binocular microscope to ensure precision in data collection. Bioassays revealed instar-specific susceptibility, with third-instar larvae exhibiting the highest mortality (LC_{50}: 48.91 IJs/larva), followed by fourth (LC_{50}: 52.36 IJs/larva) and fifth instars (LC_{50}: 71.04 IJs/larva) at four days after treatment. Fifth-instar larvae supported significantly higher nematode reproduction, indicating enhanced symbiotic bacterial proliferation and pathogenicity compared to earlier instars. This augmented reproductive potential suggests the CICR-HI-MN strain's capacity for sustained in vivo multiplication in late-instar hosts, thereby facilitating long-term persistence in the field. The findings indicate that *H. indica* (CICR-HI-MN) exhibits promising virulence against *S. frugiperda* larvae and may serve as an effective biocontrol agent in integrated pest management programs.

Keywords: entomopathogenic nematodes; *Heterorhabditis indica*; *Spodoptera frugiperda;* biocontrol; pest management

Rapid Virtual Oral Presentation

BCVP-10

Isolation of native entomopathogenic fungi from soils in North coastal districts of Andhra Pradesh

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Entomopathogenic fungi (EPF) are a group of fungi that infect and kill insect pests making them valuable tools for biological pest control. These fungi occur naturally in the environment and can be used as biopesticides to manage insect pests in agriculture. Native entomopathogenic fungi isolated from wild tree soil samples collected from Srikakulam, Vizianagaram, Visakhapatnam and Anakapalle districts of Andhra Pradesh. The soil samples collected from Nagamalli (cannon ball), Peepal, Pogada (*Mimusops elengi*), Anjeer, Cadamba (Burflower) isolated using soil serial dilution and inoculated on SDAY media. Morphological identification of fungal isolates was conducted to identify species. Microscopic observation of fungal isolates was done under NIKON Eclipse E200 at 40x magnification and images were captured using V-image 2013 software. Based on morphological features like white colony colour, flask shaped conidiogenous cell, branched conidiophore, hyaline conidia and septate hyphae one of the isolates was identified as *Beauveria*. Whereas the other isolate with light green colony colour, interwined conidiophore, elongated conidia and septate hyphal structures was identified as *Metarhizium*. Further molecular and efficacy studies need to be conducted for both the isolates. By identifying and isolating naturally occurring fungal strains, one can develop effective pest management strategies and contribute to sustainable agriculture.

Keywords: entomopathogenic fungi; serial dilution; *Beauveria*; *Metarhizium*; sustainable agriculture

Rapid Virtual Oral Presentation

BCVP-11

Isolation, and evaluation of indigenous native entomopathogenic fungus from Andhra Pradesh soils against the larva of *Spodoptera litura*. (Lepidoptera: Noctuidae)

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The objective of the study was to isolate the native indigenous entomopathogenic fungi from different groundnut growing soils of Andhra Pradesh, India and evaluate their virulence against *Spodoptera litura*. The total of eight isolates were identified among seventy-two soil samples by using the *Galleria* live bait trap method. The eight isolates identified were Bb-1, Bb-2, Bb-3, Bb-4, Mf-1, Mf-2, Ll-1 and Ll-2. *Beauveria, Metarhizium and Lecanicillium* were the most abundant genera isolated from the soils. These eight isolates were evaluated against *Spodoptera litura* by preparing different conidial concentrations in the laboratory. Among the eight isolates the highest mean mortality percentage was observed as 90 per cent in M-1 isolate and lowest mean mortality percentage was observed as 66.6 per cent in Bb-2.

Keywords: mortality; *Spodoptera litura*; entomopathogenic fungi; *Galleria*; bait trap

Rapid Virtual Oral Presentation

BCVP-12

Manifestation and dispersal of entomopathogenic nematodes in orchard ecosystem with regards to soil characters in three different zones of Chhattisgarh state

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Entomopathogenic nematodes (EPNs) are roundworms from the genera *Steinernema* and *Heterorhabditis* that kill insect pests. They are ubiquitous. Survey results of the present study show that 7 samples out of 800 collected samples (0.87%) were positive for EPN, which were obtained from silty loam and loamy sand soil. This is an extensive first-of-its-kind study on EPN surveys throughout the state of Chhattisgarh. The EPN was recovered from 5 of the 24 surveyed districts, namely Baloda Bazar (Ber crop), Mahasamund (Mango crop), Raipur (Sapota crop, Papaya and guava), Bijapur (Mango crop), Sukma (Mango crop). The organic matter estimate from EPN-recovered soils was in the range of 0.56-1.06% with a pH of slightly acidic to neutral (5.6-7.1). The water-holding capacity of EPNs-isolated soil was 32.05-38.87%, and bulk density was 0.96-1.27 g/cm^3 with a moisture percentage of 4.26-24%. The present study shows that nematodes can be found in low-moisture soil as well as high-moisture soils. The results of molecular identification reveal that isolated EPN samples were identified as *Heterorhabditis indica*. EPNs are being investigated primarily for biocontrol purposes. There are many exotic EPNs that had conflicting results in many field-testing situations, most likely due to their low adaptation to local agro-climatic conditions. Henceforth, our quest was to look for an indigenous isolate of EPN that can be used as a novel biopesticide; our work mainly focuses on identifying local EPN strains from Chhattisgarh state, which can be further used in the Integrated Pest Management program.

Keywords: entomopathogenic nematode; survey; *Heterorhabditis*; biopesticide; pest management

Rapid Virtual Oral Presentation

BCVP-13

PCR-based screening of indigenous *Bacillus thuringiensis* isolates from diverse habitats for prevalence of *cry* genes with predicted targets against insect orders Lepidoptera, Coleoptera, and Hemiptera

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Entomopathogenic agents are effective and viable options for biocontrol due to their selective action against insects while being harmless to humans and the environment. Among the most promising entomopathogens are subspecies of *Bacillus thuringiensis* (*Bt*), which are widely used for biological insect control. In recent years, the development of resistance in insect pests against conventional *cry* genes has emerged as a significant challenge in pest management. This threatens the long-term utility of conventional genes, necessitating the exploration of novel *cry* genes that exhibit different mode of action and toxicity. In response to this need, our research focused on identifying frequency of recently identified *cry* genes in Indian *Bt* isolates, which harbor diverse *cry* genes with potential insecticidal properties. The present study screened seventy-nine native *Bt* isolates from various habitats across different agroclimatic regions of India for the presence of novel *cry* genes that exhibit predicted toxicity against three insect orders (Lepidoptera, Coleoptera, and Hemiptera) using PCR-based methods. The amplification of the expected band from PCR in gel electrophoresis indicated that 27 isolates tested positive for one or more *cry* genes with significant regional variations. The *cry7/8*-type genes, which belong to conventional *cry* genes were the most abundant, followed by novel *cry* genes *cry15Aa1, cry64Ca, cry30Ga1, cry30Fa1, cry79Aa1*, *cry78Aa,* and *cry78Ba*. Among novel *cry* genes, Lepidopteran-toxic *cry* genes were more abundant than hemipteran-toxic genes. Interestingly, some genes were absent in native isolates but present in reference strains. Notably, some native isolates contained multiple *cry* genes. SK-110, SK-768, and SK-979 were positive for four different genes and SK-213 and SK-1322 were positive for three different genes. This indicates their potential for broad-spectrum toxicity for biocontrol applications. This study underscores the importance of exploring native *Bt* strains for novel *cry* genes and their potential in sustainable agriculture.

Keywords: biocontrol; *Bacillus thuringiensis*; *cry* genes; pest management; screening

Rapid Virtual Oral Presentation

BCVP-14

Population dynamics of predatory mites on major fruit crops of West Bengal

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West Bengal's diverse climate and fertile soil make it an ideal region for fruit cultivation. But adoption of high-yielding varieties and modern techniques has increased pest issues, especially mites, adversely affecting fruit production. Furthermore, rising global demand for chemical-free agricultural products is encouraging farmers to find alternatives. In this context, exploring and utilizing predatory mites, which have significant potential to control pest mites and other soft-bodied insects, could be a beneficial strategy. A detailed experiment on the exploration of predatory and phytophagous mite fauna in association with major fruit crops of Gangetic basin of West Bengal i.e. mango, citrus, litchi, guava, jackfruit, and banana, and their population dynamics has been carried out during the present study. *Oligonychus mangiferus* and *Aceria mangiferae* in mango, *Schizotetranychus baltazri* and *Phyllocoptruta oleivora* in citrus, *Aceria litchi* and *Notacaphylla chinensis* in litchi, *Eutetranychus orientalis* in guava, *Tegolophus indica* in jackfruit and *Oligonychus sapienticolus* in banana were found to be major threat associated with these crops. *Polyphagotarsoemus latus* and *Brevipalpus phoenicis,* two polyphagous mites were also found to be associated with these crops. During this investigation, *Typhlodromips syzigii* emerged as the most prevalent predatory mite, which can be mass multiplied for the successful organic production of fruit crops in West Bengal. Moreover, *Amblyseius brachycalyx* was specifically identified on jackfruit, while *Lesioseius parbarlesi* and *Phytoseius jujube* were the two species exclusively found in guava. It was found that the population of predatory mites was positively correlated with tetranychid and eriophyid mites during the dry months (March to May), which corresponds to high temperatures and dry weather. Further research on predatory mites is essential to develop more effective pest control strategies tailored to different agricultural and horticultural contexts. By deepening our understanding of these beneficial organisms, we can create targeted approaches that effectively manage pest populations while also promoting sustainable farming practices.

Keywords: predatory mites; fruits; population dynamics; West Bengal; *Typhlodromips syzigii*

Rapid Virtual Oral Presentation

BCVP-15

Survival Strategy of *Chrysoperla zastrowi sillemi* in prey scarce conditions

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Chrysoperla zastrowi sillemi (Esben-Petersen, 1935) is a highly efficient biological control agent targeting soft-bodied insect pests such as aphids, whiteflies, thrips, mealybugs, and the neonates of certain lepidopteran species. This predator is routinely mass-reared under laboratory conditions, utilizing the eggs of *Corcyra cephalonica* Stainton as a substitute prey. In the absence of prey or host eggs, *C. zastrowi sillemi* exhibits a survival strategy characterized by cannibalism, wherein individuals consume conspecific unhatched eggs or younger larvae. A 24-hour study was conducted to evaluate the cannibalistic potential across various larval stages of *C. zastrowi sillemi*. Before the experiment, larvae were subjected to a starvation for 8–10 hours. The study revealed distinct patterns of cannibalism across different instars, providing insights into the species' behavioral adaptations under prey-scarce conditions. Cannibalism among larvae of the same developmental stage is infrequent. First instar larvae, however, are observed to exhibit egg cannibalism, specifically targeting unhatched eggs. The cannibalistic behaviour is most pronounced in the third larval instar, which demonstrates a high predation rate on the first and second instar larvae due to their voracious feeding habits. However, cannibalism among larvae of the same developmental stage is infrequent.

Keywords: survival; *Chrysoperla*; *Corcyra*; cannibalistic potential; prey-scarce conditions

Rapid Virtual Oral Presentation

BCVP-16

Sustainable management of *Spodoptera frugiperda* (Smith, 1797) in the Maize using biopesticides

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Maize is one of the most important cereal crops grown in India. The Fall Armyworm, *Spodoptera frugiperda* (Smith) (Lepidoptera: Noctuidae), a newly invasive species, has been causing significant damage to maize crops and poses a serious threat to maize production in the country. Assessing the efficacy of biopesticides against this pest is essential for monitoring and managing resistance development. This research was conducted at the Entomology Research Farm, College of Agriculture, Gwalior, M.P., over two consecutive years (*Kharif* 2021–22 and *Kharif* 2022–23) to evaluate the efficacy of various biopesticides and provide crucial insights into their effectiveness in managing and suppressing pest populations. In order to evaluate, observations were recorded on number of larvae and plant damage (%) caused by *S. frugiperda* after all three sprays during *Kharif* 2021 and 2022. Reduction in pest population and plant damage over untreated control was also worked out. Based on an average of two years of data, the lowest and significantly lesser number of larvae were recorded in *Metarhizium rileyi* 1% WP (1.09 larvae/ plant), with the highest percent reduction compared to control (56.44%). Furthermore, the least amount of plant damage was also noticed in *M. rileyi* 1% WP (18.33% damage) compared to the other bio pesticides, with a maximum percent reduction over the control (63.08%). However, NSKE 5% recorded a maximum and significantly greater population (1.77 larva/ plant) with the least population reduction control (27.78%). Additionally, NSKE 5% also outperformed all other treatments, in terms of maximal and noticeably higher plant damage (35.56% damage) and lowest percent reduction compared to control (27.87%). These results demonstrate that *M. rileyi* is a highly effective and sustainable solution for controlling fall armyworm larvae.

Keywords: biopesticides; larval population; plant damage; *Metarhizium rileyi*; *Beauveria bassiana; Bacillus thuringiensis*

Rapid Virtual Oral Presentation

BCVP-17

The application of native *Beauveria bassiana* isolate offers an eco-friendly and sustainable approach to pest control in the Terai region of West Bengal

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The entomopathogenic fungus *Beauveria bassiana* presents a promising eco-friendly alternative to chemical pesticides due to its broad-spectrum insecticidal properties. This study focuses on isolating and evaluating a native strain of *B. bassiana* from the Terai region of West Bengal, India. Molecular characterization confirmed the identity of the isolate, designated UBKV Bb1, which was subjected to bioassay evaluations against major agricultural pests: mustard aphids (*Lipaphis erysimi*), rice moth (*Corcyra cephalonica*), and rice weevil (*Sitophilus oryzae*). Laboratory trials demonstrated significant pest mortality, with rates reaching 89.87% for aphids, 86.67% for *Corcyra*, and 85.33% for weevils. The median lethal concentration (LC50) values were determined as 0.74×10^6, 1.2×10^6, and 1.8×10^6 spores/ml for aphids, *Corcyra*, and weevils, respectively, highlighting the strain's virulence. Additionally, the influence of varying dextrose concentrations in Sabouraud Dextrose Agar (SDA) on fungal growth and sporulation was investigated. Optimal growth occurred at 2 g/100 ml dextrose, while sporulation was inversely proportional to dextrose concentration. Among tested substrates for mass production, rice grains were the most effective, followed by sorghum and maize. Compatibility assessments with chemical insecticides identified imidacloprid as the most suitable for integration with *B. bassiana*, enhancing its potential for combined pest management strategies. Comparative virulence assays demonstrated that the native isolate UBKV Bb1 exhibited superior performance over other strains, indicating its suitability for commercial microbial pesticide development. This research emphasizes the significant role of native entomopathogenic fungi in Integrated Pest Management (IPM) to promote sustainable agriculture by reducing dependence on synthetic pesticides. Future research will focus on field trials and optimizing formulations to improve the practical applicability of this biocontrol agent for widespread use by farmers, fostering environmentally sustainable crop protection strategies.

Keywords: *Beauveria bassiana*; bioassay; entomopathogenic fungi; LC_{50}

Rapid Virtual Oral Presentation

Theme IV
Insect Toxicology

TO-01

Efficacy and metabolite profiling of natural farming plant protectant bioinputs against mustard aphid *Lipaphis erysimi* under laboratory condition

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A laboratory experiment was conducted at the Department of Entomology, Assam Agricultural University, Jorhat to evaluate the efficacy of natural farming plant protectant bioinputs against mustard aphid, *Lipaphis erysimi* (Hemiptera:Aphididae). The adults of *L. erysimi* were subjected to rapeseed leaf dipped in desired concentrations of Agniastra, Brahmastra, Neemastra and Dasparniastra and the data on mortality was recorded at 6, 12, 24, 48, and 72 hours after treatment (HAT), which revealed a time- and dose-dependent mortality. It was observed that agniastra was the most effective causing the maximum mortality (81.67%) followed by dashparniastra (80.00%), brahmastra (61.67%) and neemastra (11.67%) at the dosage of 20 ml/lit after 72 hours of treatment, respectively. The lowest LD_{50} value of 4.72 ml/lit was recorded in the case of agniastra followed by dashparniastra, brahmastra and neemastra with 8.11 ml/lit, 13.05 ml/lit and 52.91 ml/lit at 72 HAT, respectively. Through GC-MS analysis we have identified more than 100 bioactive metabolites that revealed the presence of various biological activities including insecticidal, antifungal, and antibacterial properties. The major bioactive molecules identified in the case of agniastra were Propanoic acid, 2-chloro-, methyl ester (RT= 4.599 mins), Carbamic acid, methyl-, 3-methylphenyl ester (RT= 18.625 mins), 3(2H)-benzofuranone, 2,7-dimethyl-, and Pyridine,2-(1-methyl-2-pyrrolidinyl)- (RT = 26.223 mins), while 4-Hexadecanol (RT= 34.089 mins), Heptasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13-tetradecamethyl- (RT= 36.175 mins), and Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-n- (RT= 36.830 mins) in the case of dashparniastra. Our attempt to assess the metabolites present in the natural farming plant protectant bioinputs paved the way for its possible inclusion in the organic and natural farming system in the near future.

Keywords: *Lipaphis erysimi*; agniastra; dashaparniastra; brahmastra; neemastra.

Oral Presentation

TO-02

Efficacy of insecticides against *Leucinodes orbonalis* and their impact on brinjal yield and economics

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To evaluate the efficacy of five novel insecticides against *Leucinodes orbonalis* of brinjal, a field experiment was conducted at the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat during rabi, 2023 on brinjal variety JC1. The insecticides used during the experiment were emamectin benzoate 5 SG @ 11 g *a.i.*/ha, fenpropathrin 30 EC @ 100 g *a.i.*/ha, thiacloprid 21.7 SC @ 180 g *a.i.*/ha, spinosad 45 SC 84.5 g *a.i.*/ha and chlorantraniliprole 18.5 SC 40 g *a.i.*/ha. Among all the insecticides emamectin benzoate 5 SG @ 11 g *a.i.*/ha recorded least number of infested shoots with 0.07 number and 98.91% reduction followed by chlorantraniliprole 18.5 SC @ 40 g *a.i.*/ha (0.39 number and 94.20 % reduction) and spinosad 45 SC @ 84.5 g *a.i.*/ha (0.83 number and 87.42% reduction) at 5 weeks after treatment (WAT). The reduction rate of fruit infestation over control was found to be 6.62, 7.61, 8.34, 8.98 and 9.31% by number and 6.5, 7.11, 7.6, 7.9 and 8.3 % by weight basis in emamectin benzoate 5 SG @ 11 g *a.i.*/ha, chlorantraniliprole 18.5 SC @ 40 g *a.i.*/ha, spinosad 45 SC @ 84.5 g *a.i.*/ha, thiacloprid 21.7 SC @ 180 gm *a.i.*/ha and fenpropathrin 30 EC @ 100 g *a.i.*/ha treated plot, respectively. The yield obtained was highest in emamectin benzoate 5 SG @ 11 g *a.i.*/ha (236.25 q/ha) which differed significantly from other treatments with a benefit-cost ratio of 3.1. Therefore, emamectin benzoate 5 SG @ 11 g *a.i.*/ha was found to be the most effective in terms of both insecticidal efficacy and economic returns.

Keywords: *Leucinodes orbonalis*; emamectin benzoate; chlorantraniliprole; Spinosad; thiacloprid

Oral Presentation

TO-03

Evaluation of decontamination techniques for reducing insecticides residues in cauliflower: A food safety approach

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Increased use of insecticides in agriculture has led to significant concerns regarding pesticide residues in food, particularly in vegetables like cauliflower that are consumed globally. To address these concerns, this study evaluates the efficacy of various decontamination treatments in reducing insecticide residues in cauliflower. The estimation of seven insecticides was performed using the quick, easy, cheap, effective, rugged and safe (QuEChERS) method with liquid chromatography tandem mass spectrometry (LC-MS/MS) and Gas Chromatography Tandem Mass Spectrometry (GC-MS/MS) in cauliflower. The method validation study was carried out with linearity ($R^2 > 0.99$), average recoveries of all insecticides ranged from 74.00 to 116.81% and a precision of 0.003–8.10%. Cauliflower curds were collected from the plot applied with pre-mixed insecticides. The treatments applied included rinsing under running tap water, soaking in lukewarm water, soaking in 1per cent sodium chloride, soaking in a 5% sodium bicarbonate aqueous solution and treatment with Arka herbi wash. A treated control was also included. The overall percent reductions of tetraniliprole, emamectin benzoate, lufenuron, indoxacarb, profenofos and cypermethrin were 4.61–53.90, 4.65–41.86, 1.95–53.14, 1.95–53.14, 2.94–47.64, 21.24–41.08, 18.04-53.73 and 43.73–77.00% respectively. All the decontamination techniques showed reductions in residue levels. However, treatment by soaking in 5 per cent sodium bicarbonate aqueous solution showed 54, 42, 53, 48, 22, 54 and 77% maximum reductions in residues of tetraniliprole, emamectin benzoate, lufenuron, indoxacarb, profenofos and cypermethrin, respectively, in cauliflower curds. The next best treatment was soaking cauliflower curds in water at 45-50°C for 10 min, which reduced the residues of cypermethrin, profenofos, tetraniliprole, thiodicarb, emamectin benzoate and lufenuron. The findings of this study can inform the development of standardized decontamination protocols and innovative technologies tailored to different vegetables and insecticides.

Keywords: Cauliflower; decontamination; insecticides; QuEChERS; residues

Oral Presentation

TO-04

Evaluation of plant-based bioformulations for cowpea aphid, *Aphis craccivora* management: A laboratory investigation

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A laboratory analyses was carried out in the Pesticide Residue Laboratory, Department of Entomology, AAU, Jorhat during 2023-24 to evaluate the biofficacy of 8 (eight) plant oil-based bioformulations *viz.*, citronella oil (*Cymbopogon nardus*), jatropha oil (*Jatropha curcas*), garlic oil (*Allium sativum*), karanja oil (*Pongamia pinnata*), neem oil (*Azadirachta indica*), patchaouli oil (*Pogostemon cablin*), clove (*Syzygium aromaticum*) and basil oil (*Ocimum sanctum*) against *Aphis craccivora* for promotion of sustainable pest management strategies in the future. The data on laboratory analyses revealed a dose- dependent adult mortality with a positive correlation to the exposure period. Among all the bioformulations, cent per cent mortality of adult *A. craccivora* was observed in the case of citronella oil, jatropha oil, garlic oil, karanja oil and neem oil @ 7 ml/lit at 48 hours after treatment (HAT), followed by patchouli oil (98.33%) and clove oil (96.67%). Among the tested plant oils, basil oil showed the lowest adult mortality (81.67%) at the dosage of 7 ml/lit after 48 HAT. The lowest LD_{50} value at 48 HAT was recorded 0.13 ml/lit in case of citronella oil, followed by 0.14, 0.31, 0.38, 0.39, 0.41, 0.45 and 1.29 ml/lit in case of jatropha oil, garlic oil, neem oil, karanja oil, patchouli oil, clove oil and basil oil, respectively. In terms of bioefficacy, the plant oil-based bioformulations could be arranged as, citronella oil> jatropha oil> garlic oil> karanja oil> neem oil> patchouli oil> clove oil> basil oil. GC-MS analysis citronella oils revealed the presence of bioactive molecules like D-limonene, citronellal, citronellol, and trans-verbenol. In jatropha oil, compounds like clotrisiloxane, hexamethyl, N- hexadecenoic acid, and butyl 9- tetradecenoate were found present, while compounds like diallyl disulphide, diallyl sulphide and 3H -1,2-dithiole were present in garlic oil, which could be responsible for the insecticidal and repellent properties observed against cowpea aphid.

Keywords: *Aphis craccivora*; bioformulations; LC_{50}; per cent mortality; GC-MS analysis

Oral Presentation

TO-05

Fumigant Toxicity of Cumin Oil and Cuminaldehyde Against *Monomorium pharaonic*

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Monomorium pharaonis (pharaoh ant) is a common household pest, infesting kitchens, pantries, and indoor spaces in homes, grocery stores, and restaurants. It contaminates food and creates sanitation challenges, particularly in food storage facilities. In healthcare settings, it poses a public health risk by contaminating food, medical supplies, and equipment, making it a significant concern for hygiene and infection control. This species serves as a vector for various pathogenic bacteria, including *Salmonella*, *Staphylococcus*, *Pseudomonas*, *Streptococcus*, *Klebsiella*, and *Clostridium*, thereby posing a risk of nosocomial infections. As global temperatures continue to rise due to climate change, the distribution of *M. pharaonis* is anticipated to expand, leading to increased infestations in indoor environments and a heightened risk of infection transmission, particularly among vulnerable populations such as hospitalized patients. The present study evaluates the fumigant toxicity of cumin (*Cuminum cyminum*) seed oil and its one of the major bioactive constituents, cuminaldehyde, against *M. pharaonis*. The results show that after 3 hours of exposure, the LC_{50} values were 3.143 µL/500 mL air for cumin oil and 3.199 µL/500 mL air for cuminaldehyde. These values decreased to 0.542 µL/500 mL air and 0.280 µL/500 mL air, respectively, after 6 hours of exposure, demonstrating a time-dependent increase in toxicity. These findings suggest that cumin seed oil and cuminaldehyde exhibit significant fumigant toxicity against *M. pharaonis*, highlighting their potential as eco-friendly alternatives to conventional synthetic insecticides. The study underscores the importance of plant-derived biopesticides in integrated pest management (IPM) strategies, offering a safer and more environmentally sustainable approach to controlling *M. pharaonis* infestations in residential and healthcare settings.

Keywords: *Monomorium pharaonic;* essential oils; cumin; cuminaldehyde; fumigation toxicity

Oral Presentation

TO-06

Insecticide-induced sublethal effects on the demographic and behavioral traits of the larval parasitoid, *Habrobracon hebetor* (Say)

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Agricultural pest management has evolved from heavy reliance on chemical pesticides to integrated pest management (IPM) and sustainable alternatives. Combining biological control with targeted insecticide use can effectively manage pest populations. Even sublethal insecticide concentrations can impact non-target species, influencing their physiology, behavior, and reproduction. The current study explores the transgenerational effects of acephate on the demographic and behavioral traits of *Habrobracon hebetor*, across five generations (F_1 to F_5). The highest toxicity was observed at LC_{50} (0.52 mg. L^{-1}), whereas LC_5 (0.01 mg. L^{-1}) and LC_{30} (0.15 mg. L^{-1}) being less toxic. At LC_5, egg and pupal periods were significantly shortened, and both male and female longevity decreased, while fecundity increased when compared to control. However, LC_{30} reduced fecundity by 40.8% in F_5 individuals relative to F_1. Regarding population parameters (r, λ, R_o, T, GRR), no significant differences were observed across generations at any of the concentrations tested. In terms of adult walking speed, the highest speed was recorded in the control group, followed by LC_5 and LC_{30}. Although walking speed declined across all concentrations over generations, a statistically significant reduction was observed only at LC_{30}. Long-term generational studies would better depict possible trade-off operating between various demographic parameters. The results of the study would be helpful in utilizing *H. hebetor* as a biocontrol agent under field situations for the management of different insect pest.

Keywords: Biological control; life table; parasitoid; pesticide; transgenerational

Oral Presentation

TO-07

Investigating Lethal and Sublethal Effects of Different Insecticides on the Biological Fitness of *Coccinella septempunctata*

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This laboratory study aimed to evaluate the lethal and sublethal effects of chemical insecticides against unintentional target i.e. *Coccinella septempunctata* which is natural bio-control agent of *Lipaphis erysimi*, the pest for which insecticides are targeted. The experiments to derive LC50 of insecticides against ladybird beetle and subsequent sublethal study were carried out at Bio-control lab of university in complete randomized design with six treatments including control for each insecticide in three replications. The results of study revealed that LC50 of dimethoate 30EC and thiamethoxam 25WG against *C. septempunctata* were 133.98 ppm and 8.554 ppm, respectively thus thiamethoxam 25WG being far more toxic than dimethoate 30EC at same concentration. All the treatments significantly enhanced the incubation period of eggs except control having incubation period of 3.49 days and maximum enhancement reported in T1 and T4 (5.53 days each). Conversely, all the treatments significantly reduced the larval period of the treated insect when compared to control (17.86 days) except T6 (16.16 days) and shortest LP reported in T4 (12.50 days) and T1 (12.86 days). All the treatments significantly enhanced the pupal period of insect when compared to control (8.10 days) maximum enhancement reported in T4 (10.38 days) and T1 (10.10 days). Treatment T5 (27.70 days), T1 (28.27 days) and T4 (28.38 days) exhibited significant effect on total developmental period of ladybird beetle over control. Adult longevity of ladybird beetle varied from 33.70 days (T4) to 43.59 days (control). Ovi-positional period of beetle ranged from 16.83 days (T1) to 26.22 days (control).

Keywords: Lethal; sub-lethal; bio-control; *Coccinella septempunctata*; LC_{50}

Oral Presentation

TO-08

Method standardization and monitoring of pesticide residues in button mushroom, *Agaricus bisporus* (Lange) Imbach

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A multi-residue method was standardized for the determination of 37 pesticides in three matrices of button mushroom (fresh, in brine, powder) employing GC and LC-MS/MS. Validation parameters such as linearity, LOD, LOQ, precision, accuracy, uncertainty, and matrix effect was assessed to validate the effectiveness and accuracy of the method. Linearity was established using neat standards at six different concentration levels (0.003, 0.01, 0.025, 0.05, 0.075 and 0.1 µg g^{-1}) with R^2 value ranged from 0.979 to 0.999. The LOD and LOQ values were 0.003 and 0.01 µg g^{-1}, respectively. The recoveries obtained in the spiking level of 0.01-0.1 µg g^{-1} were in the acceptable range (71.69 to 117.90%) with RSD less than 20%. Matrix matched calibrations were employed to get accurate results and to identify interferences. In the spiked fresh and processed (in brine and powder) button mushroom samples, the matrix effect of selected pesticides was below ±20 per cent. Uncertainity of the experiment was measured at 0.01 µg g^{-1} for all selected pesticides and it was in the acceptable range. Monitoring studies were carried out by collecting 25 fresh button mushroom samples and 10 processed button mushroom samples from various markets. The results revealed the presence of cypermethrin residues in four out of 25 fresh button mushroom samples and no detectable residues were found in processed mushroom products tested. This study aims to assess the current pesticide levels and establish food safety regulations to regulate the overuse of certain pesticides on edible mushrooms.

Keywords: Button mushroom; fresh; processed; pesticide residues; QuEChERS

Oral Presentation

TO-09

Monitoring insecticide susceptibility in Indian Populations of Rice Brown Planthopper, *Nilaparvata lugens* Stål

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Rice (Oryza sativa) is a staple food crop consumed worldwide. The brown planthopper (BPH), *Nilaparvata lugens* (Stål), inflicts significant damage to rice foliage, causing "hopper burn" symptoms leading to yield losses ranging from 25 to 70%, depending on infestation levels. Although insecticides are the primary method for managing BPH, the pest has developed resistance to many of them, necessitating regular monitoring of insecticide susceptibility to ensure effective control. To address this, an insecticide bioassay was conducted during the 2024 wet season with field populations from Cuttack, Bargarh, and Raipur. Five insecticides viz. imidacloprid, dinotefuran, pymetrozine, deltamethrin, and buprofezin (Technical grade) were tested along with a water-treated control. The rice seedling dip method (IRAC Method 5) was used to calculate LC50 values, with mortality observations recorded after 72 hours. The results showed that dinotefuran and pymetrozine caused significantly higher mortality compared to other treatments. Imidacloprid demonstrated 50% mortality (LC50) at a concentration of 0.11 mg/L for all tested populations, while pymetrozine recorded an LC50 of 3.47 mg/L across all populations. Dinotefuran exhibited LC50 values of 0.915 mg/L for Cuttack and 0.76 mg/L for both Bargarh and Raipur populations. The insect growth regulator buprofezin displayed LC50 values of 0.202 mg/L in all three populations. The significantly higher efficacy of dinotefuran and pymetrozine suggests that these novel insecticides could be recommended for rotational use by farmers to effectively manage BPH with minimal chances of resistance development. In subsequent experiments, based on the field LC50 value of tested insecticides, the resistance ratio (RR) and cross-resistance may be calculated which will provide the region-wise resistance and susceptibility insights for better pest control.

Keywords: Brown planthopper; insecticide susceptibility; dinotefuran; pymetrozine; bioassay

Oral Presentation

TPP-01

Dissipation kinetics and consumer safety assessment of chlorantraniliprole and cyantraniliprole in Bitter Gourd (*Momordica charantia* L.): Insights into food safety and environmental risk mitigation

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The study at the ICAR- Indian Institute of Vegetable Research assessed the persistence and dissipation of insecticide residues in bitter gourd, focusing on chlorantraniliprole and cyantraniliprole. Residue dissipation followed first-order kinetics, with half-lives ranging from 2.44 to 3.04 days in fruits and soil. Consumer safety was ensured, as dietary exposure remained well below acceptable limits, with theoretical intake significantly below permissible thresholds. Ecological risk assessments showed low to medium risks to soil organisms, including earthworms. The study emphasized the importance of pre-harvest intervals and regulatory compliance in minimizing pesticide risks and supporting sustainable agriculture.

Keywords: Residue; kinetics; bitter gourd; risk; insecticides

Poster Presentation

TPP-02

Efficacy of some chemical pesticides and biopesticides against rice brown plant hopper (*Nilaparvata lugens* Stal.) in Paddy

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The present investigation was carried out at central research field, SHUATS, Prayagraj (U.P.) during *Kharif*-2022. All the treatments were found significantly superior over the untreated control, flonicamid 50WG @150gm/ha (4.20) was found most effective in comparison to all other treatments. The next effective treatment was dinotefuron 20 SG @ 150gm/ha (5.40) followed by lamda cyhalothrin 5EC @ 500gm/ha (7.20), spinosad 45%SC @ 165gm/ha (9.00), neem oil 2% @ 20ml/lit (11.80) > Sixer plus @ 1mi/lit (12.60) > and *Beauveria bassiana* (l2 x 108) c.f.u./ml @5ml/lit (12.80). The effectiveness of treatment determined in terms of grain yield of rice obtained from various treatments revealed that flonicamid 50WG @150gm/ha (45.50q/ha), dinotefuron20 SG @ 150gm/ha (42.80 q/ha), lamda cyhalothrin 5 EC @ 500gm/ha(40q/ha), spinosad 45%SC @ 165gm/ha (38 q/ha) Neem oil 2% @20ml/lit (35.00 q/ha), Sixer plus @ 1mi/lit (30.00 q/ha), *B. bassiana* (2 x 108) c.f.u./ml @ 5ml/lit (28.00 q/ha). Among these maximum cost: benefit ratio was obtained in the treated plot with flonicamid 50WG @ 150gm/ha (1:2.975), dinotefuron 20 SG @ 150gm/ha (1:2.569), lamda cyhalothrin 5 EC @ 500gm/ha (1:2.71), spinosad 45% SC @ 165gm/ha (1:2.44) neem oil 2% @ 20ml/lit (1:2.193), Sixer plus @ 1mi/lit (1:2.018), *B. bassiana* (2 x 108) c.f.u./ml @ 5ml/lit (1:1.781).

Keywords: Biopesticides and chemicals; efficacy; rice brown plant hopper; dinotefuran; benefit-cost ratio

Poster Presentation

TPP-03

Insecticide susceptibility study in *Aedes aegypti* (Diptera: Culicidae) populations of lower Assam

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Insecticide susceptibility and resistance status is an important parameter of effective mosquito control strategy. *Aedes aegypti* belonging to the order Diptera and family Culicidae is an important mosquito vector that carries the virus for dengue disease in humans. According to WHO, dengue causes an estimate of about 390 million infections every year, out of which 2.5% of the people die. Over the last few years, there is an increasing trend of dengue cases in India. In North- Eastern states of India, especially in Assam, high prevalence of dengue cases was reported from urban and sub urban areas. Interestingly the vector has developed insecticide resistance over the years. A preliminary work has been carried out on the susceptibility and toxicity of three insecticides, deltamethrin, cypermethrin and malathion respectively, to *A. aegypti* population from Kokrajhar and Basugaon locality of lower Assam region. A dose dependent insecticide susceptibility was observed in the study and different responses were recorded. In this study we also tried to correlate the enzymatic activities of the mosquito population of the two localities. The enzymatic activities of AchE and GST showed significant correlation with the insecticide susceptibility property of the mosquitoes. *Aedes* mosquitoes having higher AchE and GST activity showed more resistance to tested insecticides. Biochemical analysis and Larval bioassay revealed that the *A. aegypti* mosquitoes from Basugaon area are more susceptible to all the insecticides compared to Kokrajhar locality. Among the three insecticides, deltamethrin is found to be more toxic. The main aim of this study is to grab attention of researchers all around the world and also to provide some basic data on insecticide resistance as future scope.

Keywords: *Aedes aegypti*; Kokrajhar; basugaon; insecticide; dengue

Poster Presentation

TPP-04

Mosquitocidal activity of *Artemisia nilagirica* essential oil

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Mosquitoes have challenged human progress for centuries by acting as vectors of many severe diseases such as Malaria, Japanese Encephalitis, Filariasis, Zika, Chikungunya, and Dengue. Filariasis and Japanese Encephalitis are the two most common diseases spread by *Culex* species in the state of Assam, located in northeastern India. Most chemical insecticides used to manage mosquito vectors no longer provide the anticipated level of control, and significant insecticide resistance has been reported. Therefore, there has been a spike in interest in environmentally friendly alternatives to conventional insecticides. *Artemisia nilagirica* belonging to the family Asteraceae, is an important medicinal plant entering a range of pharmacological activities such as insecticidal, antifungal, and antibacterial. Therefore, the present study aimed to investigate the larvicidal activity of this plant against the vector, *Culex quinquefasciatus*. Aerial parts from the plant materials were used to extract essential oil by hydro-distillation method in Clevenger apparatus and GCMS analysis was carried out for its characterization. The larvicidal bioefficacy of *A. nilagirica* essential oil was determined by performing toxicity studies against third-instar larvae. The LC_{50} and LC_{90} values determined by probit analysis were 41.462 and 565.68 ppm respectively, indicating high larvicidal activity. However, the efficacy of the oil could be enhanced through synergistic activity with that of *O. basilicum* essential oil exhibiting an LC_{50} and LC_{90} of 38.134 and 652.872 ppm respectively. GC-MS analysis of the essential oil revealed 22 compounds consisting mainly of monoterpenes followed by sesquiterpenes. β-thujone (34.05%) was found to be the major compound present in the oil. The findings of this study revealed significant data related to the efficacy of *A. nilagirica* against the larvae suggesting its potential to be used as a bioinsecticide in mosquito vector management.

Keywords: Insecticide; vector; *culex*; mosquitocidal; *Artemisia*

Poster Presentation

TPP-05

Residue dynamics and food safety evaluation of chlorantraniliprole on tomato fruit

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This study focused on evaluating the persistence and conducting a risk assessment of chlorantraniliprole in tomatoes. A modified QuEChERS method along with liquid chromatography using a mass spectrometry was employed for method validation and analysis of tomato samples. Chlorantraniliprole 18.5% SC was administered at three application rates: the recommended dose of 30 gm *a.i.* ha^{-1}, 37.5 gm *a.i.* ha^{-1} (25% higher than the recommended rate), and 60 gm *a.i.* ha^{-1} (double the recommended rate). Applications were made at 15-day intervals, and fruit samples were taken at regular intervals after the second treatment. The initial chlorantraniliprole residues in tomatoes were 0.57, 0.63, and 1.11 mg kg^{-1}, with half-lives of 1.22, 1.53 and 2.19 days, and DT90 values of 4.06, 5.08 and 7.28 days for each respective dose. The Theoretical Maximum Daily Intake (TMDI) for both rural and urban populations was found to be well below the Maximum Permissible Intake (MPI). Moreover, a health risk assessment indicated no risk to Indian consumers from chlorantraniliprole usage (Hazard Quotient < 1), provided that recommended agricultural practices are followed.

Keywords: Chlorantraniliprole; dissipation kinetics; food safety; half-life; tomato

Poster Presentation

TVP-01

A sustainable approach to control *Aedes albopictus* (Diptera: Culicidae) with essential oils and combinations of their bioactive compounds

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The rise in urbanization and the changing lifestyle of humans has led to the widespread adoption of container gardening, aquariums, and overhead tanks in households. These water containers can serve as a breeding ground for the Asian tiger mosquito *Aedes albopictus* (Diptera: Culicidae). The increased occurrence of *Aedes*-borne diseases necessitates effective vector management strategies. Many countries including India use synthetic organophosphate insecticide temephos in container water for controlling *Aedes* spp. Since the water in these containers is used for drinking and daily activities, reducing synthetic insecticide use is important. One promising alternative is the use of environmentally friendly insecticides. This study evaluated the larvicidal potential of three essential oils extracted from commonly used food ingredients *i.e., Allium sativum*, *Syzygium aromaticum* and *Citrus paradisi* and their major bioactive compounds against *A. albopictus*. The guidelines of the World Health Organization (WHO) were followed when performing the larvicidal bioassays. The essential oils showed sublethal concentrations (LC_{50}) ranging from 12.28-20.43 ppm for *A. sativum*, 55.15–108.03 ppm for *S. aromaticum* and 78.77–143.74 ppm for *C. paradisi*. The constituent compounds diallyldisulfide, eugenol and D-limonene (major compounds of *A. sativum*, *S. aromaticum* and *C. paradisi*, respectively) exhibited strong larvicidal potential. Diallyldisulfide, eugenol and D-limonene caused notable morphological and histological alterations in the exposed larvae. Melanization in the integument was one of the main morphological alterations and histological analysis revealed gaps in the epithelial cell layer and destruction in the peritrophic membrane. in the larvae. A 1:1 binary volumetric mix of diallyldisulfide and D-limonene had a synergistic effect and a 1:1 mix of D-limonene and eugenol had an additive effect on larval mortality. Interestingly, the binary combination of the LC_{50} of these compounds i.e., diallyldisulfide with D-limonene and D-limonene with eugenol showed a synergistic larvicidal effect causing a hundred per cent mortality in the exposed larvae. Both these mixtures were effective in the large-scale laboratory and simulated field conditions.

Keywords: Dengue vector; diallyldisulfide; d-limonene; eugenol; synergist

Rapid Virtual Oral Presentation

TVP-02

Aphidicidal activity of nano-emulsions of spearmint oil and carvone against *Rhopalosiphum maidis* and *Sitobion avenae*

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The management of aphid species, which cause significant yield reductions in cereal crops such as wheat (*Triticum aestivum* L.), relies on insecticides that pose environmental and ecological risks. Therefore, an environment friendly and effective aphidicidal product of plant origin is the need of the hour. *Mentha spicata* essential oil is a rich source of carvone with limited use in crop protection because of their volatility, poor solubility, and stability. A nano-formulation not only solves these problems but also improves the efficacy and dose of the bioactive compounds. Thus, nano-emulsions of the oil and carvone prepared were characterized, and evaluated against *Rhopalosiphum maidis* (corn aphid) and *Sitobion avenae* (wheat aphid) The average droplet size of nano-emulsions of the oil and carvone was found to be 22.1 and 41.21 nm. Nano-emulsion of carvone exhibited higher aphid mortality (LC_{50} = 0.87–1.94 mg/mL) at 24 hours and acetylcholinesterase inhibitory activity (IC_{50} = 0.07–3.83 mg/mL) compared to the nano-emulsion of the oil (LC_{50}=2.87–2.81 mg/mL; IC_{50} = 1.66–5.34 mg/mL). The repellence index (RI) in nano-emulsion of essential oil was found to be higher (84.73 and 81.72%) at the highest concentration (0.05 µL/cm^2) than that of carvone (77.59 and 80.98%) for *R. maidis* and *S. avenae*. Further, *in silico* studies also revealed the favourable binding energy (−6.6 to −8.5 kcal/mol) of the main compounds in the oil with acetylcholinesterase, facilitated by hydrophobic interactions and hydrogen bonding. This study suggests that the nano-emulsions of the essential oil and carvone can be explored under field conditions to establish efficacy for their utilization as aphidicidal and repellent products against aphids. In the present study, aphidicidal and repellent activities of its essential oil and carvone were reported for the first time against *R. maidis* and *S. avenae*.

Keywords: Spearmint; aphids; repellent; acetylcholinesterase; molecular docking

TVP-03

Chemical composition and insecticidal potential of *Rosmarinus officinalis* L. and *Ocimum sanctum* L. against *Aphis craccivora* Koch, *Planococcus lilacinus* Cockrell and *Plutella xylostella* L.

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Aphis craccivora, Planococcus lilacinus, and *Plutella xylostella* are key pests of agriculture/ horticulture crop plants. Due to indiscriminate use of chemical pesticides for the control of insect pests led to resistance, harmful to beneficial insects and environment. Essential oils (EO) are plant-derived secondary metabolites that can be used to combat insect pests. In this work, chemical composition, insecticidal activities of EOs were screened for the above pests. GC and GC-MS analysis of EOs and its mixtures revealed, ocimene (36.40 %), eucalyptol (16.02%) and camphene (12.46%) were major constituents in *R. officinalis*. β-caryophyllene (58.77 %) and eugenol (20.77 %) were major constituents in *O. sanctum*. Among combinations, RO+OS (1:1) comprised eugenol (36.95%) and camphene (13.11%) as main constituents. However, (3:1) and (1:3) combinations represented eugenol (42.02 and 19.01%), camphene (11.16 and 17.64 %) and caryophyllene (11.91 and 7.97 %). In contact toxicity assay, *R. officinalis* is most effective against *A. craccivora* and *P. lilacinus* (LD_{50}=0.97 and 2.02 µL/insect) after 96 h of application than *O. sanctum* (LD_{50}=1.35 and 2.62 µL/insect). In *P. xylostella*, *O. sanctum* showed strong toxic effect after 96 h (LD_{50}= 3.92 µL/insect). All the combinations of *R. officinalis* (RO) and *O. sanctum* (OS) at 1:1, 3:1 and 1:3 ratio displayed more effective (LD_{50}=0.11-0.14 µL/insect) against *A. craccivora* after 96 h of treatment. Further, combination of RO+OS at 1:3 and 3:1 ratio also displayed high toxicity in contrast to *P. lilacinus* (LD_{50}=0.36-0.40 µL/insect) and *P. xylostella* (LD_{50}=1.36-1.49 µL/insect). EOs at higher dose showed higher repellent and enzyme inhibition activity in test insects. All combinations showed synergistic action against tested insects. EOs tested also showed inhibition of AChE, GST, CES1 and MFO enzyme in test insects.

Keywords: Chemical composition; essential oils; repellent; reproductive inhibition; synergistic

Rapid Virtual Oral Presentation

TVP-04

Comparative efficacy among the conventional pesticides and biopesticides against mustard aphid, *Lipaphis erysimi* (Kaltenbach)

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One of the major edible oilseed crops grown throughout the country is Indian mustard (Brassica juncea Linn.). Numerous insect pests including the mustard aphid (*Lipaphis erysimi*), mustard sawfly (*Athalia proxima*), painted bug (*Bagrada cruciferum*) and Bihar hairy caterpillar (*Spilosoma obliqua*), target the mustard crop at every stage of its life cycle. Among these pests, mustard aphid is the most destructive and causes huge yield loss. Insect pests have been managed using different strategies, where chemical control being one of the most common. However, there are many disadvantages to synthetic pesticides. That is why, the present investigation was conducted at Central Research field, SHUATS, Prayagraj, where seven treatments namely cypermethrin 25% EC (T_1), *Verticillium lecanii* (2 x 10^8 spores/ml) (T_2), Nisco sixer plus (T_3), Neem oil 0.03% EC (T_4), *Beauveria bassiana* 1.5% L (1 x 10^8 CFU/ml) (T_5), cypermethrin 25% EC + nisco sixer plus (T_6), profenofos 40%+ cypermethrin 25% EC (T_7) with control (T_0) were evaluated to check their efficacy against mustard aphid population. Among all the treatments, maximum population reduction per cent over control was recorded in profenofos 40%+ cypermethrin 25% EC (71.37%) and least was recorded in neem oil 0.03% EC (41.17%). The highest yield 19.69 q/h was noticed in profenofos 40%+ cypermethrin 25% EC. Microbial biopesticides *B. bassiana* and *V. lecanii* have given the yield of 12.84 q/ha and 12.23 q/ha respectively. The cost-benefit ratio for all the treatments were calculated. The best cost benefit ratio was obtained with profenofos 40%+ cypermethrin 25% EC and the least monetary return was obtained with control. Biopesticides like *B. bassiana, V. lecanii,* neem oil showed good results against mustard aphid without causing any hazards and can be a part of integrated pest management, an effective tool for sustainable future over chemical control.

Keywords: Biopesticides; *Beauveria bassiana;* efficacy; *Lipaphis erysimi*; mustard aphid.

Rapid Virtual Oral Presentation

TVP-05

Comparative efficacy of different recommended insecticides against brown plant hopper of paddy.

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The present investigation was conducted at the field of Anand Niketan College of Agriculture, Warora Dist. Chandrapur in Randomized Block Design with seven treatments and three replications. The insecticidal treatments *viz.,* were, carbosulfan 25% EC, acephate 75% SP, cartap hydrochloride 50% SP, fipronil 5% SC, thiamethoxam 25% WG, bifenthrin 10% EC, including control were used during *Kharif* 2021. Total three applications were imposed at an interval of 15 days. The application of Fipronil 5% SC proved effective in minimizing the stem borer (1.20% DH) and was on par with carbosulfan 25 EC, cartap hydrochloride 50 SP, Acephate 75 SP, bifenthrin 10 EC and thiamethoxam 25% WG recorded 1.27%, 1.33%, 1.39%, 1.47%, 1.53% yellow stem borer infestation respectively.

Keywords: Paddy; insecticide; yellow stem borer; efficacy; infestation

Rapid Virtual Oral Presentation

TVP-06

Comparative efficacy of insecticides with different mode of action against brown planthopper, *Nilaparvata lugens*

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Brown planthopper (BPH), *Nilaparvata lugens* (Stål) (Hemiptera: Delphacidae), is a destructive pest of rice found in almost all the rice-growing regions across India. Its destructive feeding habits and ability to transmit the virus causes severe damage and significant yield loss to the crop. Chemical control is a major method for managing the pest in field. Due to the erratic and indiscriminate application of the chemical insecticides over the years has led to the development of resistance in BPH to the different insecticides. In this study, we investigated the current susceptibility status of BPH population from New Delhi to different insecticides with a distinct mode of action. We employed the rice-stem dipping bioassay method (IRAC NO.005 method) to evaluate the efficacy of insecticides, coming under different mode of action groups *viz.,* imidacloprid and dinotefuran (neonicotinoid), pymetrozine (pyridine azomethine drivatives), triflumezopyrim (mesoionics), and flupyrimin (pyridylidenes) and against 3rd instar nymphs of BPH. The mortality data was recorded 96 hours after insecticide exposure, and LC50 values were determined using Polo software. Based on LC50 values, the susceptibility ranking was triflumezopyrim > flupyrimin > pymetrozine > dinotefuran > imidacloprid. Triflumezopyrim exhibited the highest susceptibility with the lowest LC_{50} value (0.381 ppm), whereas imidacloprid showed the lowest susceptibility with an LC_{50} value of 20.536 ppm. This study contributes to the effective management of the brown planthopper and offers valuable insights into insecticide resistance development and its management strategies.

Keywords: Insecticide resistance; bioassay; LC_{50}; integrated pest management; insecticides

Rapid Virtual Oral Presentation

TVP-07

Comparison of UAV-based insecticide application to conventional spraying for managing brown planthoppers in rice

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Brown planthopper (BPH), *Nilaparvata lugens* (Stål) is a major pest affecting rice productivity, necessitating efficient and precise insecticide application methods. This study evaluates the efficacy of unmanned aerial vehicle (UAV) based insecticide application compared to conventional knapsack spraying for brown planthopper management in rice. Field trials were conducted at ICAR-Indian Agricultural Research Institute (IARI), New Delhi, using Triflumezopyrim 10 SC and Pymetrozine 50 WG applied at two UAV flight heights (2.0 m and 2.5m) and with a knapsack sprayer. The experiment consisted of seven treatments, including a control, with three replications per treatment. The BPH populations were recorded 3, 7 and 14 days after spraying (DAS) from eight randomly selected plants from each replication. Data were transformed using the square root method to minimize variation. Results demonstrated that UAV-based spraying significantly reduced brown planthopper populations. Before spraying, no significant differences were observed among treatments. After 7 and 14 DAS the UAV flight heights (2.0 m and 2.5m) resulted in significantly greater population reduction compared to knapsack spraying. Statistical analysis confirmed that UAV applications, particularly at 2.0m, provided superior control efficacy compared to conventional spraying. However, the study found no significant difference between the selected flying heights, suggesting that 2.0m and 2.5m are optimal for drone spraying in rice fields. The UAV-based application demonstrated improved insect pest control efficiency and lower labour requirements, making it a promising alternative to conventional methods. Further optimization of drone flight parameters could enhance efficacy and economic feasibility.

Keywords: UAV spraying; brown planthopper; triflumezopyrim; pymetrozine; insecticide efficacy

Rapid Virtual Oral Presentation

TVP-08

Development of water dispersible powder (WDP) formulations for management of snails

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The research work was carried out at Department of Agricultural Entomology, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, (MS) India during 2023-2024. The study assessed the efficacy of five different WDP formulations against snails under laboratory conditions. The formulations tested included different products developed by using commercial grade five carriers such as barium sulphate (I), bentonite (II), fuller's earth (III), kaolin (IV) and talc (V) 84% each; 6% dispersing agent, naphthalene sulphonate condensate (NSC); 3% wetting agent, sodium lauryl sulphate (SLS); and an active ingredient, soapnut powder (7%) was tried for the WDP formulation. The study on efficacy of WDP test products by using the topical application method found that WDP Product III (Soapnut Powder + SLS + NSC + Fullers earth) was most effective with (88.33%) mortality and significantly superior to rest of other treatments. While the WDP Product V was least effective with 50.00% mortality and significantly inferior to the rest of the treatments. In case of other WDP formulations, it was concluded that the next best treatments were followed by WDP Product IV gave (85.00%) mortality, then WDP Product II had (83.33%) mortality and WDP Product I gave (81.66%) mortality. All these treatments gave relatively superior results but the formulation of WDP Product V gave an inferior result. In the leaf dipping method, the efficacy of WDP test products varies from one product to another. According to data, it was noted that WDP Product III with (65.00%) mortality gave the best results for controlling snails under laboratory conditions. The next best treatments were followed by WDP Product IV with (56.66%) mortality, WDP Product II with (53.33%) mortality, WDP Product I had (50.00%) and WDP Product V gave (48.33%) mortality of snails, respectively. The results indicated that the carrier choice plays a crucial role in enhancing the effectiveness of snail control. However, the topical application method is generally superior to the leaf dipping method. This superiority is due to the more targeted and direct body contact.

Keywords: Soapnut powder; snails; carriers; naphthalene sulphonate condensate; sodium lauryl sulphate

Rapid Virtual Oral Presentation

TVP-09

Differential resistance of *Plutella xylostella* and *Spodoptera litura* to flubendiamide and cyantraniliprole: Biochemical and molecular insights

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Insecticide resistance is a growing concern in managing the diamondback moth (*Plutella xylostella*) and the armyworm (*Spodoptera litura*), two major pests of cabbage and cauliflower. Among the commonly used insecticides, flubendiamide and cyantraniliprole have been widely applied to control these lepidopteran pests. However, intensive usage has led to varying degrees of resistance development in field populations. This study evaluated the resistance levels of seven *P. xylostella* and six *S. litura* field populations collected from major cabbage and cauliflower growing regions of Tamil Nadu, India. Bioassays conducted from 2021 to 2022 revealed high resistance in *P. xylostella*, with the Krishnagiri (KRI) and Nilgiris (NIL) populations exhibiting 121.38-fold and 2828.57-fold resistance to flubendiamide and cyantraniliprole, respectively, compared to a laboratory-maintained susceptible strain (SUS-I). In contrast, all *S. litura* field populations remained largely susceptible, with resistance ratios reaching only 3.34-fold (KRI) for flubendiamide and 1.89-fold (KRI) for cyantraniliprole when compared to a susceptible strain (SUS-III). Biochemical assays indicated that glutathione S-transferase (GST) activity significantly increased up to 24 hours after exposure in *P. xylostella*, suggesting its role in detoxification. However, no significant GST activity was detected in *S. litura*, implying a lack of metabolic resistance to diamides. Additionally, sequencing of the ryanodine receptor (RyR) gene identified a G4946E mutation in *P. xylostella*, a known marker of diamide resistance, whereas no such mutation was detected in *S. litura*. Synergist assays demonstrated that diethyl maleate (DEM) significantly enhanced the efficacy of both flubendiamide (4.23- to 5.41-fold) and cyantraniliprole (2.76- to 5.17-fold) in resistant *P. xylostella* populations, confirming GST involvement in resistance mechanisms. These findings highlight severe resistance in *P. xylostella* and potential susceptibility in *S. litura*, emphasizing the need for resistance management strategies, including synergists and insecticide rotation, to sustain the effectiveness of diamides.

Keywords: *Plutella xylostella*; *Spodoptera litura*; diamides; insecticide resistance; mutation

Rapid Virtual Oral Presentation

TVP-10

Disruptive influence of insecticides on neonate larvae of *Chrysoperla zastrowi* sillemi (Esben-Petersen)

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Chrysoperla zastrowi sillemi (Esben-Petersen) is an effective biological control agent for managing sucking insect pests and eggs and neonate larvae of lepidopterans. Due to the indiscriminate use of non-selective insecticides, the population of *C. zastrowi sillemi* in fields has drastically reduced (Ullah *et al* 2017). The present study investigated the lethal and sublethal effects of insecticides on the first larval instar of *C. zastrowi sillemi* during 2022 and 2023. Nine insecticides (afidopyropen 50 DC, dinotefuran 20 SG, pyriproxyfen 10 EC, spiromesifen 22.9 SC, tolfenpyrad 15 EC, spinetoram 11.7 SC, chlorantraniliprole 18.5 SC, profenophos 50 EC, and azadirachtin 0.15%) were selected for exposing the first larval instar by the dry film method at their recommended field doses along with untreated control. Pyriproxyfen (19.39%), chlorantraniliprole (23.09%) and spiromesifen (28.87%) were recorded as harmless, whereas profenophos (100.00%) and spinetoram (100.00%) were harmful to the first larval instar. Sublethal effects were observed in the subsequent stages of neonates, which survived the exposure to insecticides, including significantly prolonged larval and pupal durations, reduced larval survival, impaired larval mobility, and wing deformation with dinotefuran, azadirachtin, chlorantraniliprole, afidopyropen, spinetoram, and tolfenpyrad. Male-biased adult emergence and reduced longevity were observed with dinotefuran due to interrupted metamorphosis and the emergence of pharate adults. This evaluation highlights the varying toxicity of these insecticides, emphasizing their selective use to conserve *C. zastrowi sillemi* in integrated pest management programs.

Keywords: *Chrysoperla zastrowi sillemi*; insecticides; larval survival; pharate adults; sublethal effects

Rapid Virtual Oral Presentation

TVP-11

Effect of water pH on bio efficacy of different insecticides against major insect pests of *Bt* cotton

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Experiment was conducted during *kharif* 2021-22 Agricultural Research Farm, Department of Entomology, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani to study the effect of water pH on bio efficacy of insecticides against pests of cotton. The experiment was laid out in split plot design with three replications and twelve treatments. The treatment details of experiment, spraying insecticides with acidic, alkaline, and neutral water. The population of sucking pest and infestation due to bollworm complex (pink bollworm *Pectinophora gossypiella,* spotted bollworm *Earias vitella*) observed lowest in treatment with acidic water (5 pH) & highest population was recorded under alkaline water (9 pH). When treatment with insecticides, most superior insecticide treatment was fipronil 5%SC followed by treatments of profenophos 50% EC and lambda-cyhalthrin 5% EC also effective against sucking pest and bollworm complex infestation. In interaction effect highest population of sucking pest and damage due to bollworm complex, in treatment of azadirachtin 3000 ppm with alkaline water pH this treatment was least effective than other treatment.

Keywords: *Pectinophora gossypiella*; *Earias vitella*; profenophos; lambda-cyhalthrin; fipronil

Rapid Virtual Oral Presentation

TVP-12

Efficacy of biopesticides against major insect pests of chilli (*Capsicum annuum* l.) in Meghalaya.

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A field experiment was conducted during the *kharif* season of 2023-24 at the College of Post Graduate Studies in Agricultural Sciences, CAU (I), Umiam, Meghalaya, to evaluate the effectiveness of biopesticides against major insect pests of Chilli (*Capsicum annuum* L.). The experiment was laid out in a randomized block design with 5 treatments and 4 replications. The treatments included T_1 (Neem oil), T_2 (*Beauveria bassiana*), T_3 (*Verticillium lecanii),* T_4 (*Bacillus thuringiensis* var. *kurstaki*) and T_5 (thiamethoxam 25% WG). Among the biopesticides, T_3 (*V. lecanii*) was the most effective against whitefly (*Bemisia tabaci* Gennadius) achieving 52 % reduction in population over the control followed by T_1 (Neem oil, 48 %) and T_2 (*Beauveria bassiana*, 46 %). For the management of thrips (*Scirtothrips dorsalis* Hood), T_1 (Neem oil) showed the highest efficacy with 49 % reduction in population followed by T_3 (*V. lecanii*). Against aphids (*Aphis gossypii* Glover), T_2 (*B. bassiana*) was the most effective with 50 % reduction in population over the control. The maximum population reduction (55 %) of fruit borer (*Helicoverpa armigera* Hübner) was observed in T_4 (*B. thuringiensis* var. *kurstaki*) which also recorded the lowest percentage of damaged fruits (4.12 %), minimizing fruit damage in Chilli. In terms of yield and economic return, the highest marketable yield (65.50 q/ha) and B:C ratio (2.80:1) were recorded in T_5 (thiamethoxam 25% WG) followed by T_4 (*B. thuringiensis* var. *kurstaki*, 55.45 q/ha; B:C ratio: 2.30:1), T_1 (neem oil, 54.23 q/ha; B:C ratio: 2.26:1), T_3 (*V. lecanii*, 52.08 q/ha; B:C ratio: 2.20:1) and T_2 (*B. bassiana*, 49 q/ha; B:C ratio: 2.10:1). Although synthetic insecticides yielded the highest productivity and economic returns, biopesticides emerged as viable alternatives for pest management in chilli, offering effective control while reducing the environmental and health hazards associated with chemical insecticides.

Keywords: Chilli; biopesticides; yield; *Scirtothrips dorsalis*; reduction

Rapid Virtual Oral Presentation

TVP-13

Efficacy of potential insecticidal combination against fall armyworm in maize: An integrated *in silico*, *in vitro*, and field study

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A comprehensive study leveraging *in silico* analysis coupled with *in vitro*, pot, and field experiments was conducted to elucidate the potential insecticidal properties of emamectin benzoate and chlorantraniliprole against this pest. The results demonstrated that emamectin benzoate and chlorantraniliprole exhibited robust affinity to acetylcholine esterase, with binding energies of -37.6 and -35.7 KJ/mol, respectively. Notably, emamectin benzoate displayed the strongest binding affinity (ΔG -41 KJ/mol) to ryanodine receptors, while chlorantraniliprole demonstrated the most promising interaction (ΔG -27.2 KJ/mol) with GABA receptors. The *in vitro* insecticidal activity revealed that chlorantraniliprole and emamectin benzoate displayed potent bioactivity against the Fall armyworm, with LC_{50} values of 0.039 ppm and 0.027 ppm, respectively. Furthermore, the combined effect of both compounds at a ratio of 0.75-1:0.9-2.5 (%, w/w) displayed enhanced efficacy (LC_{50} 0.01 ppm). Further, the SBOD-23 formulation consisting of both insecticides at a concentration of 20 times LC_{50} (ppm) showed the least whorl damage in maize and highest plant weight without any phytotoxicity under phytotron studies. Field experiments conducted in Samrala, Hoshiarpur 1, and Hoshiarpur 2 demonstrated that the SBOD-23 formulation at a dose of 70 g/ha exhibited superior performance compared to the control and commercial product. Plants treated with SBOD-23 had significantly less leaf damage (Damage score 1.35-1.81 as compared to 4.94 in control) and infested cobs were only up to 5% whereas in control it was up to 38% and for commercial product it was up to 13%. In all the three locations, SBOD-23 treatment was superior in terms of the grain yield (6.66-6.67 t ha^{-1}) showcasing the efficacy of this combination in mitigating fall armyworm infestations.

Keywords: *Spodoptera frugiperda*; molecular docking; acetylcholinesterase; ryanodine receptors; GABA

Rapid Virtual Oral Presentation

TVP-14

Emulsification and phytotoxicity of edible and non-edible oils on selected crops

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Oils play an important role in controlling the incidence of sucking pest complex in various agriculture crops and are ecofriendly, safe and sustainable alternatives for the management of pests. Emulsification studies were conducted to study the stability of edible and non-edible oils with different available emulsifiers as per BIS standards. Further emulsified edible and non-edible oils were studied for phytotoxicity in sunflower, cotton, groundnut and chilli crop and efficacy against sucking pests (whitefly and leafhopper) in sunflower. Stability tests comprising of emulsion stability test, heat and cold test were conducted. A total of seven oils and eleven emulsifiers. Sesame, coconut, sunflower, neem, pongamia, fish and palm oil emulsified with 9.5 Mole, DMA-NE, IG 2900, Triton-X, Sodium Lauryl Sulphate, SpreadEx 539, Tea saponin, Tween 20, Tween 80, Zacharia and Teepol were tested for their stability. Among the emulsifiers Zacharia emulsified both edible and non-edible oils at 10 and 15% concentration. Stability increased with increase in the concentration of the emulsifier due its miscible nature of emulsifier with the oils. The stable emulsified edible and non-edible oils with Zacharia were tested for phytotoxicity at 0.1, 0.3, 0.5, 1, 3 and 5% on sunflower, cotton, groundnut and chilli. No phytotoxicity symptoms were observed on sunflower, cotton and groundnut. In chilli, pongamia oil at 5 per cent concentration was found to be phytotoxic to the plants with yellowing, leaf dropping, leaf curling and scorching symptoms. Pongamia oil below 5% was safe without any phytotoxicity symptoms. Phytotoxicity of pongamia oil may be due to higher contents of monoterpene alcohols, aldehydes and phenylpropanoids. Further evaluated for its efficacy against sucking pests (whitefly and leafhopper) in sunflower where emulsified neem oil at 30 ml/litre was found to be the best for their efficacy in reducing the sucking pest population in sunflower (leafhoppers and whiteflies).

Keywords: Emulsification; BIS standards; stability; phytotoxic; sucking pests

Rapid Virtual Oral Presentation

TVP-15

Essential oil of *Allium sativum* and two of its major compounds as potent larvicide for the management of *Culex quinquefasciatus*

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The global and highly adapted smart vector *Culex quinquefasciatus* also known as Southern house mosquito is known to spread diseases like Japanese encephalitis and filariasis. Although numerous insecticides have already been tested globally, this species have been seen to develop resistance against them. Moreover, insecticides can be toxic to non-target organisms and have detrimental effects on humans and the environment when used excessively. Searching for a newer eco-friendly product, we focused on plant essential oils (EOs) extracted from bulbs of *Allium sativum* (AsB) and two of its major compounds based on its GC-MS profile. We determined promising larvicidal effects of the AsB oil and its compounds diallyldisulfide (DADS) and diallyltrisulfide (DATS) showing sublethal concentration (LC_{50} values) of 3.84ppm, 11.14ppm, 11.73ppm respectively. All bioassays were performed following WHO protocol. Notably DATS showed the lowest LT_{50} of 12.20 hours. While targeted to study the morphological changes, the exposed larvae showed morphological aberrations like curved body, blackish alimentary canal, melanized spots at thoracic region etc., under a Stereo-zoom microscope. In silico analysis for the aforementioned compounds against three Cytochrome (CYP) proteins showed that both the compounds bind with the selected CYP proteins among which DATS showed higher binding energy of -4.68 against Cytochrome P405 CYP9J34 protein. From the findings, we infer that the EO of *Allium sativum* and two of its major compounds have potential to be incorporated for development of ecofriendly product formulation for the management of *C. quinquefasciatus* at their larval habitat.

Keywords: *Culex quinquefasciatus*; *Allium sativum*; diallyldisulfide; diallyltrisulfide; CYP protein

Rapid Virtual Oral Presentation

TVP-16

Field bio-efficacy of new molecules against sucking insect pests of brinjal

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A field investigation was conducted during the *Kharif* season of 2023-24 at the Department of Entomology, Baba Raghav Das Post Graduate College, Deoria, Uttar Pradesh, India. The experiment was conducted in a Randomized Block Design (RBD) with six treatments replicated thrice and a control plot to check the field bioefficacy of novel insecticides against brinjal insect pests. The treatments of different insecticides *viz.,* fipronil 5 SC, spinosad 45 SC, emamectin benzoate 5 SG, flubendiamide 39.35 SC, and neem oil 5 % revealed that all the treatments were found significantly effective in reducing the population of whiteflies (*Bemisia tabaci* Gennadius), and jassids (*Amrasca biguttula biguttula* Ishida). The most effective treatment in reducing the population of whitefly and jassid was emamectin benzoate 5 SG @ 0.5gm/l, followed by fipronil 5 SC @ 1.5 ml/l. The neem oil 5% @ 5 ml/l was found to be the least effective treatment, but it was significantly superior over the untreated control.

Keywords: Brinjal; bio-efficacy; insecticides; whitefly; Pest management

Rapid Virtual Oral Presentation

TVP-17

Insecticidal potential of green algae *Caulerpa peltata J.V. Lamouroux* extract against *Spodoptera litura* fab.

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The tobacco cutworm, *Spodoptera litura* Fabricius, is a significant pest impacting approximately 120 plant species in agricultural and horticultural ecosystems across tropical and subtropical regions of Asia. Current management strategies primarily rely on organic insecticides, which often pose economic and health risks. To ensure a safer environment, seaweeds, abundant and untapped resources in marine ecosystems, offer promising potential. Rich in bioactive compounds, seaweeds exhibit activity against a wide range of organisms including fungi, bacteria, nematodes, mites, and insects. This study explored the insecticidal and insect growth regulatory (IGR) properties of the green algal seaweed *Caulerpa peltata* J.V. Lamouroux, collected from the Rameswaram coast, Tamil Nadu, India against different life stages of *S. litura* under laboratory conditions. Aqueous extracts of *C. peltata* were tested at concentrations of 2%, 4%, 6%, 8%, 10%, and 12% using a leaf dip bioassay against third-instar larvae. Neem leaf extract (3%) served as the standard check in a free-choice test with three replications in a completely randomized design. Larval mortality reached 40% with the 12% extract after 120 hours, outperforming the standard check (13.33%). No pupal mortality was observed, though malformations in pupa and adults were recorded at 6.67% for the 8%, 10%, and 12% extracts. The pupal-to-adult conversion ratio declined significantly to 1:0.77 with the 12% extract compared to 1:1 in the standard check and control. These findings suggest that *C. peltata* extracts hold promise as eco-friendly alternatives to synthetic pesticides for sustainable management of *S. litura*.

Keywords: Seaweed; *Caulerpa peltate; Spodoptera litura;* Larvicidal; Insect growth regulator

Rapid Virtual Oral Presentation

TVP-18

Larvicidal activity of *Acalypha fruticose* extract against *Culex quinquefasciatus* Larvae

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The recent surge in mosquito-borne diseases underscores the critical importance of mosquito vector control. Among various strategies to curb vector populations and disease transmission, plant-based extracts and oils emerge as promising alternatives to synthetic insecticides. This study investigates the larvicidal efficacy of *Acalypha fruticosa* leaf extracts, utilizing both aqueous and chloroform solvents. Results revealed that chloroform extracts exhibited superior larvicidal activity against fourth-instar larvae compared to aqueous extracts. The optimum concentration for maximum efficacy was determined to be 40 mg/ml, with the extracts demonstrating remarkable stability at a temperature of 160°C and a pH of 7. Probit analysis indicated an LD50 value of 7.479 mg/ml. Furthermore, GC-MS analysis identified Phytol, an acyclic diterpene alcohol and a key component of chlorophyll, as the major bioactive compound in the plant extract. These findings suggest that *A. fruticosa* leaf extracts offer a potent, eco-friendly, and cost-effective solution for mosquito larval control, making them a viable alternative for sustainable vector management.

Keywords: *Culex quinquefasciatus, Acalypha fruticosa*, Euphorbiaceae, Plant extracts, Insecticide

TVP-19

Validation of QuEChERS Method Coupled with LC-MS/MS for Determination of Tolfenpyrad in Chilli, Onion and Soil

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Chilli (*Capsicum annum* L.) popularly known as 'Mirch' in Hindi, is an important cash crop belonging to the Solanaceae family. Onion (*Allium cepa* L.), a member of the Alliaceae family, is referred to as the "Queen of Kitchen" because of its versatility as a food and medicine, as well as its abundance of flavonoids (like quercetin) and sulphur compounds that are thought to be good for human health. These two crops subjected to losses in production mainly because of pests, of which thrips is the most serious. Recently, toflenpyrad has been found to be effective against thrips which belong to pyrazole carboxamide class insecticide. The research aimed to validate the Quick, Easy, Cheap, Effective, Rugged and Safe (QuEChERS) method for the quantification of tolfenpyrad in chilli, onion and soil using liquid chromatography–tandem mass spectrometry (LC-MS/MS). The QuEChERS method allows sample extraction by acetonitrile followed by cleanup with a primary secondary amine sorbent, and magnesium sulphate. The method was validated in terms of selectivity, linearity, limit of quantification (LOQ), limit of detection (LOD), matrix match, accuracy, and precision (repeatability and reproducibility). The estimation of residues was done by LC-MS/MS. The LOQ and LOD for tolfenpyrad were calculated as 0.01 and 0.003 mg/kg, respectively. The recovery of tolfenpyrad in chilli, onion and soil was above 80 per cent. The matrix effect values were in the acceptable range of –20 to +20%. The repeatability and reproducibility values were within the acceptable range. This method allows a simple and fast extraction of tolfenpyrad in chilli, onion and soil.

Keywords: Tolfenpyrad; Chilli; Onion; Soil; QuEChERS;

Rapid Virtual Oral Presentation

TVP-20

Pesticide residue analysis in pollen and nectar of selected crops through LC-MS/MS and GC-MS/MS

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Pesticides are the important component in modern agriculture. Due to the excessive application of these pesticides to control the insect pests by the farmers results in accumulation of these on the applied area and also inside the plant system due to their systemic action, resulting in accumulation of these pesticides mainly in floral parts posing a threat to pollinators present in the respective cropping system. Hence the present study was undertaken to estimate the pesticide residue in pollen and nectar of crops *viz.,* mustard, sunflower, and coffee during 2023-2024. The pollen samples were collected by placing the pollen traps near the entrance of the bee hives kept in crop fields during peak flowering period. The nectar samples were collected from the flowers by using micropipette in case of sunflower and coffee crops. However, in mustard crop the nectaries tissue was extracted manually from the flowers by using microscissor. Collected pollen and nectar samples were analysed for pesticide residue using LC-MS/MS and GC-MS/MS. Results revealed that the pollen of mustard crop was contaminated with pesticides chlorpyrifos, 4-Bromo-2-Chlorophenol (primary metabolite of profenofos), thiamethoxam with their residual concentration being 0.01-0.05 mg/kg, 0.01-0.02mg/kg, 0.01-0.03 mg/kg respectively. The nectar samples were contaminated with pesticides 4-Bromo-2-Chlorophenol, ethofenoprox at the levels ranging from 0.02-0.03 mg/kg, 0.01-0.02 mg/kg respectively. Pollen sample collected from sunflower crop was contaminated with pesticide bifenthrin at 0.03 mg/kg, while the nectar samples were free from contamination. Both pollen and nectar samples collected from coffee crop were free from contamination. The presence of pesticides in pollen and nectar mainly affects learning ability and also causes sub lethal effects impacting the normal flight and immune system of the pollinators such as honey bees, wasps, flies and since these insects mainly feed on the pollen and nectar, the effect of the pesticide residue on the biology of pollinators also needs to be assessed.

Keywords: Pollinators; Pesticide Residue; Honey bees; LC-MS/MS; GC-MS/MS;

Rapid Virtual Oral Presentation

TVP-21

Sub-lethal and trans-generational effects of spinetoram on biological traits and life table parameters with special emphasis on detoxification enzymes and nutritional indices of *Spodoptera frugiperda*

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Spodoptera frugiperda is the invasive pest of maize and spinetoram is the novel insecticide used mainly against lepidopteran pests so this investigation helps to comprehend the sub-lethal and trans-generational effects of spinetoram (Delegate® 11.7%SC) at LC $_{10}$ and LC $_{25}$ against *S. frugiperda*; the experiment was conducted during 2022–24 at ICAR-Indian Agricultural Research Institute, New Delhi. The leaf dip bioassay findings indicated that spinetoram exhibited notable toxicity with the LC_{50} of 0.157 ppm. Exposure of sub-lethal doses of spinetoram on parental generation (F_0) revealed that there are transgenerational deleterious effects on biology and lifetable parameters of *S. frugiperda* where the adverse effects were significantly hampering in the F_0 and F_1whereas the F_2 generation was found to be free of it. LC $_{10}$ and LC $_{25}$ of spinetoram significantly decreased biological parameters such as pupation rate, adult emergence, fecundity, adult longevity, larval and pupal weight and concurrently increased deformed adults and the duration of the larval and pupal stages. The Lifetable parameters such as net reproductive rate (R_0), intrinsic rate of increase (r), finite rate of increase (λ) were decreased significantly in F_0 and F_1 generations. Moreover, these sub-lethal doses of spinetoram had significant decreased nutritional indices and considerably increased detoxification enzymatic activities like C-P450 and GST. It is inferred that, spinetoram exerted deleterious sub-lethal and trans-generational effects on the *S. frugiperda* population by reducing its survival, development and reproduction.

Keywords: C- P450; GST; Leaf-dip bioassay;

Rapid Virtual Oral Presentation

TVP-22

Toxicity Evaluation of Novel Insecticides on *Chrysoperla zastrowi sillemi* (Esben-Peterson) Under Laboratory, Extended laboratory and Semi-field Conditions

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Green lace wing, *Chrysoperla zastrowi sillemi* (Esben-Peterson) (Neuroptera-Chrysopidae) is one of the most reliable biological control agents used against the soft bodied insects. To control these insect pests, use of excessive non-selective insecticides has resulted in various toxic effects towards the useful predatory agent. Toxicity evaluation of novel insecticides was tested on different stages, under laboratory, extended laboratory (Sandwich method) and semi-field conditions to find out the relatively safer and low persistent treatments. Under, laboratory conditions toxicity evaluation on eggs presented a range of egg hatchability between 6.67 (Profenofos) to 80% (Diafenthiuron) indicating the most toxic as well as the safest insecticide.Toxicity evaluation against larval stages by residual film method showed a mortality range varying from 33.33%-100% in 1st instar larvae, 13.33%-100% in 2nd and 3rd instar larvae. In all the larval stages chlorantraniliprole and afidopyropen found to be safer while profenofos found to be the highly toxic one. During toxicity evaluation towards larvae in diet contamination afidopyropen (6.67%) and diafenthiuron (20%) had lower mortality while profenofos (100%) followed by clothianidin and chlorantraniliprole recorded the highest mortality. The toxicity test on the pupal stage of the *C. zastrowi sillemi* through direct spray method showed diafenthiuron recording the highest adult emergence (93.33%) followed by spinetoram and profenofos followed by chlorantraniliprole witnessing low emergence. Toxicity evaluation on the adult stage through diet contamination showed least mortality (13.33%) in afidopyropen followed by diafenthiuron (33.33%). >50% mortality of the adult was recorded in clothianidin, chlorantraniliprole, spinetoram and flupyradifurone. Persistent toxicity evaluation under extended laboratory conditions depicted low mortality, with afidopyropen indicating its lower persistency. On the contrary profenofos registered 100% mortality proving to be highly persistent. Under semi-field conditions afidopyropen and diafenthiuron had minimum toxic effect indicating their less persistency whereas profenofos produced cent percent mortality which found to be highly persistent.

Keywords: *Chrysoperla zastrowi sillemi;* novel insecticides; sandwich method; persistent toxicity; mortality;

Rapid Virtual Oral Presentation

TVP-23

Volatile oils for management of stored grain insects: In-silico and in-vitro assessment against *Tribolium castaneum* and *Corcyra cephalonica*

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In the present study volatile oils (VOs) of *Myrtus communis* (McEO), *Citrus sinensis* (CsEO), *Melaleuca alternifolia* (MaEO), *Eucalyptus globulus* (EgEO), *Allium sativum* (GEO), and *Brassica juncea* (MEO) (four varieties of *B. junceai,* individually) were tested against stored grain insects namely, *Tribolium castaneum* and *Corcyra cephalonica*. The fumigant toxicity of VOs varied in the order of GEO > MEO> CsEO> McEO> EgEO> MaEO. The adults of *T. castaneum* and larvae of *C. cephalonica* displayed high susceptibility towards GEO and PJ-MEO, respectively. Gas-Chromatography-Mass-Spectrometry (GC-MS) analysis of the most effective GEO revealed occurrence of diallyl disulfide (62.02±2.48%) and allyl monosulfide (36.84±2.64%). On the other hand, VOs of MEO indicated presence of 2-pentenenitrile (78.23±2.69% to 92.99±2.10%) in varying content in PM 28 (PM28-MEO), PM 30 (PM30-MEO), Pusa Karishma (PK-MEO), Pusa Jagannath (PJ-MEO). Fumigant action of GEO exhibited significant mortality against adults of *T. castaneum* (LC_{50} 1.05 µL/L air, 24 h exposure) followed by MEO (LC_{50} 4.90-20.27 µL/L air, 24 h), CsEO (LC_{50} 11.92 µL/L air, 24 h), and McEO (LC_{50} 28.10 µL/L air, 24 h). In the case of *C. cephalonica* larvae, MEO (LC_{50} 9.52-21.55 µL/L air, 24 h) showed the highest response, followed by McEO (LC_{50} 33.76 µL/L air, 72 h), CsEO (LC_{50} 41.47 µL/L air, 72 h) and GEO (LC_{50} 29.16 µL/L air, 72 h). The molecular modelling and docking studies depicted the favourable binding affinity of allyl isothiocyanate (AITC) with arylalkylamine N-acyltransferase of *T. castaneum*, and 2-pentenenitrile with juvenile hormone (JH) esterase of *C. cephalonica*, thus explaining remarkable fumigation action of VOs of MEO, allyl isothiocyanate, and 2-pentenenitrile.The interactions of allyl monosulfide of GEO with JH esterase from *C. cephalonica* and *l*-limonene of CsEO with the arylalkylamine N-acyltransferase from *T. castaneum* are found responsible for inhibiting the target proteins.

Keywords: GC-MS; Molecular docking; Fumigation; Volatile oils; Stored grain insects;

Rapid Virtual Oral Presentation

Theme V
Insect Physiology, Insect Vectors and Molecular Advances in Entomology

ENTOMOLOGY STUDENTS CONCLAVE
ESC 2025
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PMO-01

An insight into the dysbiosis induced through antibiotic treatment and its effect on biology of tobacco cutworm, *Spodoptera litura* Fab. (Lepidoptera: Noctuidae)

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Microbial residents are prevalent in the insect gut and any perturbations in the composition of gut microbiota would have far-reaching effects on its biology. Antibiotics are frequently used to induce dysbiosis in insect gut. Herein, an experiment was conducted in the Department of Agricultural Entomology, University of Agricultural Sciences, GKVK, Bengaluru during the year 2022-2023, on effect of different doses of antibiotic, streptomycin sulphate on biology of tobacco cutworm, *Spodoptera litura*, which is a key pest on castor, chilli, amaranthus, tomato *etc.* causing a significant loss in the fruit and vegetable yield. Six gradient doses of antibiotic *viz.* T1 (0.5g), T2 (1.0g), T3 (1.5g), T4 (2.0g), T5 (2.5g) and Control (0.00g) were considered for the study. Antibiotic treatments were imposed by feeding the larvae with the artificial diet supplemented with antibiotic. The experiment revealed that, increase in the dose of streptomycin sulphate negatively affected both survival and developmental parameters of *S. litura*. Though, complete feeding cessation was showed by larvae but prolonged pupal developmental duration for 1-2 days and shortened adult longevity for 2-3 days was observed to be significant between the treatments particularly at the higher doses (2.50 g). A significant drop in the larval (up to 0.08 g) and pupal weight (up to 0.07g) was also exhibited in the higher doses (2.50 g) of streptomycin sulphate. Antibiotic treatment not only affected the growth and development of the insect, but also the survivability and reproduction of the host. Antibiotic treatment has shown a significant negative effect on the survival rate of all the developmental stages. In the higher antibiotic dose, the survival rates of larva up to 5th instar, pupa and adult stage was reduced to 83.33, 73.33 and 58.33% respectively. Furthermore, both the fecundity and egg hatchability were drastically reduced in the *S. litura* after feeding the artificial diet supplemented with higher doses of streptomycin sulphate.

Keywords: *Spodoptera litura;* antibiotics; streptomycin sulphate; biological parameters; per cent survivability

Oral Presentation

PMO-02

Combined insights from RNA-seq and metabolic profiling to study deltamethrin tolerance between the susceptible and resistant population of tea looper, *Hyposidra talaca* Walker (Lepidoptera: Geometridae)

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Hyposidra talaca is a major pest in the tea ecosystem that has developed tolerance to various insecticides, including deltamethrin, a commonly used synthetic pyrethroid. This study aims to explore the mechanisms contributing to deltamethrin tolerance in *H. talaca* by integrating relative toxicity, biochemical assays, metabolomic profiling, and transcriptomic analysis. Relative toxicity assays confirmed the significant difference in deltamethrin tolerance between the susceptible and tolerant populations with resistance coefficient (RC) values of 25.27 and 4.04, respectively. Biochemical assays were conducted to determine the activity of key detoxifying enzymes, which include glutathione-S-transferase (GST), general esterases (GE), and cytochrome P_{450} monooxygenases (CYP). The tolerant population exhibits the highest GE, GST, and CYP activity in comparison to the susceptible population with increase of 1.22, 2.23 and 2.30-fold respectively. Metabolomic profiling was done using liquid chromatography-mass spectrometry (LC-MS) to identify metabolic changes associated with deltamethrin tolerance. RNA sequencing was performed using the Illumina NovaSeq 6000 platform with a paired-end library type to identify differentially expressed genes between susceptible and tolerant populations. Metabolomic analysis revealed several altered metabolic pathways, including selenocompound metabolism, purine metabolism, porphyrin metabolism, sphingolipid metabolism, folate biosynthesis, and tryptophan and tyrosine metabolism, with log2 fold changes of 1.21, 0.75, 0.78, 0.68, 0.65, and 0.63, respectively. Transcriptomic analysis revealed 8,502 upregulated and 1,688 downregulated genes, including key detoxification-related genes such as glutathione S-transferase 1-1-like, putative antennal esterase CXE21, and cytochrome P450 genes associated with deltamethrin metabolism. GSTs, CYP, and esterase genes displayed significant upregulation, with log2 fold changes reaching up to 8.37, 14.17, and 13.40, respectively, highlighting their roles in detoxifying xenobiotics and hydrolysing ester bonds. These findings highlight that elevated CYP activity and gene upregulation enhance detoxification by oxidising xenobiotics, making toxins more hydrophilic for elimination, which helps the tolerant population more than the susceptible ones.

Keywords: *Hyposidra talaca*; deltamethrin; tolerance; transcriptomics; metabolomics.

Oral Presentation

PMO-03

Culturable bacteria associated with different developmental stages of *Spodoptera frugiperda* (J. E. Smith)

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The fall armyworm, *Spodoptera frugiperda* (J. E. Smith) (Lepidoptera: Noctuidae), is a major invasive pest that seriously threatens world agricultural production and food security. *S. frugiperda* is highly migratory, exhibits high fecundity, feeds voraciously, has a broad range of host plants, and does not undergo diapause. These characteristics make the fall armyworm a major destructive crop insect pest. It causes severe economic damage particularly to the maize crop, which significantly decreases the quality and quantity of the crop's yield. The microbiota of fall armyworm could play important roles in its growth, development and environmental adaptation to its host plants or animals. However, the diversity and dynamics of gut microbes with different developmental stages in *S. frugiperda* is not much explored. Hence, the study aimed to investigate the changes in bacterial diversity during metamorphosis of insect using culturable techniques. Based on 16S rRNA sequencing, ten culturable bacteria were identified from different development stages of *S. frugiperda*. Firmicutes were found to be the most abundant followed by Proteobacteria. The eggs supported few bacterial flora consisting of *Staphylococcus* and *Bacillus*. The gut bacteria isolated from the late larval stage of *S. frugiperda* include Firmicutes such as *Enterococcus* and *Bacillus*, as well as Proteobacteria like *Serratia*. The bacterial diversity decreased in pupal stage. Further, the adult stage supported only one bacterium which belongs to the genus *Bacillus*. The genus *Bacillus* was vertically transmitted from the egg stage to the larval stage, persisting through metamorphosis. The results indicate that developmental stages can alter the gut bacteria of *S. frugiperda* and suggest a vertical transmission route of bacteria in *S. frugiperda*. A thorough understanding of the culturable bacterial flora of *S. frugiperda* can aid in developing innovative pest control strategies to effectively manage this pest.

Keywords: fall armyworm; gut microbiome; developmental stage; 16SrRNA; bacterial diversity

Oral Presentation

PMO-04

Development of species-specific marker for the identification of solanum whitefly (*Aleurotrachelus trachoides*)

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India has witnessed the invasion and establishment of several exotic whitefly species (Hemiptera: Aleyrodidae) since 1995, posing significant threats to agriculture, horticulture, and forestry. Among the 471 whitefly species across 72 genera reported in the country, nine are classified as invasive, causing substantial direct and indirect yield losses in various crop plants. Notably, the Solanum whitefly, *Aleurotrachelus (=Aleurothrixus) trachoides* Back, 2015, serves as a vector for plant viruses, including begomoviruses, further intensifying its impact. Rapid and accurate identification of *A. trachoides* is crucial for implementing timely measures to prevent cross-border introductions. Whitefly puparium and adult have several taxonomic characters for morphological identification but often show high intra-specific variability, phenotypic plasticity and vary with host plants and environment. Hence molecular confirmation is required for accurate identification of different species of whiteflies. To address this, an *in-silico* analysis was conducted to design species-specific molecular markers for *A. trachoides*. Polymerase chain reaction (PCR) primers targeting a 150 bp region of the mitochondrial cytochrome oxidase I (*mtCOI*) gene were developed. These primers were subsequently evaluated for their specificity, sensitivity, and validation, confirming their effectiveness for precise and reliable detection of this invasive whitefly species. However, the reliance on complex and costly thermal cyclers for PCR amplification limits its field applicability. To overcome this limitation, alternative diagnostic techniques such as Loop-Mediated Isothermal Amplification (LAMP) and Recombinase Polymerase Amplification (RPA) can be developed. These methods offer simple, rapid, sensitive, and accurate detection and can be adapted into diagnostic kits for the early and reliable identification of invasive whiteflies in the field.

Keywords: invasive whiteflies; solanum whitefly; species specific primers; PCR; validation

Oral Presentation

PMO-05

Genome wide analysis of transient recceptor potential channels in whitefly *Bemisia tabaci* Asia II-1

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Transient Receptor Potential (TRP) channels are pivotal in sensory perception, behaviour, and physiological adaptation in insects, offering promising avenues for targeted pest management strategies. This study represents the first genome-wide analysis of TRP channels in the whitefly, *Bemisia tabaci* Asia II-1, a significant agricultural pest. Extensive screening of GenBank databases like, NCBI, EMBL, and DDBJ identified 22 TRP channel sequences related to *B. tabaci* and other Hemipteran insects, including *Nilaparvata lugens*, *Acyrthosiphon pisum*, and *Aphis craccivora*. Using long PCR, touchdown PCR, and gradient PCR techniques, 11 TRP channels were successfully amplified. The TRP channels characterized in this study include TRPA1, TRPA5, PAINLESS, PYREXIA, TRP, TRP-Gamma, TRPM, TRPN, TRPML, *Nanchung* and *Inactive*. The fragment sizes ranged from 2200 bp (e.g., TRPML) to 5800 bp (e.g., TRPN and TRPM). Gene prediction was carried out using the ANGUSTUS tool, which enabled precise annotation of TRP channel genes in *B. tabaci*. Phylogenetic analysis using MEGA and RAxML revealed significant evolutionary lineage of TRP channels across insect groups, including *Bactrocera dorsalis*, *Apis mellifera*, *Aedes aegypti*, *Drosophila melanogaster*, *Musca domestica*, and *Tribolium castaneum* and biotype specific variation/conservation within *B. tabaci* genetic groups. Motif analysis using Genome.jp identified conserved motifs critical to TRP channel functionality. Structural and functional analysis of TRP proteins using Pfam, HMMER, and PHYRE2, provided insights into domain architectures and three-dimensional view of these proteins. Further, functional characterization through expression analysis of TRP channel genes through qRT-PCR coupled with bioassays and other molecular assays would elucidate the role of TRP channels on the behavioural physiology of *B. tabaci* and its adaptation to thermal and xenobiotic stresses. Moreover, the TRPV channels like, *Nanchung* and *Inactive* and TRPA channels like, *painless* and *pyrexia* act as active sites for insecticide binding, which, can be explored through *in-silico* docking techniques and field assays for developing novel insecticide molecules.

Keywords: transient receptor potential (TRP) channels; whitefly *Bemisia tabaci* Asia II-1; gene ontology; phylogeny; protein analyses

Oral Presentation

PMO-06

Genome-wide identification and characterisation of ionotropic receptors in whitefly, *Bemisia tabaci*

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Insect chemosensation constitutes a complex and multifaceted mechanism involving a diverse array of receptor proteins and sensory pathways. Among these, Ionotropic Receptors (IRs), a recently classified group of chemosensory genes, are part of the broader family of Ionotropic Glutamate Receptors (iGluRs). IRs are further subdivided into IR co-receptors, which facilitate ligand binding, and stimuli-specific tuning receptors, which mediate a range of stimuli, including olfaction, gustation, and other non-chemosensory external signals. The present study, aimed to characterise ionotropic receptors in the notorious sucking pest whitefly, *Bemisia tabaci*. We conducted an exhaustive genome-wide search for candidate IRs from various public domain databases using the homologous sequences from different model organisms through use of robust bioinformatic tools. Four Inotropic receptor genes namely, IR8a, IR25a, IR76b and IR93a functioning as co-receptors were shortlisted based on conserved protein domains and sequence similarities. Gene-specific primers were designed to deduce the complete coding sequences. The genome architecture of these Ionotropic co-receptors was characterised by analysing their functional domains, motif patterns, signal peptide sequences and chromosomal localization. The phylogenetic analysis unravelled their evolutionary lineage among the insect orders. Further, the predictive protein analysis identified the presence of characteristic Co-receptor Extra Loop in their amino acid sequences. The comparative evolutionary analysis of non-synonymous and synonymous substitutions highlighted convergence/divergence of IR genes among the members of Class Insecta. This is the first report of genome wide analysis and characterization of ionotropic receptors in whitefly *B. tabaci* and the outcome of this study has implications for their use in pest management.

Keywords: ionotropic receptors; co-receptor; whiteflies; PCR amplification; gene specific primers

Oral Presentation

PMO-07

Molecular marker-based detection of cry toxin resistance in indian population of pink bollworm, *Pectinophora gossypiella* (Saunders)

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Following the introduction of *Bt* cotton, its cultivation area in India surged from 0.29 lakh hectares in 2002-03 to 33.53 lakh hectares by 2006-07. By 2015, over 95% of Bt cotton comprised BG II hybrids, containing stacked Cry1Ac and Cry2Ab genes. This widespread adoption exerted significant selection pressure on bollworms, leading to the development of field-scale resistance in pink bollworm (PBW) populations across India. Traditional bioassays for PBW resistance are time-consuming, requiring approximately 21 days. To expedite the assessment of PBW resistance to Cry toxins, Bulk Segregation Analysis (BSA) has been implemented. During the 2022-23 season, pink bollworm larvae were collected from 59 cotton fields across India for Cry toxin bioassays. Strains from Nagpur exhibited the highest resistance to both Cry1Ac (LC_{50}: 7.682 µg/ml, RR: 960) and Cry2Ab (LC_{50}: 12.574 µg/ml, RR: 2096). A single-pair cross was established between the Nagpur strain and a susceptible PBW strain (30 individuals per strain). The F_1 generation was sib-mated to produce F_2 individuals, which were then exposed to a Cry toxin discriminating dose (10µg/ml) and classified as resistant or susceptible based on mortality and body weight. Genomic DNA from the parents and pooled F_2 individuals (extreme resistant and susceptible) was extracted for a parental polymorphism study. Further, BSA revealed that out of six polymorphic SSR markers (among 50 SSR markers), three (not*r15*F and *r15*allR2; 164*Pg*cad5 F and 163*Pg*cad3 R; gF47 and gR47) were polymorphic between Cry1Ac resistant parents and bulks. Similarly, out of two polymorphic SSR markers (among 50 SSR markers), one (gF47 and gR47) was polymorphic between Cry2Ab resistant parents and bulks. These markers were validated across 15 locations spanning Southern, Central, and Northern cotton-growing zones in India during the 2023-24 season. All three SSR markers associated with Cry1Ac and one marker associated with Cry2Ab were validated, indicating widespread PBW resistance to Cry toxins. These locations exhibited historical PBW resistance to Cry toxins, confirmed by both molecular marker analysis and conventional bioassays. Notably, this method can utilize any stage of PBW (live or dead) or even adults collected from pheromone traps, making it a rapid and reliable tool for assessing resistance qualitatively.

Keywords: pink bollworm; cry toxin, resistance; makers; bulk segregation analysis

PMO-08

Quick detection of economically important oriental fruit fly, *Bactrocera dorsalis* (hendel) using species-specific primers in a real-time PCR assay

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The global invasion of fruit flies (family: Tephritidae) has drawn significant attention in the fields of plant quarantine and invasion biology due to their considerable economic impact. The most notorious amongst them is the oriental fruit fly (*Bactrocera dorsalis*), which has created significant bottlenecks in the production and trade of horticultural crops globally. The identification of these pests remains a significant challenge due to densely overlapping adult morphological characters among different species and the indistinguishable immature stages. This challenge is addressed through 'DNA barcoding', which provides more accurate and detailed identification but requires large amounts of input, high-quality equipment, and specialized skills, along with a high likelihood of errors. To address these limitations, the present study developed and validated mitochondrial cytochrome c oxidase-1 gene-based species-specific primers (SSP) to reliably identify and differentiate B. dorsalis from other economically important fruit fly species. The SSP successfully amplified a 506 bp amplicon specific to all the developmental stages of B. dorsalis at a PCR annealing temperature of 66°C, as identified through gradient PCR. Further validation revealed that the primer consistently produced positive results for *B. dorsalis* populations collected from eight Indian states, with no cross-amplification observed across six different fruit fly species of major economic importance. The SSP was found to be highly sensitive, with a detection limit of 1 pg/µl in a standard PCR assay. Additionally, *B. dorsalis* produced amplification curves in a real-time PCR assay, with significantly low critical threshold (Ct) values ranging from 11.38 ± 0.06 to 16.34 ± 0.48 ($P < 0.05$). Melt curve analysis confirmed the dissociation of a single, species-specific PCR product at a temperature range of 76.5 – 77.5 °C. To further validate the results, an on-field specificity test was conducted. Maggots were meticulously collected from fruit fly-infested fruits and subjected to screening using SSP, while the remaining maggots were reared to adulthood for species confirmation. The SSP demonstrated 100% accuracy in identifying *B. dorsalis* from the infested mango and guava fruits.

Keywords: *Bactrocera dorsalis*; species-specific primer; real-time PCR; on-field specificity; biosecurity;

Oral Presentation

PMO-09

Stage-dependent biochemical and physiological adaptations in tea red slug (*Eterusia aedea*) to mitigate insecticidal stress

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The red slug caterpillar, *Eterusia aedea* Butler (Lepidoptera: Zygaenidae), is a widely distributed pest that poses a significant productivity barrier in tea plantations, causing periodic outbreaks, primarily during the flushing period. All larval stages feed voraciously on mature tea leaves, with severe infestations leading to complete defoliation of bushes and occasional bark damage. The life cycle of *E. aedea* comprises five larval instars, each capable of causing substantial damage to tea crops. Effective management largely depends on the application of synthetic insecticides. In this study, the relative toxicity of emamectin benzoate 8EC and quinalphos 25EC was assessed, along with the differential expression of three key detoxifying enzymes: general esterase, glutathione S transferase, and cytochrome P450 monooxygenase across various larval stages in *E. aedea* populations from tea ecosystems. Relative toxicity tests (LC_{50}) showed that different stages of larvae had different levels of tolerance to emamectin benzoate and quinalphos. Enzyme expression increased progressively through successive instars, indicating a role in mitigating insecticidal stress. The late instars red slug populations exhibited the highest GE, GST, and CYP activities compared to the earlier instars, with ranges of 0.94-2.35 umol alpha-napthol/min/mg, 1.07-12.23 CDNB-GSH conjugate/min/mg protein and 0.0009-0.0042 nmol/min/mg protein respectively. These findings underscore that insecticide susceptibility is intricately stage-dependent, suggesting that early-stage interventions yield greater efficacy. An additional factor contributing to insecticide tolerance explored in this study is the instar-specific thickness of *E. aedea*'s skin, measured using scanning electron microscopy (SEM). SEM analysis revealed a significant increase in skin thickness across successive instars, with measurements ranging from 12.01 ± 2.26 µm in the first instar to 38.98 ± 6.51 µm in the fifth. A strong positive correlation (+0.875) was observed between skin thickness and the relative toxicity (LC_{50}) of insecticides, indicating that thicker skin in later instars acts as a barrier, diminishing insecticide penetration and efficacy.

Keywords: *Eterusia aedea*; General esterase; Glutathione-S-transferase; Cytochrome P450 monooxygenase; scanning electron microscopy

Oral Presentation

PMO-10

Therapeutic potential of honeybee venom and melittin: Targeted cytotoxicity and apoptosis induction in breast cancer cells

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Bee venom (BV), a naturally occurring toxin produced by honeybees, exhibits a range of toxic and therapeutic properties. Despite extensive research, the molecular mechanisms and selectivity of honeybee (Apis mellifera) venom components as potential anticancer agents remain inadequately understood. BV has demonstrated therapeutic potential in treating various cancer types, including breast, ovarian, human cervical tumors, renal, hepatic, and prostate cancers. Notably, breast cancer remains one of the leading causes of cancer-related mortality among women worldwide. This study highlights the potent cytotoxic effects of honeybee venom and its principal component, melittin, on MCF-7 breast cancer cells, while exhibiting significantly lower cytotoxicity toward normal cell lines HEK293 kidney cells. The primary objective was to evaluate the cytotoxic effects of BV and melittin on breast cancer cell lines, focusing on oxidative stress, cell cycle progression, and apoptosis. The MCF-7 cell line was treated with a range of BV and Melittin concentrations (0.5, 1, 2, 4, 8, and 10 µg/ml) to assess their apoptosis-inducing potential. Cytotoxicity was quantified using the MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) assay at 24 and 48 hour intervals. The results revealed a concentration and time dependent cytotoxic effect of BV and Melittin on MCF-7 cells within 24 hours. At a concentration of 2 µg/ml, both BV and Melittin reduced cell viability by 50% compared to the control group. Flow cytometric analysis further indicated that treatment with BV and Melittin caused significant arrest of MCF-7 cells in the Sub-G1 phase of the cell cycle and induced apoptotic cell death. Additionally, the generation of reactive oxygen species (ROS) and alterations in mitochondrial membrane potential ($\Delta\Psi$m) suggest that oxidative stress is a key mechanism underlying BV and Melittin induced cytotoxicity in MCF-7 cells.

Keywords: bee venom; melittin; breast cancer; cytotoxicity; anticancer agents.

Oral Presentation

PMO-11

Transcriptomic evidences of heat stress-induced adaptive mechanisms balancing survival and reproduction in *Spodoptera litura*

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The common cutworm, *Spodoptera litura* (Lepidoptera: Noctuidae) a voracious polyphagous pest feeding on 120 species of plants including field crops, vegetables and ornamental crops across tropical and subtropical regions with expansive global range that ravages to Asia, Africa, North America, and Oceania. High reproduction rate, insecticide resistance and adaptability of pest to climate change suggest rising temperatures may expand its range to new areas. The molecular mechanisms of *S. litura* heat stress response remain underexplored yet hence, the present research investigates the molecular mechanisms underlying the response of *S. litura* to heat stress by analysing differential gene expression. The fourth instar larvae were exposed to heat stress (44 ˚C for 4 h) at humidity 60±5 % in temperature and humidity-controlled incubator and control larvae were maintained at 27±1 °C. Subsequently, RNA sequencing and bio-informatic analysis of heat stressed and control larvae shown that 11,390 transcripts were differentially expressed, with 262 upregulated and 61 downregulated genes. Key differentially expressed genes (DEGs) included heat shock proteins (hsp60, hsp67, hsp70, hsp68, hsp27, hsp26), developmental genes (Tret1, mora, stv, stipe-1, sgt, foxO, trap1, mlf, DNAJ/DROJ), cuticular protein genes, ribosomal genes, antioxidative genes (Pxd, SoD), mitochondrial genes, CYP450, cell cycle regulators, and chromatin proteins (*cdc, cdk, barr, nesd, mr, feo, caf-1, cap-D2*), and immune-related genes. These findings provide a foundation for better understanding of *S. litura* adaptation mechanisms and molecular basis of adaptation to higher temperature in changing climate scenario.

Keywords: transcriptomics; heat stress; *Spodoptera litura*; heat shock proteins; reproductive genes

Oral Presentation

PMPP-01

Molecular characterization of lesser grain borer, *Rhyzopertha dominica* from Andhra Pradesh

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The lesser grain borer, *Rhyzopertha dominica*, is a significant pest of stored grains, particularly in cereal crops. Understanding genetic variety is crucial for controlling the pest invasion and for effectively managing the pest. Recent advances have made rapid molecular identification of insect species more common and a viable alternative to traditional taxonomic methods. DNA barcoding using the MT-CO1 gene has proven to be a valuable addition to traditional taxonomic methods for insect species identification. The analysis of sequence variations in MT-CO1 gene is used as bench mark for insect species identification as it exhibits reliable interspecies and intra specific variations as compared to other parts of the genome. In addition, the MT-CO1 gene sequence can be compared among the insect populations to study the phylogenetic relationships among them. Lesser grain borer, *Rhyzopertha dominica* is a monotypic genus of beetles in the family Bostrichidae, the false powder post beetles. This beetle is cosmopolitan and commonly found within stored products and pest of stored cereal grains and distributed worldwide. The current investigation was carried out to identify the molecular variations in insect populations from rice storage facilities in Andhra Pradesh, India. Molecular characterization of five *R. dominica* populations collected from different districts of Andhra Pradesh was carried out and the MT-COI gene sequences were deposited in NCBI and allotted with accession numbers *viz*., OR048127 (Bapatla), OR105008(Nellore), OR105001 (Tirupati), OR054138 (Krishna) and OR054110 (Kurnool). Haplotype analysis was carried out with a total of 30 mtCO1 lesser grain borer sequences that resulted in 12 different lesser grain borer haplotypes. Out of 9 singletons, four singletons represented from the current study, four singletons from India populations and one singleton in populations from Nigeria. This study generated the CO1 DNA barcodes of lesser grain borer populations of Andhra Pradesh, South India for the first time and allotted with the BIN number, ACB4329 and were available in public database of BOLD Systems.

Keywords: lesser grain borer; DNA barcode; MT-CO1; BOLD system; stored product pest

Poster Presentation

PMPP-02

Studies on diapausing behaviour of pink bollworm, *Pectinophora gossypiella* (Saunders) (Lepidoptera: Gelechiidae) in Laboratory

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Diapause, a genetically predetermined and environmentally governed state, entails suppressed development, lowered metabolic rates, heightened resistance to extreme conditions, and altered behaviour. To comprehend the diapause patterns of *Pectinophora gossypiella*, larvae were collected from Raichur district and observed under both ambient and controlled conditions (60±5% RH & 25±1°C). Similarly, to assess the host plant influence in diapause termination, an equivalent number of diapaused larvae (6) were placed near potted cotton plants at various planting intervals, including a control group devoid of a host plant. Results indicated that, there was no significant difference in number of larvae diapaused between ambient and controlled conditions, but notable differences emerged in the number of pupated larvae and the percentage of emerging moths. Diapause larvae count increased from December, peaked in March, and waned as moth emergence intensified. The diapause duration ranged from 21 to 203 days. Influenced by photoperiod and temperature, diapause termination rates increased from late March to peak in May and June, closely associated with genetic factors. Intriguingly, exposing diapaused larvae to different cotton plant stages didn't prompt emergence, implying no host plant role in larval diapause termination in *Pectinophora gossypiella*.

Keywords: diapause; genetic factors; photoperiod; pupation; temperature

Poster Presentation

PMPP-03

Rapid identification of invasive chilli thrips, *Thrips parvispinus* using simple PCR-based species-specific primers

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Thrips parvispinus (Karny 1922) which belongs to order Thysanoptera and family Thripidae has recently become an invasive pest in Chilli. Though it was reported on other crops, it was not reported from chilli ecosystem anywhere in India. However, recent researches have shown that yield loss due to this species ranged from 40 to 80% in chilli. Both nymphs and adults lacerate on flowers, flower buds, leaves and small fruits. Probably, it may pose a serious threat to other agriculturally important crops also. The accurate identification of *T. parvispinus* is challenging at the egg, nymphal and adult stages due to its similarity to other thrips. Since the existing identification methods of the species is laborious, time consuming and expensive, a rapid and precise method which can be used in the identification of this species has become the crucial need of the hour. In this study, we developed a species-specific primer (SSP), TPF/TPR, targeting cytochrome C oxidase subunit I (COI) for the rapid PCR-based identification of *T. parvispinus*. The optimal annealing temperature for the SSP was determined to be 62 °C, with no cross amplification. The SSP was validated with other economically important thrips which were collected from 7 different hosts. The SSP was tested to be highly sensitive even at low DNA concentration. The detection process could generally be completed within 2–3 hr post DNA extraction and is therefore feasible for quarantine surveillance. The proposed approach may improve the early detection and continuous monitoring of *T. parvispinus* populations and thereby control it regardless of the different life stages.

Keywords: Species-specific primer; chilli; *Thrips parvispinus;* PCR; cytochrome C oxidase subunit I (COI);

Poster Presentation

PMVP-01

Characterization of hemocytes in *Tribolium castaneum* and their role in immune defense

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Haemocytes are vital components of the insect immune system, playing a key role in defence mechanisms. The red flour beetle, *Tribolium castaneum*, a significant pest of stored grains, relies on hemocytes for immune responses and physiological adaptations. Understanding the types and functions of haemocytes in *T. castaneum* provides valuable insights into its immune system. This study aims to characterize the different haemocyte types and analyze their morphology and distribution. The haemolymph smear method was employed to examine haemocyte types. Haemolymph was extracted from adult *T. castaneum*, smeared onto glass slides, and fixed using May-Grünwald stain for 3 minutes. The slides were then rinsed with distilled water and mounted for observation under a Labomed Light Microscope at 40× magnification. Haemocyte identification was based on size, morphology, and staining affinity differences. Five distinct haemocyte types were identified: prohemocytes, plasmatocytes, granulocytes, oenocytoids, and spherulocytes. Prohemocytes and granulocytes were predominant, highlighting their significant role in immune defense. This study provides a detailed classification of *T. castaneum* hemocytes, enhancing our understanding of its immune system. Investigating haemocyte responses to biopesticides and pathogens can aid in developing targeted pest management strategies and improving biological control methods for *T. castaneum*.

Keywords: Tribolium castaneum; haemocyte; prohemocytes; haemolymph; immune system.

Rapid Virtual Oral Presentation

PMVP-02

Diet-induced gut microbiome variations: Exploring the thermoplastic degrading potential of *Corcyra cephalonica*

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Thermoplastic pollution poses a significant environmental and health challenge, primarily due to its slow natural degradation and limited recycling capability. The bottleneck of abiotic pretreatment hinders the role of microbial enzymes in biodegrading untreated thermoplastics. Recent findings indicate that lepidopteran insects, particularly *Corcyra cephalonica*, hold promise for thermoplastic degradation via their gut microbiota. This study explores the gut microbial diversity in *C. cephalonica*, focusing on diet-induced variations and their implications for plastic biodegradation. The metagenomic analysis of the midgut microbiome of *Corcyra cephalonica* was conducted under varying dietary conditions to investigate the microbial community structure and its functional potential. Six samples (in duplicates) were derived from diets comprising sorghum, pearl millet, and rice. Shotgun sequencing and the SqueezeMeta pipeline were employed for data processing, including quality control, assembly, binning, and functional annotation. High-quality metagenome-assembled genomes (MAGs) were generated and analyzed revealing taxonomic and functional diversity across diet types. Based on these results, *C. cephalonica* larvae were reared on experimental diets comprising sorghum supplemented with thermoplastics to investigate their degradation potential. Two diet combinations were prepared using sorghum and polyvinyl chloride (PVC) in ratios of 75:25 and 50:50, respectively. Similarly, another set of diets was formulated using sorghum and polypropylene (PPE) in ratios of 75:25 and 50:50, respectively. Further analyzed for metagenomic alterations. Functional annotation utilizing KEGG and PlasticDB highlighted differential enzyme abundance and the presence of microbiota & pathways related to plastic degradation.

Keywords: *Corcyra cephalonica;* metagenomic; plastic degradation; polyvinyl chloride; polypropylene

Rapid Virtual Oral Presentation

PMVP-03

Decoding olfactory protein interactions with key host volatiles in silverleaf whitefly, *Bemisia tabaci*

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The sense of smell (olfaction) is a critical adaptation in insects, enabling them to locate hosts, find mates, lay eggs, detect predators, and perform other survival activities. This sensory ability is mediated by a range of olfactory proteins, including odorant-binding proteins (OBPs), chemosensory proteins (CSPs), sensory neuron membrane proteins (SNMPs), odorant receptors (ORs), ionotropic receptors (IRs), and odorant-degrading enzymes (ODEs). These olfactory proteins are primarily located in the antennae, the insect's main sensory organ, as well as in other sensory structures. These proteins function within the sensillar lymph of the sensory structures; and bind to odour molecules, forming complexes that are transported to specific receptors, facilitating the detection and identification of odours. The silverleaf whitefly, *Bemisia tabaci* (Gennadius), is a highly polyphagous and multivoltine pest that infests over 1,000 plant species across 74 families. As a polyphagous pest, it responds to a wide range of host plant volatiles when distinguishing favourable and unfavourable hosts. These volatiles can trigger attraction, repulsion, or no response in *B. tabaci*. Many attractant and repellent cues have been identified across various cryptic species of *B. tabaci*. Of which, the major attractant cues include nonanal, (Z)-3-hexenyl acetate, and β-caryophyllene, while repellents include limonene, linalool, and myrcene. Advances in genomic and transcriptomic studies have deepened our understanding of the molecular basis of olfaction in *B. tabaci*. For example, eight OBP genes and 19 CSP genes have been identified in *B. tabaci* MEAM1 (via the NCBI database), along with six additional OBPs recently reported in *B. tabaci* Asia II-1. Using *in silico* docking techniques, the binding affinities between various host volatiles and olfactory proteins (OBPs and CSPs) were analysed to identify the most critical volatiles influencing host detection behaviour. Findings from this study provide valuable insights into key cues that could disrupt host-location behaviours in *B. tabaci*, offering new avenues for enhancing pest management strategies.

Keywords: sap feeder; binding affinity; *in silico* docking; odorant binding proteins; chemosensory proteins

Rapid Virtual Oral Presentation

PMVP-04

Effects of different seasons on the transmission efficiency of tomato leaf curl virus (tolcv) by *Bemisia tabaci* (Gennadius)

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The present study investigates the transmission efficiency (TE%) of Tomato Leaf Curl Virus (ToLCV), transmitted by the whitefly *Bemisia tabaci*. The experiment was meticulously designed by artificial inoculation was performed monthly throughout 2023 on tomato plants at the two-leaf stage, covering a comprehensive period from February to December. Data collection involved monitoring environmental variables, infection dynamics, and corresponding transmission efficiency across each month. The results demonstrated a pronounced impact of temperature and RH on ToLCV transmission. A strong positive correlation was observed between temperature and TE%, where increased temperatures led to higher virus transmission rates. Conversely, a negative correlation was evident between RH and TE%, indicating that higher humidity levels suppressed viral spread. Correlation analysis between TE% and environmental factors showed a strong positive relationship with temperature ($r = 0.897$, $p < 0.001$), suggesting that warmer conditions enhance viral transmission by *B. tabaci*. The moderate negative correlation with RH ($r = -0.408$) was not statistically significant ($p = 0.213$), indicating that RH alone does not critically impact TE%. The TE% was recorded in June (93.33%) under conditions of elevated temperature (33.9°C) and moderate RH (44.05%), highlighting an optimal environment for whitefly activity and virus transmission. The TE% peaked in July (96.67%) at 31.8°C and 69.05% RH. Conversely, the lowest TE% was observed in December (43.33%) at 13.9°C and 67.0% RH, reflecting reduced vector efficiency in cooler conditions. With a similar trend, the TE% observed in February (56.67%) when the temperature was cooler (14.71°C) and RH was higher (67.50%). This pattern underscores the dominant influence of temperature over humidity in ToLCV transmission dynamics. The infection dynamics further revealed that the number of days to first infection and complete plant infection decreased during warmer months, indicating enhanced vector activity and viral proliferation under favourable climatic conditions.

Keywords: transmission; *Bemisia tabaci*; tomato leaf curl virus; temperature; relative humidity

Rapid Virtual Oral Presentation

PMVP-05

Evaluation and improvement of different semi-synthetic diets for mass rearing of Brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee (Lepidoptera: Crambidae)

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The brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee is a destructive pest of brinjal. Few studies were carried out on rearing of BSFB on artificial diet. Studies on artificial or semi-synthetic diet is prerequisite for biological studies like insect behaviours, management strategies, insect diseases, sex pheromones, effects of chemical sterilant, generation of resistant kinds, sterile insect technology, and pest growth and development so the present investigation was carried out to evaluate and improve semi-synthetic diet for mass rearing of Brinjal shoot and fruit borer, *L. orbonalis* Guenee. Three published semi-synthetic diets (diet A, B and C) were evaluated for two successive generations and compered with the natural host potato. Among the semi-synthetic diets, diet A recorded significantly highest pupal recovery of 38.35 percent and fertility of 75.75 percent but not as comparable as natural host potato, which recorded 65.33 percent pupal recovery and 78.37 percent fertility. Diet A was further improved by adding potential substituents like linoleic acid, α-tocopherol and host plant-based components among those, brinjal fruit powder-based diet performed better with 57.83 percent pupal recovery and 79.53 percent fertility. Significant increase in developmental durations were recorded in all the semisynthetic diet in comparison with the natural host. This diet could be improved by adding other host plant-based components and successive rearing.

Keywords: semi-synthetic diet; pupal recovery; brinjal shoot and fruit borer; potato; successive rearing

Rapid Virtual Oral Presentation

PMVP-06

Functional exploration of gut bacteria in *Apis cerana* and *Apis mellifera* within Indian hive scape

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The gut micro-organisms are indispensable in the health and ecology of disparate animal species, yet the connection between social behaviors and microbial communities is underexplored. Honey bees, known for their highly social nature, offer a valuable model to study intra-species microbial diversity, as their behavioral tasks expose them to distinct environmental conditions. This study used both culture-dependent and culture-independent methods to investigate the gut microbiome of two closely related honey bee species, *Apis mellifera* and *Apis cerana*. Additionally, enzyme assays were conducted to assess the ability of these gut bacteria to break down complex molecules. Culture-dependent techniques yielded 42 isolates, including 10 core isolates meanwhile, 16S rRNA sequencing and metagenomics revealed core bacterial species like *Gilliamella apicola*, *Bartonella apis*, *Commensalibacter intestini*, *Snodgrasella alvi*, and *Frischella perrara*, with both species hosting bacteria predominantly from the phyla *Proteobacteria, Firmicutes, Bacteroidetes*, and *Actinobacteria*. The diversity analysis revealed a greater bacterial diversity and functional capacity in *A. mellifera* compared to *A. cerana*. Our results also emphasized the significant contribution of these core bacteria towards major metabolic pathways and enzyme analysis of core bacteria revealed their capacities in breaking down complex molecules. These gut microbes boost the nutrition and health of honey bees by facilitating the breakdown of complex carbohydrates and lipids. Understanding the bee microbiome's functional roles is crucial for digesting complex carbohydrates, lipids, and sucrose, supporting honeybee health. Furthermore, identifying isolates with enzymatic potential such as potent pectinolytic or invertase activity holds promise for industrial uses including food processing and biofuel production.

Keywords: *Apis cerana*; *Apis mellifera*; bacteria; isolation; metagenomics

Rapid Virtual Oral Presentation

PMVP-07

Isolation and molecular characterization of bacterial gut symbionts of diamondback moth, *Plutella xylostella* (Linnaeus) (Plutellidae: Lepidoptera)

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Third instar larvae of Diamondback moth, *Plutella xylostella* were accessed to feed on artificial diet incorporated with three different concentrations of Streptomycin sulphate @0.05%, 0.1% and 0.2% and without antibiotic for 72 h, and were used for dissection and isolation of bacterial gut symbionts. Gut microbiota from *P. xylostella* reared on artificial diet were identified based on morphological characteristics of bacterial colonies and their molecular characterization using 16S rRNA gene sequencing. A total of thirteen species of bacterial gut symbionts of distinctive characters were identified from larvae of Diamondback moth larvae reared on artificial diet with and without antibiotic. The dominant bacterial gut symbionts phylum was Bacillota (Firmicutes) followed by Pseudomonadota (Proteobacteria). Highest number (13 species) of bacterial gut symbionts were isolated from larvae reared on artificial diet without antibiotic and were identified as *Pseudomonas putida, Stutzerimonas stutzeri, Bacillus pumilis*, *Enterobacter absuriae*, *Sphingopyxis terrae*, *Stenotrophomonas maltophilia, Bacillus subtilis, Staphylococcus aureus, Levilactobacillus brevis, Bacillus licheniformis, Pantoea agglomerans, Enterococcus casseliflavus* and *Carnobacterium maltaromaticum,* while the gut microbiota diversity and species composition decreased with increasing concentration of antibiotic at 0.05%, 0.1% and 0.2% with 9, 7 and 4 bacterial gut symbionts, respectively. The elimination of bacterial gut symbionts was more rapid with 0.2% of Streptomycin sulphate. Bacterial gut symbionts; *Stutzerimonas stutzeri, Staphylococcus aureus, Bacillus licheniformis* and *Pantoea agglomerans* were rapidly eliminated at all the three concentrations of Streptomycin sulphate, while *Enterococcus casseliflavus, Pseudomonas putida, Enterobacter absuriae* and *Carnobacterium maltaromaticum* bacteria were not eliminated even at 0.2% of Streptomycin sulphate.

Keywords: *Plutella xylostella*; streptomycin sulphate; gut symbionts; 16S rRNA gene

Rapid Virtual Oral Presentation

PMVP-08

Mating-induced transcriptomic changes in fall armyworm (*Spodoptera frugiperda*) female moths

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The fall armyworm (*Spodoptera frugiperda*) is a highly destructive pest known for causing substantial economic losses. Its ability to infest a diverse range of host plants, coupled with strong dispersal capabilities and high reproductive potential, makes it a formidable challenge to manage. Current control strategies are hindered by the pest's high fecundity, mobility, and rapid development of resistance to insecticides. Investigating gene expression changes induced by mating provides insights into the molecular mechanisms driving adaptations in female reproductive processes. Post-mating in *S. frugiperda*, changes in the expression levels of 13,207 genes were observed. Among these, 846 genes showed significant expression changes 24 hours after mating, with 89 being upregulated and 757 downregulated. At zero hours post-mating, only four genes exhibited upregulation. Gene Ontology analysis indicated that the majority of differentially expressed genes (DEGs) were linked to biological processes, followed by cellular components and molecular functions. Notably, several upregulated genes, including cathepsin B, cytochrome P450 6B1, ecdysone oxidase, and ribosome-binding protein-1, were found to play critical roles in egg development, detoxification, hormone synthesis, and protein production, processes vital for reproduction. Conversely, genes associated with immune functions, such as serine-protease inhibitor dipetalogastin-like, attacin, and lysozyme, were downregulated. This indicates a trade-off where resources are allocated to enhance reproductive success at the potential expense of immune defense. These findings highlight the dynamic redistribution of energy resources to prioritize reproduction, potentially reducing the effectiveness of the immune system. Targeting key genes and pathways involved in these processes could present innovative strategies to disrupt reproduction and curb population growth in *S. frugiperda*, ultimately reducing the economic damage caused by this pest.

Keywords: *Spodoptera frugiperda*; transcriptomics; mating-induced gene expression; RNA-Seq; qRT-PCR.

Rapid Virtual Oral Presentation

PMVP-09

Nitrogenous waste recycling in *Holotrichia longipennis* larvae mediated by symbiotic bacteria: Implications for pest management

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White grubs, the larvae of scarab beetles (Coleoptera: Scarabaeidae), present a complex ecological paradox in Indian agriculture. While these soil-dwelling insects are notorious pests that cause extensive damage to crops such as sugarcane, groundnut, maize, potato, and turfgrass by feeding on their roots, they simultaneously contribute to ecosystem health through organic matter decomposition and nutrient cycling. Nitrogen is a limiting nutrient for herbivorous insects. The insects rely on symbiotic microbes which enable them to utilize the nitrogen-poordiets. In *Holotrichia longipennis* larvae, which develop in nitrogen-deficient environments, the mechanism of nitrogen acquisition remains unclear. Using shotgun metagenomics and in vitro assays, we investigated nitrogen exploitation strategies in *H. longipennis* larvae. Our results revealed that nitrogenous waste recycling (NWR) is driven by symbiotic bacteria, including *Sporosarcina ureae, Saccharomonospora azurea, Oligella urethralis, Ureaplasma parvum, Corynebacterium ureicelerivorans*, and *Corynebacterium urealyticum*. The urease-positive bacteria, such as *Sporosarcina ureae* and *Corynebacterium urealyticum*, mediated urea hydrolysis, while core bacterial species contributed to essential amino acid biosynthesis via ammonium assimilation and transamination. The qPCR analysis showed significant upregulation of *ureC* (urease subunit), *glnA* (glutamine synthetase), and *gdhA* (glutamate dehydrogenase) in ammonia-rich conditions, confirming active nitrogen metabolism. Our findings suggest that *H. longipennis* employs an NWR strategy, with urease-positive bacteria facilitating nitrogenous waste hydrolysis to support larval development. Disrupting microbial nitrogen recycling could offer a novel pest management strategy by hindering larval growth. Targeting key microbial pathways may aid in developing microbial-based biocontrol methods to suppress white grub populations in agriculture.

Keywords: *Holotrichia longipennis*; metagenomics; nitrogenous waste recycling, symbiotic bacteria, *ureC*, pest management.

Rapid Virtual Oral Presentation

PMVP-10

Parasitism by *Chelonus blackburni* cameron (hymenoptera: braconidae) affecting growth, development and nutritional physiology of *Corcyra cephalonica* (stainton) (lepidoptera)

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Chelonus blackburni is a solitary egg-larval endoparasitoid that feeds on the haemolymph of its host during its internal developmental phase. Parasitization by *C. blackburni* induces a precocious onset of metamorphosis and a developmental arrest at the prepupal stage in its host, *Corcyra cephalonica*. At this point, the parasitoid larva emerges from the host and consumes it. The parasitization by *C. blackburni* reduces the larval developmental period in *C. cephalonica*, with unparasitized larvae taking 19–28 days to develop, while parasitized larvae complete development in 16–24 days before pupation. Notably, parasitized larvae exhibit premature moulting into the next instar, indicating altered developmental timing. Additionally, parasitization affects the host's nutritional physiology, resulting in a reduced food intake, an increase in the concentration of free sugars and glycogen, and a decrease in protein levels. In contrast, there is an accumulation of lipids in the host's body. These changes suggest that the parasitoid's presence and its feeding activities significantly modulate the host's metabolic processes. The concentration of nutrients in the host's haemolymph plays a crucial role in supporting successful parasitoid development.

Keywords: parasitoid; pest; insect physiology; nutrition physiology; larval development.

Rapid Virtual Oral Presentation

PMVP-11

Studies on whitefly, *Bemisia tabaci* Gennadius (Hemiptera: Aleyrodidae); genetic diversity, associated viruses and endosymbionts

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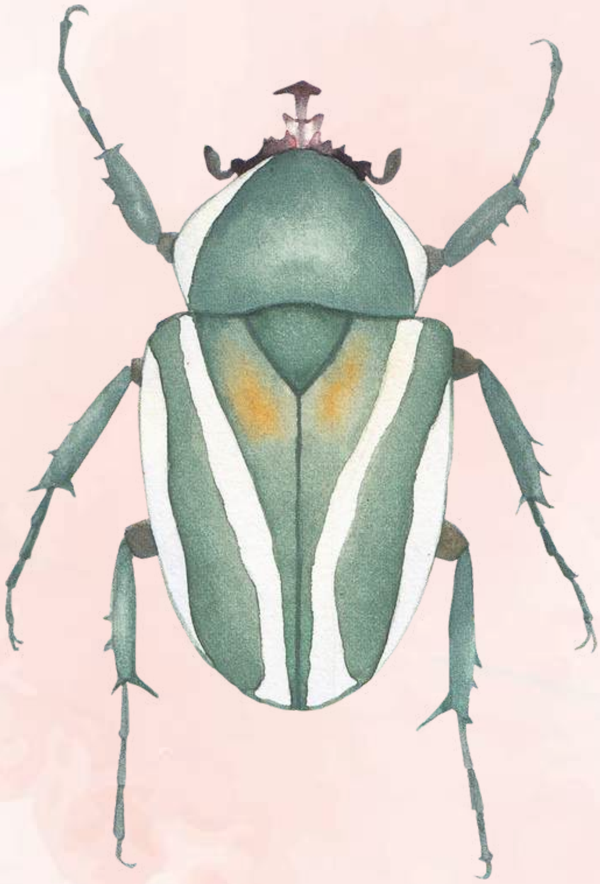
The whitefly, *Bemisia tabaci* Gennadius (Hemiptera: Aleyrodidae) is posing significant threat to vegetable production in India, jeopardizing agriculture. Being considered as a cryptic species complex, it is a challenge to manage the population due to endosymbionts harboured and viruses transmitted. To address this, we conducted an extensive survey to analyse the genetic diversity of *B. tabaci* cryptic species complex along with its virome and endosymbionts diversity in the vegetable ecosystems covering 85 locations across 11 districts of Karnataka and 10 districts of Andhra Pradesh. Genetic diversity analysis using mitochondrial cytochrome oxidase subunit gene I (*mtCOI*) sequence revealed, six cryptic species (Asia I, Asia II-2, Asia II-5, Asia II-7, Asia II-8 and MEAM1) associated with vegetable crops belonging to *Solanaceae, Malvaceae, Cucurbitaceae* and *Brassicaceae*. Begomoviruses *viz.,* chilli leaf curl virus (ChiLCV), eggplant leaf curl Chhattisgarh virus (EgLCuChV) and tomato leaf curl New Delhi virus (ToLCNDV) were detected in whitefly population using group specific primers. Next generation sequencing identified 34 plant viruses in *B. tabaci*, revealing the diverse viral landscape. Further, endosymbionts including Gammaproteobacteria, Bacilli, Actinomycetes and Sphingobacteria were isolated and characterized. Primary and secondary endosymbionts associated with *B. tabaci* were identified across the surveyed locations. The study revealed significant genetic diversity among *B. tabaci* cryptic species, their associated begomoviruses, and endosymbionts across surveyed regions, highlighting a complex viral and microbial landscape. The results will help to develop IPDM strategies, to combat whitefly and its vectored viruses. This would support to expand virome and endosymbiont studies to explore novel control measures and understand emerging risks. This will also promote regular surveillance, climate impact assessments, and farmer-friendly tools for sustainable agricultural practices.

Keywords: white fly; genetic diversity; Asia-II; begomoviruses; cryptic species

Rapid Virtual Oral Presentation



Theme VI
Host Plant Resistance and Insect Ecology

ENTOMOLOGY STUDENTS CONCLAVE
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HPRO-01

Effect of food baited trap in mango orchard ecosystem against female fruit fly (*Bactrocera dorsalis*)

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Four different food baits were tested against female Oriental fruit flies, *Bactrocera dorsalis* (Hendel) (Diptera: Tephritidae) with and without additives, in Mango orchard ecosystem at Coimbatore district for two weeks in May, 2024. The four different treatments viz., T1 (Mango fruit pulp), T2 (Guava fruit pulp), T3 (Mango fruit pulp + food additive) and T4 (Guava fruit pulp + food additive) with control (water) and Standard check (Methyl Eugenol) and recorded significant results respectively. Attraction of the female fruit flies were higher for T1 and T3, than T2 and T4 of which T3 was the best in efficiency followed by T1, T4 and T3. The study also reveals that the treatments with additives such as protein materials, longevity components etc., were more efficient than the treatments with the respective fruit pulp alone. The performance of the baits was recorded to better in the initial week followed by a gradual decrease of fruit fly count in the second week. The fly activity period was also recorded from this experiment in the morning and evening hours. More number of flies were trapped from 6:00 hrs to 10:00 hrs in the morning and from 16:00 hrs to 18:00 hrs in the evening. This management practice effectively decreased the female populations of the fruit flies, thereby reducing the overall infestation.

Keywords: Food baits; behavioral management; economical; trapping system; *Bactocera dorsalis*

Oral Presentation

HPRO-02

GC-MS profiling and behavioural analysis of host plant volatiles for fruit fly *Zeugodacus cucurbitae*

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Among the globally distributed 5,000 species across 500 genera of true fruit flies belonging to Tephritidae family, the melon fly (*Zeugodacus cucurbitae*) is a major agricultural pest. It can infect a wide range of host plants, particularly cucurbits. Females oviposit within the fruit pulp by piercing the rind. Host plant volatiles, primarily from fruits and leaves, function as key semiochemical cues for females, mediating host plant selection and oviposition behaviour. This study aimed to elucidate the behavioral responses of virgin and gravid female melon flies in response to volatiles emitted by injured and uninjured fruits of three different cucurbitaceous hosts. The fruits at distinct phenological stages i.e., 3, 5, and 7days old fruits (DOF) were selected for study. Behavioural assays utilizing a Y-tube olfactometer were conducted to evaluate the preference of *Z. cucurbitae*. Concurrently, volatile profiling of host fruits was performed through dynamic headspace collection and gas chromatography-mass spectrometry (GC-MS) to identify bioactive compounds associated with attraction of melon fly to these fruits. Behavioural analyses revealed that the attraction was highest in 3 and 5 DOF (χ^2=1.190) in sponge gourd followed by bottle gourd (χ^2=4.54) and bitter gourd (χ^2=16.01) fruits. Volatile profiling of sponge gourd fruits revealed 51 compounds, with 3-hexenone, hexane, and butanoic acid, being the major constituents. Significant qualitative and quantitative differences were observed in the volatile profiles of injured and uninjured fruits. Notably, the concentrations of compounds such as p-cymenol, p-xylene, cyclopentasiloxane, and m-ethylacetophenone were markedly elevated in injured fruits compared to their uninjured counterparts. These injury-induced volatiles likely influence the host-seeking behaviour. The findings of the present investigation provide insights for further electrophysiological investigations to identify behaviourally active compounds.

Keywords: semiochemicals; *Zeugodacus cucurbitae*; plant volatiles; eco-friendly; chemo-profiling

Oral Presentation

HPRO-03

Influence of morphological and biochemical parameters of the custard apple in relation to oriental fruit fly infestation

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The oriental fruit fly, *Bactrocera dorsalis* (Hendel) belongs to the order Diptera and the family Tephritidae. The extensive cultivation of custard apple has led to an increased incidence of insect pests, with fruit flies causing over 50% yield losses in orchards. Plant resistance is influenced by factors such as biochemical properties, which play a critical role in deterring insect attacks. Understanding these traits can help identify resistant genotypes for variety development, thereby reducing reliance on insecticides and mitigating environmental impacts. This study aimed to analyze the morphological and biochemical traits of various custard apple genotypes in relation to fruit fly infestation. The results revealed that fruit eye dimensions, particularly eye length and width, showed strong positive correlations with infestation parameters, including maggot population, pupae, and adult emergence (r = 0.80 to 0.98). Biochemical analysis further indicated that genotypes with higher total soluble sugar content (r = 0.62 to 0.67) and pH levels (r = 0.91) were more susceptible to fruit fly infestation. Conversely, higher flavonoid content negatively correlated with infestation (r = -0.66), highlighting its detrimental effects on maggot development. Among the genotypes, *Arka Sahana* recorded the highest infestation (58%), with elevated mean numbers of maggots (3.61), pupae (3.41), and adult emergence (3.33), confirming its susceptibility to fruit fly infestation. In contrast, the Local variety (46%) and Balanagar (42%) exhibited relatively lower susceptibility. These findings underscore that genotype with smaller eye dimensions, lower sugar content, and higher flavonoid levels exhibit greater resistance to fruit fly infestation, offering a sustainable approach to pest management.

Keywords: *Bactrocera dorsalis*; custard apple; biochemical trait; morphological traits;

Oral Presentation

HPRO-04

Morpho-physiological traits of resistance in soybean against tobacco cutworm (*Spodoptera litura*) and bihar hairy caterpillar (*Spilosoma obliqua*)

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The present investigation was carried out to assess the morpho-physiological basis of resistance of soybean six varieties *viz.*, Shivalik, PK472, KDS 753, NRC7, Monetta and Punjab 1 against *Spodoptera litura* and *Spilosoma obliqua* at different growth stages. The variety PK472 recorded the highest 53.27±2.78 trichomes/ mm^2, 57.92±4.02 trichomes/ mm^2, 61.28±4.82 trichomes/ mm^2, and 46.67±4.13 trichomes/ mm^2 leaf trichome density at seedling, vegetative, flowering and pod formation stage among all the varieties respectively. The leaf length was recorded the highest 6.10±0.39 cm, 8.30±0.36 cm, 8.80±0.47 cm and 9.40±1.07 cm in PK472 at seedling, vegetative, flowering and pod formation stage respectively. The leaf area was lowest 18.65±1.35 cm^2, 21.21±2.25 cm^2, 30.40±1.34 cm^2 and 49.95±1.12 cm^2 in PK472 at seedling, vegetative, flowering and pod formation stage respectively. In respect to leaf breadth, it was also recorded the lowest 2.95±0.46 cm, 3.06±0.30 cm, 3.12±0.52 cm, 3.31±0.49 cm at all the four stages respectively. Among all the stages, the leaf moisture content was significantly higher (79.15±5.32 %) in PK472 at the seedling stage. The correlation study revealed positive association of leaf area and leaf breadth with the larval population of *S. litura* and *S. obliqua* whereas the mean leaf length and leaf trichome density showed negative association. A negative correlation was found between the larval population of *S. litura* and the leaf moisture content at all the growth stages while *S.obliqua* showed negative correlation at the vegetative stage. The correlation study revealed a positive association of *S.obliqua* with all the morpho-physiological parameters at the flowering and pod formation stage. From this study it was concluded that PK472 among all the varieties had certain morpho- physiological (smaller leaf area and leaf breadth with higher leaf length and trichome density) characteristics which imparted resistance against these two lepidopteran insect pests.

Keywords: *Spodoptera litura*; *Spilosoma obliqua*; trichomes; morpho-physiological characteristics

Oral Presentation

HPRO-05

Oxidative stress response in interspecific derivatives of pigeonpea against *Maruca vitrata (fab.)*: A study on sod, cat, apx, and gr activities

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Spotted pod borer, *Maruca vitrata* (Fab.) (Lepidoptera: Crambidae), owing to its high damage potential and broad host range, is the most devastating threat to pigeonpea [*Cajanus cajan* (L.) Millspaugh] in different parts of the world. This study evaluated two promising interspecific derivatives of pigeonpea derived from crosses between the cultivated pigeonpea *C. cajan* and its wild relative, *C. scarabaeoides* (exhibiting diverse reaction to *M. vitrata* in the field and laboratory bioassay) for oxidative stress responses, along with two local checks (PAU 881 and AL 882) and one susceptible check (MN1). At 50% flower and pod formation stage, five second-instar larvae of *M. vitrata* were released on three randomly tagged plants grown inside insect-proof net house. The insect-infested plants were covered with muslin cloth to prevent larval movement onto the neighbouring plants. The larvae were allowed to feed on the developing flowers and pods for a period of five days. Interspecific derivatives and check varieties of pigeonpea kept free from pod borer infestation were served as uninfested control. Flowers and pods were collected from the infested and uninfested plants for the biochemical assays at one and five days after infestation. The activities of superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX), and glutathione reductase (GR) were significantly elevated in the infested plants as compared to the uninfested plants, highlighting the dynamic oxidative stress response in pigeonpea derivatives. This enhanced antioxidant defense indicates the critical role of reactive oxygen species (ROS) scavenging in mitigating *M. vitrata*-induced stress in pigeonpea.

Keywords: *Maruca vitrata*; interspecific derivatives; pigeonpea; oxidative stress; antioxidant defense

Oral Presentation

HPRO-06

Morpho-physical basis of resistance in potato cultivars against potato tuber moth, *Phthorimaea operculella* (zeller)

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Potato (*Solanum tuberosum*) is a significant cash crop widely cultivated in Meghalaya. The potato tuber moth (*Phthorimaea operculella*), a pest affecting both field and storage conditions, poses a substantial challenge to the storage of potato tubers, particularly those intended for seed purposes, resulting in considerable economic losses. This study investigated the morpho-physical traits associated with resistance in potato cultivars against potato tuber moth. Fifteen cultivars were evaluated to assess tuber- and foliage-based resistance. The cultivars were screened for various tuber morpho-physical characteristics, including average number of eyes, tuber color, and surface texture, to determine their influence on oviposition preference, feeding preference, survival rate, and the number of mines. Among the tested varieties, Kufri Jyoti (14) and Kufri Megha (11.6) were found to be highly susceptible, characterized by a higher number of eyes, a creamy white color, and smooth surface texture. Conversely, Lah Ksain (4.1) and Phan San Minit (3.3) showed slight resistance, exhibiting fewer eyes, a reddish-white color, and rough surface texture. Foliage characteristics such as trichome density, length, and width were also analyzed to assess their role in host preference for oviposition. Phan Saw (14.42) and Lah Shidieng (20.62) had the lowest number of eggs laid on them, attributed to their high trichome density of 125 and 74/20mm^2, respectively. In contrast, Lah Ksain (98.86) and Lah Taret (86.08) exhibited the highest number of eggs, correlating with their low trichome densities of 13 and 20/20mm^2, respectively.

Keywords: *Phthorimaea operculella*; Potato; morpho-physical resistance; trichomes; texture

Oral Presentation

HPRO-07

Varietal Screening of Okra (*Abelmoschus esculentus* L.) against major insect pests and their bio-intensive management

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Okra (*Abelmoschus esculentus* L.) is a significant vegetable crop in the Malvaceae family. The current study was carried out utilizing the objectives of screening most commonly grown okra varieties against the major insect pests, their population dynamics and evaluating the efficacy of various bio-pesticides and insecticide for their management. Experiments were conducted at Experimental Farm, CPGS-AS, CAU (I), Umiam, Meghalaya. Six okra varieties *viz.*, Pusa Sawani, Punjab Padmini, Arka Anamika, Red Bhindi, Pusa Padmini and Parbhani Kranti were screened. Pusa Sawani was recorded the most resilient variety (22.37%) whereas Arka Anamika the most vulnerable (44.84%). For the analysis of insect pests population dynamics, the variety Arka Anamika was selected. A total of 13 insect species were recorded, out of which 9 were pests and 4 are natural enemies belonging to 4 orders and 11 families. Among all the insect pests recorded aphid, *Aphis gossypii* caused (96.87%) infestation followed by leafhopper *A. biguttula biguttula* (36.67%), fruit borer, *E. vittella* (31.45%) and whitefly, *Bemisia tabaci* (12.18%) and thus were considered the important pests of Okra. The occurrence of significant important pests was negatively non-significant with highest temperature (r= -0.26) and positively significant with lowest temperature (r= 0.52) and relative humidity (r= 0.573) during Summer season 2024. To evaluate the efficacy of bio-pesticides and insecticide for control of significant insect infestation, the experiments were laid in RBD with 6 treatments and 4 replications during March-July, 2024. Profen super was most effective in controlling leafhopper, aphid and whitefly with a percent reduction of (70.05%, 68.87% and 66.46%) over control and had significantly highest yield (7.12 t/ha). For fruit borer, *B. thuringiensis* var. *kurstaki* was highly effective with 48.19% percent reduction over control. The highest percent corrected mortality 49.95%, 56.81% and 61.21% was documented in T5 treatment Profen super for leafhopper, aphid and whitefly whereas the highest corrected mortality (34.59%) was found in T1 treatment (*B. thuringiensis* var. *kurstaki*) for fruit borer.

Keywords: Arka Anamika; *Bacillus thuringiensis* var. *kurstaki*; Population dynamics; UmComb; UmLec

Oral Presentation

HPRPP-01

Crop phenology changes the population dynamics of invasive thrips, *Thrips parvispinus* (karny) (Thysanoptera: Thripidae) on chilli under open field condition

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Chilli, *Capsicum annum* (L.) commonly called as bell pepper, is cultivated in tropical and subtropical regions worldwide, known for its rich Vitamin A and C content making it a "wonder spice", and a universal culinary staple. Despite its widespread usage, yet faces considerable challenges in maintaining crop quality and yield due to pest pressures, particularly insect pests and pathogens threaten the country's chilli ecosystem most notably due to the recent outbreak of the invasive thrips, *Thrips parvispinus* (Karny) (Thysanoptera: Thripidae) The current study evaluated thrips distribution patterns over chilli phenological stages in Summer (March-June, 2023) and rainy (June-September,2023) at the University of Agricultural Sciences, GKVK, Bengaluru, Karnataka, India, under the open-field condition. Open-field monitoring of thrips from the seedling stage to harvest (1-95 days after transplanting) in two different seasons revealed an early rise in the thrips population on leaves, which peaked during the blooming stage (45 DAT) and then began to decline. There were very few thrips on fruits, and the population was greatest on flowers, with an average of 16 thrips per flower. Around 50-60 DAT, thrips counts on flowers reached a strong peak, although infestations of leaves and fruit stayed low. The flowering stage and thrips populations were significantly positively correlated, indicating that flowers are a preferred location for thrips activity. The results show that when the plant progresses from the vegetative to the reproductive stages, thrips move from leaves to flowers in response to the availability of nutrient-rich pollen. These findings highlight the importance of targeting the flowering stage with pest management initiatives to reduce infestation and yield loss.

Keywords: invasive thrips; phenological stages; targeted pest management; chilli; flowering stage

Poster Presentation

HPRPP-02

Field screening of different rice cultivars for Resistance against *Scirpophaga incertulas* Walker

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Rice serves as a staple food crop for a significant portion of the global population; however, it is susceptible to various insect pests, among which Scirpophaga incertulas cause substantial economic loss. Therefore, the field experiment, conducted at the Institutional Research Farm of Palli Siksha Bhavana, Visva-Bharati in Sriniketan, West Bengal, took place during the Boro season (December 2022 to April 2023) to assess resistance among thirty-three rice cultivars to the yellow stem borer, S. incertulas Walker. In order to evaluate the prevalence of the yellow stem borer, the occurrence of deadhearts (DH) was documented at 30 and 40 days after transplanting (DAT). Additionally, the incidence of white earheads (WE) was recorded at 65 and 75 DAT during the flowering phase. Both DH% and WE% were transformed into modified percent damage (D%) through a slight adaptation of the methodology proposed by Heinrichs et al. (1985) for grading of different rice cultivars following IRRI'S Standard Evaluation System (SES) for rice. Early-duration cultivars displayed a range of resistance levels; notably, 'Jaldi 13' showed consistent resistance with deadheart (DH) and damage (D) percentages at 2.53% and 12.65%, respectively. Other early-duration cultivars presented intermediate to susceptible responses, with DH percentages from 4.73% to 8.51% and damage between 23.65% and 42.55%. Among mid-early cultivars, 'Sahabhagi' demonstrated moderate resistance with a DH of 4.92%, whereas 'Sukumar' was moderately susceptible at 8.21% DH in the vegetative stage. These trends remained consistent through the reproductive phase, contributing to a comprehensive view of each cultivar's response to pest pressure. Further analysis among medium and late-duration cultivars revealed varied resistance responses. In the mid-duration group, 'Pratiksha (20)' exhibited moderate resistance (6.63% DH), while 'Ajith (25)' in the late-duration category also showed moderate resistance with 6.33% DH. Cluster analysis categorized cultivars across all growth durations, identifying groups with resistance, moderate resistance, and susceptibility. Of particular note were cultivars like 'Gotra 1 (10)', 'Parijat (14)', 'Pushpa (17)', 'PNR 546 (19)', 'Pravat (23)', and 'Gotra 2 (31)', which consistently exhibited resistance or moderate resistance across growth stages. These findings underscore their potential role in breeding programs aimed at developing resistant varieties and offer insights for effective pest management strategies to address stem borer infestations in rice cultivation.

Keywords: yellow stem borer; dead hearts; resistance; white ear head; management

Poster Presentation

HPRPP-03

Infestation of *Callosobruchus chinensis* on chickpea variety IPC 4-98

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This study examined the biology and development of the pest, *Callosobruchus chinensis*, on the chickpea variety IPC 4-98 in the School of Entomology, Department of Zoology, St. John's College, Agra. The pulse beetle, *Callosobruchus chinensis*, is a serious pest of stored legumes, especially chickpeas (*Cicer arietinum*), chickpea is one of the most popular and widely grown crops high in protein. Due to seed damage, weight loss, and decreased germination capacity, infestation by this insect during storage results in significant financial losses. To study biology, the mother culture of the insect was multiplied in the laboratory. The experiment was conducted in triplet; 2 pairs of adults with 20 seeds kept in a container and observed with the help of a magnifying lens and stereoscope. The incubation period of *C. chinensis* was 4.5 to 5 days, and the larval period was 12 to 17 days. The pupal period was observed from 5 to 8 days, and the oviposition period lasted 3 to 7 days. The entire developmental period was from 21.5 to 30 days. The total number of average eggs laid by a female was 77.6 and the hatchability rate was 28.73%. The destruction caused a 9% loss in the weight of seeds, which demonstrates the destructive capability of this pest. Adults survived for only 7 to 9 days in males and 8 to 12 days in females. This study provided important information on the biology and life cycle of *Callosobruchus chinensis*, which may be beneficial to both farmers and researchers. It provides baseline data to formulate sustainable, eco-friendly remedies like biological control, integrated pest management (IPM) and mitigate post-harvest losses. This study encourages the adoption of environmentally safe practices that reduce reliance on chemicals while also improving food security and yield quality.

Keywords: *Callosobruchus chinensis*; Chickpea; biology; damage; biocontrol; integrated pest management

Poster Presentation

HPRPP-04

Varietal reaction of tomato hybrids against whitefly and leaf curl disease in field condition

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The field experiment on varietal reaction of tomato hybrids against whitefly and leaf curl disease was conducted during the *Rabi* 2022-23 and *Rabi* 2023-24 at research farm, Department of Entomology, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra. During the study ten promising tomato hybrids *viz.,* To-2048, To-3251, To-3440, To-6242, KTH-301, Abhinav, Aryaman, To-2174, Phule Raja and variety Phule Kesari (susceptible check) were used. The overall pooled mean population of whitefly during *Rabi* 2022-23 and 2023-24 revealed that average mean population of whitefly during the crop growth stages ranged from 1.05 to 4.31 whiteflies/3 leaves/plant. The hybrid To-2174 was the most promising and recorded least average population of 1.05 whiteflies/3 leaves/plant followed by the hybrid Abhinav, which recorded 1.60 whiteflies/3 leaves/plant. The maximum mean population of 4.31 whiteflies/3 leaves/plant was observed on the variety Phule Kesari followed by hybrid Phule Raja and KTH-301, which recorded the population in the tune of 2.95 and 2.70, respectively. In the present findings, the hybrid To-7174 exhibited resistant reaction against whitefly, whereas the hybrids Abhinav, To-6242, Aryaman and To-2048 showed moderately resistant reaction. Moderately susceptible hybrids were Phule Raja, KTH-301, To-3251 and To-3440, whereas susceptible reaction to whitefly was seen in the variety Phule Kesari. The overall mean per cent disease incidence of tomato leaf curl virus (ToLCV) during both the season was in the range 16.66 to 62.22 per cent. The most promising highly resistant hybrids for the ToLCV was To-2174 with 16.66 per cent incidence followed by hybrids To-6242 (18.89%). The incidence of ToLCV on hybrids To-3440 and To-2048 was 24.44 and 24.50 per cent, respectively and categorized into resistant grade. Remaining hybrids Abhinav, To-3251 and Aryaman recorded moderate incidence of ToLCV with tune of 26.66, 26.66 and 31.16 per cent, respectively. The maximum incidence of ToLCV was recorded on variety Phule Kesari (62.22%) followed by KTH-301 (41.11%) and Phule Raja (38.89%) and showed susceptible reaction to the ToLCV.

Keywords: Varietal reaction; hybrids; whitefly; tomato leaf curl virus; resistance;

Poster Presentation

HPRVP-01

Adaptation is the key to success: Alterations in the feeding behaviour of rice yellow stem borer (*Scirpophaga incertulas* Walker)

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Rice yellow stem borer (RYSB) (*Scirpophaga incertulas* Walker), is well known for being a major pest of rice in the Indian subcontinent. It causes damage to rice plants by feeding the internal stem contents and restricting the transportation of nutrients and minerals, which leads to specific symptoms such as deadheart and white ear at the vegetative and reproductive stages respectively under field conditions. Under confined conditions, it produces unusual symptoms that were not previously reported in field conditions. If the neonates hatched when fed with plants at the booting stage, they made the borehole at the top internode and found their way towards the florets; made boreholes; entered inside and finally fed the anthers. If stem bits are not supplied, the neonates started to mine into the leaf midrib and fed the internal contents like a leaf miner or scrap the chlorophyll like rice leaf folder (*Cnaphalocrocis medinalis* Guen.). RYSB also cut the rice stem into two pieces horizontally like the rice swarming caterpillar (*Spodoptera mauritia* Boisduval), but from inside. Subsequently, the cut pieces were used as a shelter to move as like caseworm (*Nymphula depunctalis* Guen.). Further, they spun a silken web to unite the cut piece with another stem bit, enter inside by making a borehole in the new stem and continue their feeding. These observations evidence the adaptability of RYSB to varied conditions and hence evince successful survival. This may be one of the major reasons for RYSB's dominance in the rice ecosystem. Investigation under the pest biology and subsequently on of these abilities in the field condition should be done in the future, to devise proper pest management practices.

Keywords: Rice yellow stem borer; damage; symptoms; behaviour; biology

Rapid Virtual Oral Presentation

HPRVP-02

Assessment of virulence of gall midge population in rice cultures with r genes and *Echinochloa sp* under green-house condition.

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The Asian rice gall midge, *Orseolia oryzae* (Wood-Mason) (Diptera: Cecidomyiidae) is most prevalent in irrigated or rainfed wetland environments during tillering stage of rice crop. Seven distinct biotypes of the Asian rice gall midge have been characterized so far from different parts of India. Warangal rice gall midge population is designated as biotype 4M. In order to find the virulence pattern of the rice gall midge population, single gall midge female virulence test was conducted under green-house condition at RARS, Warangal with rice differentials, Abhaya (*Gm4*), Aganni (*Gm8*) along with Purple (Susceptible check) and *Echinochloa sp*. 77% of the females were virulent among which 53% were virulent on *Echinochloa sp*, 31.31% on Purple, 33% on Abhaya (*Gm4*) and 3% on Aganni (*Gm8*) recorded as the pot wise per cent virulence. Plant wise per cent virulence was also observed as 15% on *Echinochloa sp*, 8.76 % on Purple, 8.54% on Abhaya (*Gm4*) and 0.63% on Aganni (*Gm8*). Sex ratio of off springs emerged is 1:3 and is favourable in all the differentials and *Echinochloa sp*. It was found that Aganni (*Gm8*) has recorded low virulence by gall midge biotype 4M and *Echinochloa sp.* is the most prevalent weed which is also an alternate host for rice gall midge.

Keywords: Differential; gall midge; pest; rice; virulence

Rapid Virtual Oral Presentation

HPRVP-03

Behavioural rules in nestmate recognition among ants differ in conspecific and heterospecific colonies

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Nestmate recognition in ants is driven by cuticular hydrocarbon (CHC) profiles among interacting nestmates within the colony, whether conspecific or heterospecific. While the CHC profiles of conspecific nestmates are largely comparable, recognition between conspecific nestmates does not necessarily ensure hostility. Conversely, the discordance of CHC profiles often results in aggression and even fatality among heterospecific nest members. Further, the degree of aggressiveness among the interacting species may be highly variable depending on the genetic variability of the species, the CHC side chains, and the environmental contexts. We inquired whether the behavioural rules in nestmate recognition among ants differ between conspecific and heterospecific colonies and whether these rules remain consistent across varying density levels. The present investigation focuses on the behavioural cooperation and conflict between conspecific and heterospecific individuals of bi-colored arboreal ant, *Tetraponera rufonigra* (Formicidae: Pseudomyrmecinae), and two species of carpenter ants, *Camponotus dolendus* (Formicidae: Formicinae), and *Camponotus nearcticus* (Formicidae: Formicinae) from the tropics. The metrics of 'antennation', 'avoidance', and 'hostility'—indicators of cooperation and conflict—were assessed independently among the focal ants in a crisscross manner (Conspecific: *T. rufonigra* × *T. rufonigra*; Heterospecific: *C. dolendus* × *C. nearcticus*; *C. dolendus* × *T. rufonigra*; and *C. nearcticus* × *T. rufonigra*) at varying density levels (1:1; 1:5; 1:10) for each pair. We observed significant differences in cooperation (non-aggression) and conflict (aggression) among the conspecific and heterospecific species, regardless of the density of participating members.

Keywords: Cooperation and conflict; Conspecific and heterospecific ants; behavioural rule.

Rapid Virtual Oral Presentation

HPRVP-04

Biochemical basis of resistance in different pulses against *Callosobruchus maculatus* Fabricius

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A study was conducted to investigate the host preference of *Callosobruchus maculatus* (pulse beetle) on nine different pulses. The results showed that cowpea, mungbean, mothbean, and pigeonpea were the most preferred hosts, with higher adult emergence, shorter developmental period, and maximum seed damage. In contrast, horsegram, chickpea, fieldpea, and blackgram were the least preferred hosts. Biochemical analysis revealed that total soluble sugars favored beetle development, while high levels of total phenol and tannin were detrimental to growth and development. Cowpea and mungbean, with higher sugar content and lower phenol and tannin content, proved to be the most suitable hosts for *C. maculatus*. These findings have implications for the management of pulse beetle and the development of resistant pulse varieties.

Keywords: Host preference; biochemical; pulse beetle; *Callosobruchus maculatus*; pulses

Rapid Virtual Oral Presentation

HPRVP-05

Bioecology of shot hole borer infesting pomegranate (*Punica granatum* l.)

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The study on the bioecology of the shot hole borer infesting pomegranate (*Punica granatum* L.) was conducted with controlled laboratory condition at ICAR-NRC on Pomegranate, Solapur, Maharashtra, during 2023-24. Beetles reared on a sawdust-based artificial diet exhibited active movement, tunneling by removing diet particles with their mandibles and forelegs and expelling debris using their hind legs. Tunnel lengths reached 1-3.5 cm at 24 hours and 2-5 cm at 72 hours post-release. Development of all life stages occurred within the tunnel, with grubs dominating movement. Adults blocked the tunnel near entry and exit points to prevent grub escape. Solidified diet led to frass accumulation as toothpick-like structures, while in looser diets, frass formed small heaps. Eggs were laid singly or in groups and were relocated by adults in *in vitro* conditions, unlike in infested plants where they were found at tunnel ends. Eggs appeared after 10 days, and all stages were present by 20 days. A single foundress produced 13-14 eggs, 29-32 larvae, 7-9 pupae and 5-7 adults in 20 days. The diet supported development for 55-60 days before beetles exited through holes. Females lived longer (31.3 days) than males (10.8 days). The pre-oviposition, oviposition and post-oviposition periods averaged 3.00, 16.70 and 11.50 days, respectively, with an average of 28 eggs laid. The total life cycle lasted 50.60 days, with multiple generations per year. Larval and pupal periods averaged 8.10 and 5.65 days, respectively.

Keywords: Bioecology; pomegranate; scolytinae; ambrosia; beetle

Rapid Virtual Oral Presentation

HPRVP-06

Characterization of intra-specific interactions of white-backed planthopper, *Sogatella furcifera* (horvath) and analysis of gene expression in selected rice genotypes

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This study investigates WBPH intra-specific interactions at three different nymphal densities across 10 rice genotypes, focusing on antibiosis mechanism [nymphal survival (NS), nymphal duration (ND) and growth index (GI)]. The NS of WBPH was highest at 15 nymphs/plants (61.33%) followed by 30 nymphs/plants (57.56%) and 60 WBPH nymphs/plants (52.33%).TN1 showed highest NS at three densities (86.67%, 84.44% and 82.78%), While MO1, N22 and PTB33 showed lowest NS. Overall NS was highest in TN1 (84.63%) followed by BPT5204 (77.59%), RPBi04918-230S (65.56%), while lowest in MO1 (37.78%) and N'Diang Marie (40.18%). The ND was highest at 60 nymphs/plants (15.36 days) followed by 30 nymphs/plants (15.22) and 15 nymphs/plants (15.07). At 15 nymphs/plants, N22 (16.97 days) had longest duration, followed by RPBi04918-230S (14.94) and shortest in TN1 (12.24). At 30 nymphs/plants, MO1 (17.20 days) had longest duration, followed by RP 2068-18-3-5 (15.72), and shortest in TN1 (12.64). At 60 nymphs/plants, N'Diang Marie (16.95 days) had longest duration, followed by BM71 (15.21) and shortest in TN1 (12.93). BM71 and N22 showed decreased duration with higher densities. The overall ND was highest in MO1 (17.13 days), followed by N'Diang Marie (16.84), N22 (16.47), RP2068-18-3-5 (15.49), Swarna (13.35), TN1(12.60). The GI was directly proportional to NS. For gene expression analysis, 10 genotypes were screened using standard seed box technique. From these, four genotypes with varying resistance levels to WBPH were selected for gene expression analysis. Three herbivory resistance genes were chosen and their expression was analyzed through qRT-PCR. The *OsJAZ8*-gene was modestly upregulated in BPT5204 (2.46 folds) but highly expressed in RP2068-18-3-5(37.37-folds), PTB33 (47.63-folds) and MO1 (164.33-folds). The *OsWRKY45*-gene was downregulated in BPT5204 (2.46-folds) but highly upregulated in RP2068-18-3-5 (13.65-folds), MO1 (47.63-folds) and PTB33 (16.68 folds) indicating its defense role. The *OsJAR1*-gene was suppressed in BPT5204 (2.87-fold) but substantially upregulated in RP2068-18-3-5 (27.72-fold), MO1 (49.98-fold) and PTB33 (114.17-fold). These results highlight genotype-dependent responses and suggest that WBPH-resistant genotypes exhibit lower NS, longer ND, lower GI and stronger gene upregulation.

Keywords: Antibiosis; Gene expression; Intra-specific interactions; OsJAR1; WBPH;

Rapid Virtual Oral Presentation

HPRVP-07

Comparative incidence of *Pectinophora gossypiella* on transgenic Bt, non-Bt, desi cotton in Punjab, India

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The study on the population dynamics of *Pectinophora gossypiella* was conducted on seven cotton cultivars, including BG II (Ankur Jassi, RCH 776, US 71), Bt (PAU Bt 1, PAU Bt 2), non-Bt (F 2228), and desi cotton (LD 1019) at the Regional Research Station (RRS), Bathinda, during the kharif seasons of 2021 and 2022. The data revealed that flower damage began in the 27th standard meteorological week (SMW) (first week of July) and persisted until the 42nd SMW (mid-October) in both years. Green boll incidence exceeding the economic threshold level (ETL) was recorded in nearly all cultivars except Ankur Jassi and LD 1019 during the 30th SMW in both years. Overall, flower, green boll, and boll damage caused by *P. gossypiella* were significantly lower in desi cotton (LD 1019) and BG II (Ankur Jassi) but higher in Bt varieties (PAU Bt 1 and PAU Bt 2) and BG II cultivars (RCH 776 and US 71) during the study period. Abiotic factors such as minimum and maximum temperature, wind speed, and the number of rainy days negatively correlated with green boll damage, while morning and evening relative humidity showed a positive correlation. Principal component analysis (PCA) revealed that factor 1 and factor 2 accounted for 53.49% and 24.52% of the data variation, respectively. As a significant pest of cotton in India, *P. gossypiella* causes severe damage to the economic part of the crop, the boll, resulting in yield losses. This study highlights the importance of monitoring pest populations, particularly during peak infestation periods, and understanding the influence of weather variables on pest dynamics. The findings underscore the need for targeted management strategies tailored to seasonal infestation patterns and the specific susceptibility of various cotton cultivars.

Keywords: *Pectinophora gossypiella*; abiotic factors; population dynamics; Principal Component Analysis; correlation Coefficient;

Rapid Virtual Oral Presentation

HPRVP-08

Deciphering the potent kairomonal cues in western flower thrips, *Frankliniella occidentalis* (peragande) for sustainable pest management strategies

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Thrips are highly polyphagous agricultural pests that cause significant economic damage to numerous commercially cultivated crops through direct feeding and as vectors of tospoviruses. Olfaction plays a critical role in their host selection and survival, mediated by olfactory proteins such as odorant-binding proteins (OBPs), chemosensory proteins (CSPs), sensory neuron membrane proteins (SNMPs), and odorant receptors (ORs). These proteins enable thrips to detect and process volatile organic compounds (VOCs) emitted by host plants, triggering specific behavioral responses, such as attraction or repulsion. Recent advancements in molecular techniques, including gene sequencing and *in silico* docking studies, have helped identify key OBPs and CSPs associated with these olfactory-mediated behaviors in several insect species. However, research on olfactory proteins in thrips species remains limited, with most available data focusing on the Western flower thrips [*Frankliniella occidentalis* (Pergande)]. In *F. occidentalis*, seven odorant-binding proteins (OBPs) and eight chemosensory proteins (CSPs) have been identified. Studies have revealed that this species uses specific plant volatiles as host location cues (kairomones). For instance, (E)-β-caryophyllene and linalool are attractive in tomatoes, whereas (E)-2-hexenal and (Z)-3-hexenyl acetate are key attractants in peppers. Similarly, flowers emitting high levels of benzyl alcohol and linalool are highly attractive to *F. occidentalis* including non-floral odour ethyl nicotinate. Understanding the binding affinities of thrips olfactory proteins with specific volatiles [(E)-β-caryophyllene; linalool; (E)-2-hexenal; (Z)-3-hexenyl acetate; benzyl alcohol; ethyl nicotinate; benzaldehyde, *p*/*o*-anisaldehyde,geraniol; (+)-citronellol; E-β-farnesene; eugenol; 3-phenylpropionaldehyde;nerol;ethyl nicotinate] provides a foundation for developing eco-friendly pest management strategies (like attract-and-kill methods or repellent-based interventions), which could disrupt host-location behavior and offer sustainable solutions for managing these pervasive pests. This study aims to identify potent volatile cues utilized by *F. occidentalis*, paving the way for formulating effective trapping strategies to mitigate the impact of this nefarious pest.

Keywords: *Thrips;* olfactory proteins; binding affinity; *Insilico* docking; host volatiles

Rapid Virtual Oral Presentation

HPRVP-09

Distribution and dynamics of *Bemisia tabaci* on vegetable crops in Chhattisgarh

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Whitefly, *Bemisia tabaci* Gennadius is one of the most important pests of vegetables in India which causes both direct and indirect damage to the crop by lowering the plant vigour and transmitting the deadly begomo viruses. It transmits more than 100 plant viruses (Jones, 2003). This study analysed the population dynamics of *B. tabaci* on chilli (NS2572), tomato (Saaho), Brinjal (VNR212) and okra (Raadhika) under field condition. Whitefly egg, nymph and adult samples were also collected from upper, middle and lower strata of the plant on five randomly selected plants at seven-day intervals. The highest population of whiteflies was found in brinjal, followed by chilli, tomato, and okra. The pest population is positively correlated with relative humidity but negatively correlated with temperature. The distribution pattern showed that eggs were predominantly found on upper leaves in chilli (2.823±1.055), tomato (0.553±0.360), and brinjal (0.292±0.189) crops, whereas they were more prevalent on lower leaves in okra (0.461±0.398). Nymphs were mainly distributed in the middle stratum in chilli (1.353±0.738), tomato (2.4±0.480) and okra (0.523±0.348) crops, whereas they were more abundant in the lower stratum for brinjal (3.184±0.799) crop. Adults, on the other hand, were primarily located on the upper leaves in all four crops, including chilli (2.823±1.055), tomato (2±0.437), brinjal (3.469±1.681), and okra (1.261±0.608). This study helps us to take specific strata wise management strategy or sampling for research purposes.

Keywords- Whitefly; vegetables; stratum; distribution; tomato

Rapid Virtual Oral Presentation

HPRVP-10

Diversity and ecological roles of insects in the bitter gourd, *Momordica charantia* L., ecosystems at western region of Coimbatore, Tamil nadu, India

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Bitter gourd (*Momordica charantia* L.) is a prominent vegetable in India, cultivated primarily across 111,400 hectares, yielding approximately 1,391.8 metric tonnes annually, however its production is constrained by various biotic factors such as insect pests and diseases. Insect pests like red pumpkin beetle (*Aulacophora foveicollis*), fruit fly (*Bactrocera cucurbitae*), jassids (*Amrasca biguttula biguttula*), aphids (*Aphis gossypii*) and whiteflies (*Bemisia tabaci*) causes substantial damage leading to severe yield losses. Studies focusing on insect diversity and its ecological roles within bitter gourd ecosystems remains limited. To assess the diversity, abundance and functional role of arthropods within the bitter gourd ecosystem, systematic field collections were carried across four locations in Tamil Nadu, Narasipuram, TNAU Orchard, Thondamuthur and Pollachi during February to July 2023 using various sampling techniques, including sweep nets and traps documenting 12,481 individual arthropods belonging to 80 species across 45 families. Coleoptera was the most diverse order, while predator species constituted the largest group. Narasipuram recorded the highest species diversity (Shannon-Weiner index: 3.268) and richness. A total of 22 pest species were identified. These findings provide insights into arthropod diversity in bitter gourd ecosystems, ensuring sustainable crop production and thus contributing to future integrated pest management strategies.

Keywords: Arthropod diversity; bitter gourd; species diversity; Relative abundance; coleoptera

Rapid Virtual Oral Presentation

HPRVP-11

Forecasting of codling moth flight pattern using degree model: Insights from the North-Western Himalayan region of district Baramulla of Kashmir valley

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The codling moth, *Cydia pomonella* (L.) (Lepidoptera: Tortricidae), is a globally significant pest of pome fruits like apple, pear and walnut whose seasonal life cycle that is largely influenced by temperature. We developed a simple degree-day (DD) phenology model with reference to a temperate. Eight data sets were collected from apple orchards of Baramulla from 2021 to 2022 for each generation. Using the data from 2021 and 2022, non-linear regression model was constructed to fit cumulative moth captures as a function of accumulated degree days (Biofix 1st January, TL = 10.1 °C). The model described moth phenology of all three male flights with high accuracy. The first males of the first overwintering generation across all observation years were caught after 121 and 133 DD and peaked at 550 and 480 accumulated degree days during year 2021 and 2022 respectively. The first males of the second flight were caught after 704 and 630 DD, and the population peaked at 1321 and 1441 accumulated degree days. During 2021 and 2022 respectively. Moreover, the first males of the third and last flight were caught after 1604 and 1663 DD. Subsequently, using the moth capture data from 2021 and 2022, the predictions of the model were validated. The phenological model developed in this study is expected to be useful for field applications in integrated pest management (IPM) systems, for example, to forecast optimal spray times for available insecticides and application of other control measures.

Key words: codling moth; insect phenology; IPM; temperature; overwintering

Rapid Virtual Oral Presentation

HPRVP-12

Insect pests complex in a rice germplasm

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The insect pest complex in a rice germplasm (258 lines) was studied at Zonal Agricultural and Horticultural Research Station, Navile, Shivamogga during *Kharif* 2023. Seventeen types of insect pests were recorded from the rice germplasm irrespective of the rice genotypes. There were 8 types of sucking insect pests belonging to the family Alydidae, Cicadellidae, Delphacidae, Meenoplidae, Coreidae, Pentatomidae and Thripidae. The defoliators were 4 types belonging to the family Crambidae, Acrididae and Pyrgomorphidae. One type of stem borer was noticed which belongs to the family Crambidae. Fifteen days after transplanting (DAT) on 32nd Standard meteorological week (SMW) the incidence of leaf folder, green leafhopper, white leafhopper and grasshopper was first noticed, whereas incidence of gundhi bug from 60 DAT (39th SMW), white ears caused by yellow stem borer from 75 DAT (41st SMW). The maximum number of green leafhopper (2.63 no./hill) and grasshopper (0.5 no./hill) was noticed at 45 DAT (37th SMW). Leaf folder infestation (7.68%) and number of white leafhopper (1.16 no./hill) was maximum at 60 DAT (39th SMW). Gundhi bugs number (1.11 no./hill) was maximum at 75 DAT (41st SMW) and yellow stem borer infestation (4.99%) was maximum at 90 DAT (43rd SMW).

Keywords: Insect pests; incidence; white ears; rice; germplasm; standard meteorological week

Rapid Virtual Oral Presentation

HPRVP-13

Insect pests of linseed (*Linum usitatissimum* L.) in Nagaland

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Linseed (*Linum usitatissimum* L.), or flaxseed, is gaining prominence in the North-Eastern Hill (NEH) Region of India, known for its dual-purpose as an oilseed and fibre crop. Like any other crop, linseed also suffers severely due to ravages of various insect pests at various phases of its growth which reduce the crop yield and quality of the crop. The experiment was conducted during 2021-22 at Nagaland University: School of Agricultural Sciences, Medziphema, Nagaland, India. A total of 10 insect pests were recorded, out of which two was regarded as major insect pests viz.,green peach aphid and pod borer. The remaining eight insect species were categorized as minor pests which belonged to 3 orders and 7 families.

Keywords: Linseed; major pests; minor pests; pod borer; fibre crop

Rapid Virtual Oral Presentation

HPRVP-14

Morpho-biochemical traits of different pigeon pea genotypes and its field screening for resistance against pod fly *Melanagromyza obtusa* (Malloch)

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Host plant resistance is an important factor for minimizing the losses due to pod fly (*Melanagromyza obtusa*), which is the most destructive pest of pigeon pea (*Cajanus cajan* (L.). Millsp.). A comprehensive understanding of the various morphological and biochemical components of resistance in various pigeon pea varieties is crucial for developing effective strategies to breed insect-resistant crops. The present experiment was designed to study the bio-physical characters like pod wall thickness, pod width, trichome length, density of trichomes and biochemical characters viz., phenols, tannins and flavonoids content in different pigeon pea genotypes in order to check the variations in the occurrence of pod fly damage and subsequently, correlation studies were carried out during *Kharif* 2019-2020.Among fifteen pigeon pea genotypes taken the 11 genotypes i.e., IP 203, Sarad, Pusa172, Pusa151, Pusa171, Pusa163, Pusa141, Pusa153, KA 16-5, DA 18-1 and Rajendra Arhar1 showed moderately resistant against *M. obtusa* on percent damage of pod and grain. Morpho- biochemical characteristics like thickness of pod wall, density of trichomes, phenol content, tannin and flavonoid contents of pod exhibited a substantial negative correlation while width and length of the pod exhibit positive correlation towards pod fly.

Keywords: correlation; host plant resistance; morpho-biochemical characters; pod fly; pigeon pea

Rapid Virtual Oral Presentation

HPRVP-15

Morphological traits of trichomes in traditional rice genotypes and their impact on rice leaf folder, *Cnaphalocrocis medinalis* Guenee larval behaviour

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Rice serves as a primary source of calories and sustenance and providing food security for more than 60% of the Indian population. Of late, there is renewed interest towards traditional rice genotypes (TRVs) for its higher nutritional properties and diverse flavors. These genotypes are claimed to possess resistance or tolerance towards both biotic and abiotic stresses. One of the factors contributing such resistance is the presence of trichomes which acts as first line of defense restricting the orientation and feeding of insect pests. Considering this, selected traditional rice genotypes were evaluated at the Host Plant Laboratory, Department of Entomology, Annamalai University, India for the influence of trichomes on leaffolder (*Cnaphalocrocis medinalis* Guenee). Based on preliminary field evaluation conducted during *Kuruvai* 2023, one resistant, two tolerant and one susceptible genotype were selected for this study. Trichome length and density of different types of trichomes on leaves were observed. The influence of trichomes of TRGs against *C. medinalis* was evaluated *in situ* by conducting impedance test. The TRGs contained four types of trichomes namely Type 1, Type 2, Type 3 and Type 4. In the impedance test, larva took a significantly longer time to cross known distance of leaves of tolerant genotype *Kullakar*, which contained longest Type 1 trichome followed by resistant genotype *Karunkuruvai*, bearing maximum denser and medium sized Type 1 and Type 2 trichomes that effectively hinders the movement of larvae compared to susceptible check TN 1. Density and length of Type 1 was positively correlated with the time taken for larval movement and *vice versa* in case of Type 3 trichome. This clearly explains the hindrance caused by trichomes in the selected TRGs on larval locomotion. The present investigation shows that the defense of traditional rice genotypes on movement of *C. medinalis* was attributed partially by the trichomes. This resistant trait can be utilized in future breeding programmes to develop insect resistant genotypes.

Keywords: Traditional rice; genotypes; *Cnaphalocrocis medinalis*; trichomes; impedance

Rapid Virtual Oral Presentation

HPRVP-16

Population dynamics of mirid bugs in different B*t* and non-B*t* cotton genotypes in Karnataka

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Mirid bug is a significant insect pest of the *Bt* cotton ecosystem in Karnataka. The severe symptoms and damage caused by mirid bugs result in huge economic losses for the cotton crop. To have a better understanding, population dynamics of mirid bugs were studied in several *Bt* and non-*Bt* cotton genotypes in Dharwad district of Karnataka from 2023 to 2024. The study found diverse patterns of infection across different genotypes. The incidence of mirid bug was first noted in September II FN and steadily grew in October. The peak incidence of mirid bug was seen in November II FN in all genotypes except DDhC-11 and DLSa-17 N *Bt*. The highest infestation levels were observed in November II with DHH-11 non-*Bt* recording the peak at 14.21 bugs/10 squares. Considering the entire season mirid incidence, DHH-11 N *Bt* (5.30 bugs/10 squares) had the highest incidence, followed by DDhC-11 non-*Bt* (5.30 bugs/10 squares), while suvin (1.93 bugs/10 squares) had the lowest. DHH-11 non-*Bt* consistently exhibited greater amounts of square (19.68%) and boll (13.36%) shedding, as well as parrot-beaked 20.89% and 22.84% bolls with scar. In contrast, Suvin non-*Bt* showed the least amount of damage. These findings underscore the necessity for targeted pest management strategies in cotton ecosystems to mitigate mirid bug incidence effectively.

Keywords: Cotton; mirid bug; square shedding; population dynamics; genotypes

Rapid Virtual Oral Presentation

HPRVP-17

Population dynamics of sucking pest complex in brinjal crops

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Aphids (*Aphis gossypii* Glover), whiteflies (*Bemisia tabaci* Gennadius), and jassids (*Amrasca biguttula biguttula* Ishida) were first observed on the 46th, 47th, and 48th SMW, respectively. The number of *A. gossypii* peaked population (34.67/six leaves) was observed in the 7th SMW during this period, maximum temperature (26.17°C), minimum temperature (11.57°C), morning relative humidity (80.29%), evening relative humidity (41.29%) and rainfall (0.00 mm) were recorded followed by *B. tabaci* peak population (11.27/ six leaves) in the 8th SMW during this period, maximum temperature (29.73°C), minimum temperature (14.9°C), morning relative humidity (81.57%), evening relative humidity (35.43%) and rainfall (0.00 mm) were recorded and *A. b. biguttula* peak population (9.87/six leaves) in the 9th SMW during this period, maximum temperature (30.7°C), minimum temperature (16.06°C), morning relative humidity (78.29%), evening relative humidity (37.14%) and rainfall (0.00 mm) were recorded thereafter, and the population gradually decreased. The population of *A. gossypii* exhibited a negative, non-significant association with rainfall, minimum temperature, and maximum temperature, while a positive, non-significant correlation with morning and evening relative humidity. The *B. tabaci* and *A. b. biguttula* populations exhibited non-significant relationships with rainfall, morning and evening relative humidity, and a positive non-significant association with the minimum and maximum temperatures. This research addresses the difficulty of understanding the complex dynamics of insect infestations in brinjal. Examples of sucking insect pests that harm crops by ingesting their sap include jassids, whiteflies, and aphids. This is a difficult task since it requires forecasting when these pests will appear, how much damage they will cause, and the most effective method of getting rid of them without harming the ecosystem.

Keywords: Sucking pests ; seasonal incidence; correlation; regression analysis; weather parameters

Rapid Virtual Oral Presentation

HPRVP-18

Screening of coconut cultivars against exotic whitefly complex and assessment of *Encarsia guadelopae* parasitazation efficiency on whitefly

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Screening of coconut varieties against whitefly complex is crucial to determine the tolerance levels which can aid for developing resistant varieties against whitefly. The present study was conducted at HRS, Ambajipeta on ten coconut cultivars which include Gautami Ganga, Vasista Ganga, Abhaya Ganga, Vynateya Ganga, Pillalakodi Green, Pillalakodi Brown, Jonnalarasi Brown, East Coast Tall, Philippines Ordinary Tall and Kera Bastar . Among them, Gauthami Ganga (dwarf) recorded the highest incidence (87.53%) and intensity (92.79%) of whitefly complex (Rugose spiralling whitefly, *Aleurodicus rugioperculatus* Martin and Bondar's nesting whitefly *Paraleyrodes bondari* Peracchi) while lowest incidence of (51.11%) and intensity (69.20%) was recorded in the variety Kera Bastar (Tall). Percent parasitazation by *E. guadeloupae* was observed more in Gauthami Ganga (45.26 %) on pupa of RSW and lowest parasitazation was observed in Kera Bastar (3.21%). No parasitazation was observed by *E. guadeloupae* on BNW stages.

Keywords: Screening; coconut; whitefly; parasitazation; *Aleurodicus rugioperculatus*

Rapid Virtual Oral Presentation

HPRVP-19

Screening of Onion Varieties for their Susceptibility against Thrips (*Thrips tabaci* L.) in Gird region of Madhya Pradesh

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The onion is a biennial vegetable grown in temperate zones as an annual crop. Onion thrips (*T. tabaci* L.) (Thysanoptera: Thripidae) is a major insect pest that causes significant yield losses. With the aim to reduce these losses, the present study was undertaken to screen out the onion varieties against thrips, *Thrips tabaci* L., on onion in the Grid region of Madhya Pradesh, India. Twelve onion varieties were sown, and were observed with the incidence levels of thrips during two successive years, 2022–23 and 2023 – 24. It was noteworthy that none of the studied varieties were fully free of thrips infestations. In the investigation, among the twelve varieties screened against onion thrips, Nasik Red (N-53) and Gauran LR-241 were categorized as highly susceptible; Bhima Super, Bhima Red, Bhima Raj, Bhima Kiran, Bhima Safed, Bhima Shubhra, Bhima Shakti, and Bhima Dark Red were moderately susceptible; and Bhima Shweta and Light Red were less susceptible varieties to thrips. The variety Light Red had the lowest thrips population, followed by Bhima Shweta. Among the moderately susceptible varieties, Bhima Shakti had the highest thrips population, followed by Bhima Shubhra. The highly susceptible varieties Nasik Red (N-53) and Gauran LR-241 recorded the highest thrips population. Thus, it was concluded that varying levels of susceptibility of different onion varieties against *Thrips tabaci*, highlights the potential of resistant varieties for effective insect pest management and improved yield programmes.

Keywords: *Thrips tabaci*; varieties; susceptibility; Bhima Shweta; light Red

Rapid Virtual Oral Presentation

HPRVP-20

Seasonal incidence of insect pests of sesame in relation to environmental factors

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The study on "Seasonal incidence of major insect pests of sesame and their natural enemies in relation to environmental factors" was conducted at experimental farm of Project Coordinating unit Sesame and Niger (ICAR), Jawahar Lal Nehru Krishi Vishwa Vidyalaya, Jabalpur, MP, India during *kharif* season 2024. The results revealed that different insect pests were damaging the crop at different stages of the crop growth. Among the recorded insect pests, leaf webber and capsule borer, mirid bug, whitefly, Bihar hairy caterpillar, leafhopper and hawk moth were the major insect pests. The incidence of insect pests viz., *Antigastra catalaunalis*, mirid bug, whitefly and Bihar hairy caterpillar were first noted on the crop during 35th standard meteorological week (29th August, 2024). The peak population of these insect pests were received during 37thSMW (12th September, 2024) and coincided with the flowering to capsule formation stage of the plant growth. During the peak incidence period, the maximum and minimum temperature and morning and evening relative humidity were 30.0°C, 24.2°C and 93.3%,75.3% respectively. Correlation of whitefly and mirid bug population with meteorological parameters was found non-significant while these insect pests showed non-significant positive correlation with evening relative humidity and minimum temperature but negatively correlated with maximum temperature and morning relative humidity. Larval population of leaf webber and capsule borer (*Antigastra catalaunalis*) was showed significant positive correlation with morning and evening relative humidity and rainfall. The lady bird beetle and spider were recorded as the major predators of sucking insect pests of sesame. The incidence of gall fly was noted during 38th standard week and coincides with the capsule formation stage of the crop. The peak period for the incidence of gall fly was recorded during 43rd standard week. Incidence of til hawk moth was noted from 36th standard week and their incidence was continued till maturity of the crop.

Keywords: Insect pests; Relative Humidity; Seasonal Incidence; Sesame; Temperature

Rapid Virtual Oral Presentation

HPRVP-21

Thrips parvispinus, the unrelenting threat to chilli cultivation

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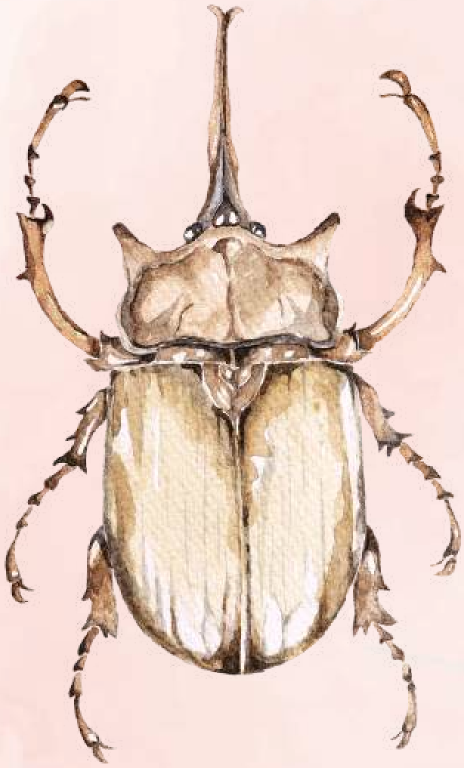
The chilli thrips *S. dorsalis* was the most dominant and destructive pest. During 2021, the outbreak of this species was observed on chilli by mainly colonizing flowers and underside of leaves and affected thousand acres of chilli causing up to 80-100% yield loss and completely replaced the native thrips species. After the time introduction of any invasive pests, it usually dominates the other native pests in view of the absence of the natural enemies and after few years the incidence continue to decline. Hence a systemic study need to be done to monitor the current status of the pest for developing effective management strategies. Hence the study was taken up to assess the species composition of thrips and competitive displacement ability of the new invasive species in chilli during *kharif,* 2023 & 2024. The findings revealed that, *T. parvispinus* and *S. dorsalis* shared their niche in leaves and fruits, while *Thrips parvispinus* (Karny), *Thrips hawaiiensis* (Morgan), *Megalurothrips* spp. and *Haplothrips* spp. were found occurring in flowers. The competitive displacement ability studies revealed that, *S. dorsalis* was the only species found damaging the crop at nursery stage and it continued to remain as the most dominant species even at vegetative stage, (82.63%) over *T. parvispinus* (17.37%), but after flower initiation, *T. parvispinus* continued to increase both on leaves and flowers and it competitively displaced the *S. dorsalis* on leaves to an extent of 78.08% over *S. dorsalis* (21.92%) at reproductive stage. Similarly, in flowers, *T. parvispinus* was predominant (99.19%) over other thrips species and in fruits also, found to be the most dominant species (84.83%) over *S. dorsalis* (15.17%). The overall results indicated that though *T. parvispinus* incidence was very less at the beginning of the crop stage, it continued to remain as the most dominant species infesting all parts of the plant by competitively displacing the native thrips at reproductive stage of the crop.

Keywords: *Thrips parvispinus*; chilli thrips; species composition; competitive displacement; management

Rapid Virtual Oral Presentation



Theme VII
Climate Change and Insects, Industrial Entomology, and Non-Insect Pests of Crops

ENTOMOLOGY STUDENTS CONCLAVE

ESC 2025

ENTOMOLOGICAL SOCIETY OF INDIA

CCO-01

Population build-up of black cutworm, *Agrotis ipsilon* (Hufnagel) on linseed crop in north bank plain zone of Assam.

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The population build-up of black cutworm, *Agrotis ipsilon* (Hufnagel) on linseed crop (var.-Sekhar) was studied at the experimental farm of AICRPDA, BNCA during *rabi,* 2023-24. Larvae of *A.ipsilon* first appeared in the crop field with a low population density (0.33 larvae/sqm) during the 47th Standard Meteorological Week (SMW), 2023 when the crop was in the seedling stage. A sharp increase in the larval population (2.16 larvae/sqm) become evident in the next sampling date (27 November,2023). After that the black cutworm population increased gradually and attained a peak (6.83 larvae/sqm) on 11 January, 2024 (2nd SMW) coinciding with the late vegetative stage of the crop. Later it showed a declining trend till the 7th SMW, 2024. Among the weather parameters, both maximum and minimum temperatures exhibited significant negative correlations (r=0.518 & 0.623, P=0.05, respectively) with the larval population of black cutworm. Multiple regression analysis of various weather parameters showed 58.20 percent relationship with the larval population of *A.ipsilon*.

Keywords: *Agrotis ipsilon;* black cutworm; linseed crop; population; seedling stage

Oral Presentation

CCO-02

Population dynamics of insect pest complex of summer green gram [*Vigna radiata* (L.)] and their correlation with weather parameters

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A field experiment on "Population dynamics of insect pest complex of summer green gram [*Vigna radiata* (L.)] and their correlation with weather parameters" was conducted in PG research field of Biswanath college of Agriculture, Assam Agricultural University, Jorhat, during summer, 2024. The results revealed that black aphid, *Aphis craccivora* koch; spotted pod borer, *Maruca vitrata* (F.); gram pod borer, *Helicoverpa* armigera (H.); green stink bug, *Nezara viridula* (L.) and coreid bug, *Riptortus pedestris* (F.) were observed infesting green gram crop. The population of *A. craccivora* was first recorded in 16th Standard Meteorological Week (SMW) during vegetative stage with a peak population of 63.42 aphids per 5 cm twig in 21st SMW and persisted until crop maturity (21st SMW). This pest showed a positive, non-significant correlation with maximum temperature (0.622) and a negative, significant correlation with rainfall (-0.503*). *H. armigera* appeared in the 18th SMW with 3.2 larvae per plant and peaking in the 20th SMW with average of 4.5 larvae per plant, which exhibited a negative, significant correlation with relative humidity (-0.640*). *M. vitrata* was active from the 18th SMW at the reproductive stage, with the largest population recorded in the 20th SMW, averaging 3.2 larvae per plant, and showing a negative, significant correlation with relative humidity (-0.641*). *N. viridula* was first noticed in the 16th SMW and peaked at 5.2 bugs per plant in the 19th SMW, demonstrating a positive, significant correlation with relative humidity (0.757*). Finally, *R. pedestris* was observed from the 18th SMW at the vegetative stage until crop maturity, with the highest population in the 21st SMW, averaging 2.2 bugs per plant, and showing a positive, significant correlation with maximum temperature (0.717*). These findings provide valuable insights into the pest dynamics of green gram crops and their relationship with weather conditions, aiding in better pest management strategies.

Keywords: *Nezara viridula;* Population dynamics; *Aphis craccivora; Helicoverpa armigera*; *Riptortus pedestris*

Oral Presentation

CCO-03

Population dynamics of major pests infesting green gram (*Vigna radiata* l.) in the Gangetic plain of West Bengal

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In India, green gram or mungbean (*Vigna radiata* L.) is the third crucial pulse crop after chickpea and pigeonpea. At every stage of the crop cycle, from seedling to storage, insect pests attack mungbeans and severely reduce crop productivity. As environmental factors play an important role especially in the era of climate change on the bio-ecology of the pest as well as its damaging potentiality, it is important to study the population dynamics of the pest complex recorded on the crop for developing an ecologically sound pest management strategy. In this context an experiment was undertaken during pre-*kharif season* of 2022 and 2023 on five germplasms of green gram viz. BCM 20-46, BCM 20-47, BCM 21-133, Sukumar and Virat to study the incidence of major insect pests of mungbean and their correlation with weather parameters. The observation on pest population was taken at weekly intervals from randomly selected five plants of each replication starting from three weeks after sowing. Major insect pests recorded during the investigation were spotted pod borer (*Maruca vitrata*), black bean aphid (*Aphis craccivora*) and flower thrips (*Megalurothrips* sp.). *Megalurothrips* sp. reached its highest peak in flowering stage while highest population of *Maruca vitrata* and *Aphis craccivora* was recorded in pod development stage. In case of *Maruca vitrata* and flower thrips, most of the meteorological parameters taken into consideration were found to be non-significantly correlated. However, rainfall showed a significant positive correlation with the aphid population.

Keywords: Green gram; insect pests; meteorological parameters; population dynamics

Oral Presentation

CCO-04

Seasonal incidence and effect of weather parameters on insect-pests in maize

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A field study on "Seasonal incidence and effect of weather parameters on insect-pests in maize" was conducted during Kharif, 2024 at PG Research Field of Biswanath College of Agriculture, Assam Agricultural University. A total of five insect pest viz., fall armyworm, *Spodoptera frugiperda*, maize aphid, *Rophalosiphum maidis*, *Monolepta signata*, *Chaetocnema pulicaria* and gundhi bug, Leptocorisa species were recorded as pest of maize crop. Among natural enemy's rice red lady bird, *Micraspis discolour*, six spotted zigzag lady bird beetle, *Cheilomenes sexmaculata*, assassin bug, *Rhynocoris iracundus*, leafhopper assassin bug, *Zelus renardii* as predator and Ichneumonidae species, Tachinidae species as parasitoides were recorded on maize crop. The larval population of *S. frugiperda* was first recorded on last week of March (13th SMW) with a peak population of 3.20 larvae/ plant during 2nd week of May (19th SMW). The maximum infestation (60%) was recorded during 20th SMW. *R. maidis* population was first noticed on 1st week of March (9th SMW) with a maximum population of 67.93 aphid/plant on 4th week of May (21st SMW). Similarly, *M. signata* was observed from 1st week of March (9th SMW) with a peak of 1.2 beetle/plant during last week of April (17th SMW). The correlation between *S. frugiperda* population with environmental factors and plant age revealed that larvae of *S. frugiperda* exhibited positive and significant correlation with maximum temperature (0.693*), whereas, it was negative and significantly correlated with rainfall (-0.158**) and non-significantly with plant age (-0.038). Similarly, *R. maidis* population was positive and significantly correlated with maximum temperature (0.771**), plant age (DAS) stating higher infestation in later stages of crop growth, while it shows a significantly negative correlation with rainfall (-0.074**) and negative but non-significantly correlated with relative humidity (-0.017).

Keywords: Fall armyworm; aphids; infestation; natural enemies

Oral Presentation

CCO-05

Spatial and temporal variations in *Nilaparvata lugens* (stal) population based on temperature-driven phenology model

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Global warming, droughts, changing atmospheric CO_2 levels, and weather disruptions are critical challenges of the 21st century. Insects being cold-blooded organisms, are highly dependent on the external environment, particularly temperature, which influences their establishment, abundance, phenology, and distribution. Understanding these changes is crucial for predicting their geographical distribution under changing climate scenarios. The brown planthopper (*Nilaparvata lugens*), a monophagous phloem feeder, significantly affects the rice crop by causing direct yield losses and transmitting viral diseases, leading to severe economic and food security issues. Its outbreaks are strongly linked to temperature, highlighting the need to study its distribution in India under changing climate conditions. A temperature-response phenology model was developed, simulated, and validated by analyzing *N. lugens* development across constant temperatures (18, 22, 26, 30, and 34°C & 75–80% RH) using Insect Life Cycle Modeling (ILCYM). Life table parameters, including the finite rate of increase (λ), gross reproductive rate (GRR), intrinsic rate of natural increase (r_m), net reproductive rate (Ro), mean generation time (T), and doubling time (Dt) were assessed. Spatial simulations integrated with geographic information system (GIS) algorithms enabled the prediction of pest population dynamics across agroecological regions. Risk indices for establishment, abundance, and generations were mapped for representative locations, scenarios, and timeframes (2030–2090). Results indicated high establishment risk (1.0) in Southern and Eastern regions, high abundance risk (20–25 index), and 52% of areas projected as highly suitable (>9 generations per year) for *N. lugens* under current climatic conditions. These findings offer a framework for proactive, region-specific pest management strategy to mitigate rising risks due to climate change. The methodology can also be adapted to study other major and invasive pests in India.

Keywords: cereals; climate; temperature; risk mapping; yield

Oral Presentation

CCO-06

The potential role of *Dremomys lokriah* in agro-ecosystem: Impacts and management strategies

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Dremomys lokriah, commonly known as the Orange Bellied Himalayan squirrel, plays a complex role in agricultural ecosystems, particularly in regions where its habitat overlaps with cultivated land. This study examines the dual nature of *D. lokriah* as both a contributor to ecosystem services and a potential agricultural pest. The squirrel's foraging behaviour facilitates seed dispersal, contributing to forest regeneration and biodiversity. Ecological analyses revealed that *D. lokriah* is an opportunistic feeder, adapting its diet based on seasonal availability. With the abundance of food their damage also increased. This dietary flexibility made them a potential pest in agro-ecosystem. The study was conducted in Jorhat district of Assam during 2023-24. Direct observations confirm that the species' activity peaks during early mornings and late afternoons. The study of damage incidence was done in coconut and arecanut. It was recorded that *D. lokriah* also caused damage in several crops such as banana, sugarcane, pumelo, orange, wood apple, Indian goose berry, mango, guava, ridge gourd, ivy gourd. Their damage incidence reached up to 30-55% in coconut and 18-53% in arecanut. The study revealed that the seasonal variation in activity and the foraging behaviour had a huge impact on the crop damage. During the squirrels' reproductive season and lactating season, the activity as well as the extent of crop damage also increased by 2-3 times. For the management strategies such as clean cultivation with trunk bending recorded 70-85% reduction in squirrel damage followed by squirrel guard (65-80%) and e-Cannon (40-55%) in coconut and arecanut. The findings highlighted the necessity of a holistic approach to manage *D. lokriah* populations, emphasizing their ecological significance while mitigating economic damages. By integrating ecological and agricultural sciences, this research provides a framework for fostering co-existence between wildlife and agriculture, contributing to both biodiversity conservation and sustainable farming practices.

Keywords: *Dremomys lokriah;* damage; coconut; arecanut; management

Oral Presentation

CCPP-01

Impact of climate change on insect

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Insects are a very crucial part and parcel for the sustainability of the ecological balance by its multifunctional contribution to pollination, decomposition and serving as the vital component of food web. However, the abrupt changes in the climate has profoundly impacted the insect population and their ecological functions. Rising Global temperature, erratic rainfall patterns and increased carbon dioxide levels are disrupting the insects life cycles, fecundity, influencing their physiology, behaviour and distribution. Pollinators like bees, butterflies, bats, which play a crucial role in maintaining the biodiversity and proper food distribution are facing a surge decline in their population leading to detrimental effect on global food security and biodiversity as obvious prima facie impact. But agricultural pests and disease vectors, such as mosquitoes and ticks, are increasing abruptly that fuel outbreaks of malaria and dengue and a host of other vector-borne diseases. Populations of many insects are impacting predator-prey dynamics, destroying ecosystem services, and eroding biodiversity. Understanding these impacts is very important for conservation strategy formulation, climate-resilient agricultural practice promotion, and the mitigation of cascading effects of climate change on both natural and human-managed ecosystems. Urgency in the research and policy implementation are needed to safeguard the insect diversity and maintain the ecological stability in the face of a rapidly changing climate.

Keywords: Climate change; Insect biodiversity; Pollinators; Vector-borne diseases; Ecosystem stability; Conservation strategies

Poster Presentation

CCPP-02

Population dynamics of mustard aphid on (*Brassica juncea* l.) crop in relation to abiotic factors

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A study on the population dynamics of mustard aphid (*Lipaphis erysimi*) was conducted during the Rabi seasons of 2021–2022 and 2022–2023 at the Agricultural Research Farm, Institute of Agricultural Sciences BHU, Varanasi. Two mustard varieties, Pro Agro Hybrid Mustard-5222 and Pioneer Hybrid Mustard-45S46, were cultivated under three fertility levels (75%, 100% and 125% RDF) and three seed treatments (Control, PSB+SDB, and NPK consortia) in a split-plot design. Weekly observations of aphid populations on the central mother axis revealed population peaks of 15.08 and 11.44 aphids/plant for Pro Agro Hybrid Mustard-5222 and 13.09 and 12.02 aphids/plant for Pioneer Hybrid Mustard-45S46 across two years, respectively. The aphid population was influenced by weather parameters, with relative humidity (morning hours) and rainfall showing positive associations. Additionally, varietal traits and the flowering stage significantly impacted aphid infestation and population growth rates. The findings highlight the importance of integrating varietal selection and environmental factors for sustainable pest management in mustard cultivation.

Keywords: Biofertilizer; hybrid variety; mustard aphid; population dynamics; weather parameters

Poster Presentation

CCVP-01

Growth and development fall armyworm, *Spodoptera frugiperda* (J E Smith) on maize at different temperatures

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Maize (Zea mays L.) is an important cereal food crop belonging to family Graminae or Poaceae, globally known as “Queen of cereals” due to its high genetic yield potential and variability. Fall armyworm is a polyphagous insect pest resident to tropical and subtropical America which is rapidly expanding in most of the maize growing areas. FAW has emerged as a great menace due to mankind due to its short development period, wide host range, high prolificacy, high dispersal ability and absence of diapause. Temperature is one of the most important environmental factors influencing insect growth, development and reproduction of insects. The growth and development of the fall armyworm, *Spodoptera frugiperda* (J.E. Smith), were significantly influenced by temperature when reared on maize. The incubation period, larval, and pupal durations were shortest at 35°C (1.69, 9.56, and 6.88 days, respectively) and longest at 20°C (6.78, 31.08, and 22.14 days, respectively). The highest egg hatchability (94%) was recorded at 25°C, while the lowest (78%) was observed at 35°C. Larval development proceeded through six instars at all temperature levels. The highest pupation rate occurred at 30°C (92%), followed by 25°C (88%), whereas it was lowest at 20°C (34%). The highest growth index was recorded at 30°C (7.77), and the lowest at 20°C (1.09). The total developmental period (egg to adult emergence) was shortest at 35°C (18.13 days) and longest at 20°C (60.00 days). The highest adult emergence occurred at 30°C (98.2%) and the lowest at 35°C (68.4%). Adult longevity was significantly affected by temperature, with the longest lifespan at 20°C (males: 12.24 days, females: 13.84 days) and the shortest at 35°C (males: 5.12 days, females: 6.32 days). The shortest total life cycle duration was at 35°C (males: 23.25 days, females: 24.45 days), while the longest was at 20°C (males: 72.23 days, females: 73.84 days). The pre-oviposition, oviposition, and post-oviposition periods were maximum at 20°C and minimum at 35°C. Fecundity was highest at 30°C (764.40 eggs per female) and lowest at 35°C (195.20 eggs per female). The sex ratio (male:female) was highest at 20°C (1:1.18) and lowest at 35°C (1:0.66). Overall, 30°C was the most favorable temperature for the rapid growth, high survival, and reproductive success of *S. frugiperda*, while extreme temperatures (20°C and 35°C) negatively impacted development and fecundity.

Keywords: Temperature; larval duration; Fall armyworm; fecundity; Oviposition

Rapid Virtual Oral Presentation

CCVP-02

Impact of abiotic factors on the biology of rice leaf folder, *Cnaphalocrocis medinalis* (Guenee)

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Rice (*Oryza sativa* L.) is the world's leading staple food that nourishes more than 65 per cent of world's population. In India, insect pests pose a major menace to the rice production causing 31.1-86 per cent yield losses. Insects being poikilothermic are greatly affected by various environmental factors in the atmosphere. Rice leaf folder, *Cnaphalocrocis medinalis* (Guenee) (Lepidoptera: Pyralidae) which earlier was considered as a pest of minor importance has attained status of major pest in many parts of India. The study on influence of abiotic factors on several growth and developmental parameters of *C. medinalis* was conducted in Plant Growth Chambers, Entomological Research Farm, Punjab Agricultural University (PAU), Ludhiana. The study evaluated possible impact of variable temperature (22:32°C to 26:35°C), carbon dioxide (400 to 450 ppm) and relative humidity (75% to 85%) on the biology of *C. medinalis*. Larval duration of *C. medinalis* decreased with increasing temperature, CO_2 and RH ranging from 17 to 7.50 days. The mean number of pupae developed varied from 9.25 to 7.50 days as higher pupal counts were recorded at lower temperature ranges and declining numbers at higher ranges while CO_2 concentration and RH had non-significant effects. The pupal duration of *C. medinalis* decreased from 8.50 to 6.00 days with rising temperature while other abiotic factors had minimal influence. The mean number of adults emerged decreased from 8.75 to 5.25 as temperature increased and CO_2 concentration showed a similar trend while RH had a minimal effect. The sex ratio of *C. medinalis* shifted with increasing temperature, CO_2 concentration and RH to a higher proportion of females. The longevity of male and female adults decreased significantly with rising temperature from 6.50 to 4.38 days and 7.00 to 4.80 days respectively. Fecundity of adult female increased from 106.50 to 142.25 eggs with increasing temperature, CO_2 concentration and RH. These changes due to abiotic factors impacts crop-pest interactions posing a global threat to food security. The changing status of pests requires adaptive management strategies, monitoring climate and pest population and the use of modelling prediction tools.

Keywords: *Cnaphalocrocis medinalis* (Guenee); rice; climate change; abiotic factors; pest;

Rapid Virtual Oral Presentation

CCVP-03

Impact of climatic variables on dusky cotton bug infestation in Bt cotton

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A study was conducted during the *Kharif* season 2023 at the SKN Department of Entomology to evaluate the correlation between the population dynamics of the dusky cotton bug (*Oxycarenus spp.*) and various weather parameters on Bt cotton. Key meteorological factors, including maximum temperature, minimum temperature, relative humidity, rainfall, and sunshine hours, were analysed. The correlation coefficients revealed that the dusky cotton bug showed a positive correlation with maximum temperature (0.58) and sunshine hours (0.42), while a weaker positive correlation was observed with minimum temperature (0.28). Conversely, negative correlations were recorded with relative humidity (-0.45) and rainfall (-0.23). These findings highlight the significant influence of climatic conditions on the population trends of the dusky cotton bug, providing critical insights for integrated pest management strategies in Bt cotton ecosystems.

Keywords: - Dusky cotton bug; Bt cotton; weather parameters; population dynamics; integrated pest management

Rapid Virtual Oral Presentation

CCVP-04

Population study of birds in different stages of rice agro-ecosystem

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Birds are found to be abundant in the agricultural field as they provide concentrated and highly predictble food source. The different category of birds such as beneficial, predatory, insectivorous and omnivorous birds play a very important role in controlling the never-ending insect population. The variation of species richness and relative abundance of avifauna is associated with crop cultivation stages such as ploughing, puddling operation, transplantation, vegetative stage, milky and grain maturation, harvesting and post harvesting stages of the crop. A study was conducted in the kharif paddy at the experimental blocks of AAU-Zonal Research Station, North Lakhimpur in the year 2022-23 to identify and record the community structure and diversity of birds in the paddy agro-ecosystem. At different stages of the crop, the number of all the birds visiting the paddy field (0.25 ha) were recorded between 07.45 and 9.00 h to determine their relative abundance (%). A total of 20 species were observed in the paddy fields from transplanting to harvesting stages of the crop. Most granivorous birds were observed from late vegetative stage to the harvesting stage of the crop. Baya weaver, *Ploceus phillipinus* (36.81%) was observed to be most abundant during maturity stage followed by Munia, *Lonchura sp* (19.75%) at harvesting stage. However, barn swallows *Hirundo rustica*, were observed to be highest (23.29%) at vegetative stage and cattle egret, *Bubulcus ibis* (13.75%) followed by common myna, *Acridotheres tristis* (11.98) were observed to be highest at transplanting stage of the crop. The observation revealed that most beneficial insectivorous birds such as barn swallow, cattle egret, jungle and common myna are abundant at the vegetative stage of the rice crop that can help in reduction of insect pest such as green leaf hopper, stem borer, leaf folder, cutworm etc. 60 percent of bird population in agricultural landscape of Assam are insectivorous. The study also suggests proper preventive measures such as use of botanicals and other mechanical devices at proper time of the crop can manage granivorous birds in the crop field.

Key words: Stages of the crop, cattle egret (*Bubulcus ibis*), barn swallow (*Hirundo rustica*), baya weaver (*Ploceus phillipinus*), munia (*Lonchura sp*)

Rapid Virtual Oral Presentation

CCVP-05

Seasonal abundance of melon fruit fly, *Zeugodacus cucurbitae* (coquillett) on cucumber in relation to abiotic factors

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The cucurbit fruit fly, *Zeugodacus cucurbitae* (Coquillett) (Diptera: Tephritidae), is a polyphagous pest widely distributed across tropical, subtropical, and temperate regions. It poses a serious threat to cucurbitaceous crops, infesting over 81 host plants, including bitter gourd, bottle gourd, cucumber, pumpkin, muskmelon, sponge gourd, and snake gourd. Crop losses caused by this pest range from 20% to 100%, depending on the cucurbit species and environmental conditions. Effective management of *Z. cucurbitae* (Coquillett) requires monitoring adult populations and predicting outbreaks. Pest incidence is driven by interactions between host plants, insects, and abiotic factors such as temperature, rainfall, relative humidity, evaporation etc., which significantly influence population dynamics. The present study on the seasonal abundance of the melon fruit fly, *Z. cucurbitae* (Coquillett), on cucumber was conducted from July to October, 2024 at the experimental area of the Department of Entomology, CCS Haryana Agricultural University, Hisar. The cucumber crop variety used was *Green Wonder*, and the experimental plot was maintained insecticide-free throughout the cropping season. Parapheromone traps (Cue lure traps) were installed in the field to capture adult male fruit flies. The number of adult males caught per trap was recorded weekly. The activity of *Z. cucurbitae* (Coquillett) adults commenced on 15th July and ended on 28th October, with peak populations recorded between September and early October (38th to 40th Standard Meteorological Week), averaging 55, 58, and 62 males per two traps. A sharp population decline occurred in late October. Moreover, the fruit fly population showed positive and significant correlations with maximum temperature and evaporation. Positive but non-significant correlations were observed with minimum temperature and sunshine hours, while negative and non-significant correlations were recorded with relative humidity and rainfall. These findings highlight the significant role of environmental factors in influencing *Z. cucurbitae* (Coquillett) population dynamics, aiding effective pest management strategies.

Keywords: Cucumber; Fruit fly; Abundance; Abiotic; Cue lure

Rapid Virtual Oral Presentation

CCVP-06

Seasonal incidence of *Bemisia tabaci* (Gennadius) on cotton and its correlation with weather parameters under subtropical conditions of Punjab, India

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Cotton, being an important crop, is attacked by a large number of pests throughout its growth period. The introduction of Bt cotton in 2002 led to drastic reduction in bollworm incidence. However, sucking pests has increased in this period and outbreak of whitefly, *Bemisia tabaci* was observed in 2015. The research study was done with an objective, to record the seasonal population dynamics of whitefly on cotton and its correlation with weather parameters under Punjab conditions. Bt cotton cultivar (RCH 776) and non-Bt cotton variety (F 2228) were grown at PAU, Ludhiana during *kharif* 2022. Observation of pest population was taken weekly from three leaves (top, middle, bottom) of 10 plants per replication during standard meteorological weeks (June-September, 2022). Meteorological data including temperature, relative humidity (RH), rainfall, and sunshine hours, were correlated with pest populations, to assess the influence of abiotic factors on pest population levels. The results revealed that whitefly pest incidence was more on Bt cotton cultivar in comparison with non-Bt cotton variety. The peak population of whitefly on RCH 776 was observed on 27th (10.08/ plant) and 29th (11.81/ plant) standard meteorological week. The peak population of whitefly on F 2228 was observed on 29th (10.80/ plant) standard meteorological week. The incidence of whitefly on RCH 776 and F 2228 was high during 3rd week of July, 2022. The correlation studies indicated that in Bt cotton, whitefly population showed a positive correlation with relative humidity (RH) and rainfall, but a negative correlation with maximum temperature, minimum temperature, and sunshine hours. For non-Bt cotton, RH and rainfall were positively correlated, while sunshine hours and temperatures (both maximum and minimum) were negatively correlated. The study concluded that July is critical for whitefly infestation and population buildup, highlighting the need for Integrated Pest Management strategies to control the pest and ensure healthy plant growth.

Keywords: seasonal incidence; *Bemisia tabaci;* correlation; abiotic factors; standard meteorological week

Rapid Virtual Oral Presentation

CCVP-07

Valuable resources from black soldier fly: A sustainable contributor to the circular bioeconomy

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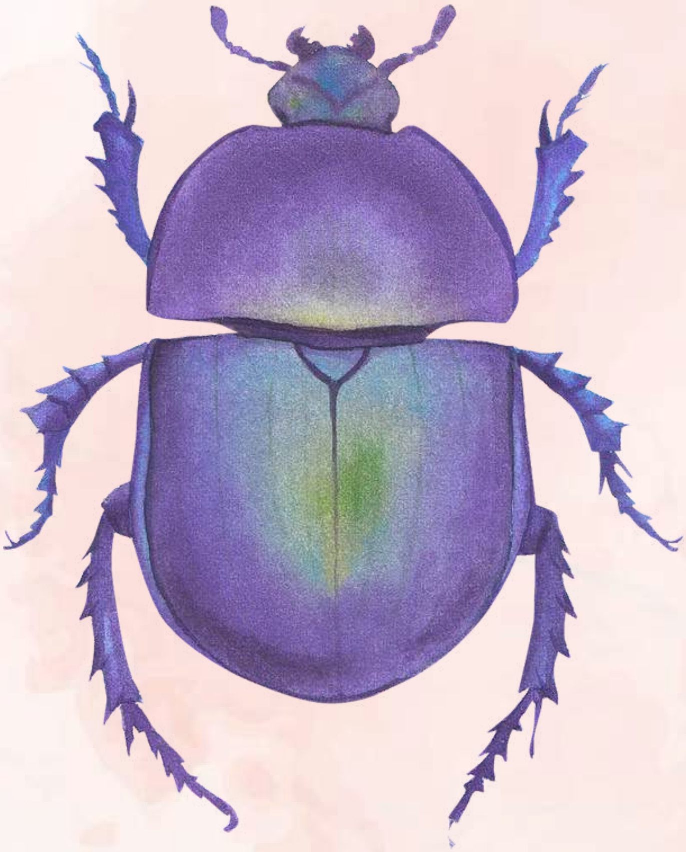
Black Soldier Fly (BSF) larvae (*Hermetia illucens*L.) present a sustainable solution for the production of certain biodiesel, biofuel, chitin, chitosan, biofertilizer, etc. and serves as a promising contributor to the circular economy. BSFL contains approximately 40% protein, 30% lipids and chitin content ranges from 8% to 24%, which can be processed into chitosan. Transesterification of BSFL lipids from food waste has achieved biodiesel yields of up to 93.8 wt %, with fuel properties meeting international standards.Chitosan is a biodegradable biopolymer with significant potential in various sectors such as agriculture, food industry, and healthcare. Its antimicrobial properties make it ideal for food packaging, extending shelf life and enhancing food safety. Moreover, BSF-derived chitosan can be utilized in manufacturing biofertilizers, contributing to organic farming by improving soil health and nutrient recycling. Research into optimizing BSF rearing substrates and feedstock preservation methods, such as acidification, will improve bioconversion efficiency and increase the applicability of BSFL products across different industries. BSFL serves as a significant asset in sustainable agriculture, waste management, and environmental conservation through its role in the production of biopolymers and fertilizers. However, the full potential of BSFL in addressing global challenges like food security, waste management, and reducing plastic pollution lies in continued innovative strategies of BSFL-based solutions.

Keywords: chitosan; biofertilizer; biodiesel; leachate; kasgot

Rapid Virtual Oral Presentation



Theme VIII
Beneficial insects

ENTOMOLOGY STUDENTS CONCLAVE
ESC 2025
ENTOMOLOGICAL SOCIETY OF INDIA

BO-01

Biology and biometrics of black soldier fly, *Hermatia illucens* (L.) on poultry waste

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Black soldier fly (*H. illucens*) larvae offer an eco-friendly waste management solution. Their frass, a nutrient-rich byproduct, can enhance soil health. Biology and biometrics of black soldier fly was studied and results revealed that the mean incubation period, larval duration, pupal duration, total developmental period, adult longevity of females, adult longevity of males, and total life-cycle duration of females and males when reared on poultry waste were 2.58 ± 0.01, 15.30 ± 0.11 (with instar durations of 2.20 ± 0.12, 2.70 ± 0.004, 2.51 ± 0.06, 2.98 ± 0.17, 1.91 ± 0.01 and 3.00 ± 0.03 days for instars I-VI), 7.76 ± 0.15, 25.64 ± 0.02, 8.74 ± 0.04, 7.05 ± 0.02, 34.38 ± 0.03 and 32.69 ± 0.008 days, respectively. The egg hatchability, per cent pupation, growth index and adult emergence were 84.30 ± 0.40 per cent, 77.12 ± 1.96 per cent, 5.04 ± 0.03 and 87.44 ± 0.74 per cent, respectively when reared on poultry waste. The pre-oviposition, oviposition and post-oviposition periods were 2.16 ± 0.03, 2.76 ± 0.01 and 3.92 ± 0.007 days, respectively on poultry waste. The mean fecundity was 695.30 ± 8.34 eggs per female and the male-to-female sex ratio was 1:1.28 and when reared on poultry waste. The results on biometrics of *H. illucens* evidenced that the mean measurement of larval head capsule length, larval head capsule width, larval body length, larval body width and larval weight of *H. illucens* on poultry waste varied from 0.14 to 2.91 mm, 0.12 to 2.64 mm, 0.62 to 30.2 mm, 0.13 to 2.79 mm and 1.57 to 419.7 mg for I, II, III, IV, V and VI larval instars, respectively. The average length, width and weight of pupae measured to be 12.09 mm, 3.79 mm and 291.18 mg, respectively.

Keywords: *H. illucens*; biology; biometrics; poultry waste

Oral Presentation

BO-02

Cocoon characteristics assessment for selection of suitable Eri silkworm Eco-races during summer and autumn seasons in Nagaland

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Rearing of Eri silkworm (*Philosamia ricini* Hutt.) is a prevalent practice in rural households of Nagaland. Out of the 26 eco-races found in NE India, identification of the best suited eco-race for rearing is vital to enhance the overall returns and assure top quality silk production. In this study, five most frequent eri silkworm eco-races *viz*., Titabar, Borduar, Barpathar, Kokrajhar and Dhemaji were reared over the summer and autumn seasons and evaluated on their cocoon characteristics in Medziphema, Nagaland. The Barpathar and Borduar eco-races was particularly better than the others in terms of effective rate of rearing, cocoon shell weight ratio, silk productivity and fibroin and sericin content. The Titabar eco-race may be a feasible alternative to the Barpathar and Borduar eco-races, while the Dhemaji and Kokrajhar eco-races performed badly and were found unsuitable for cocoon production in these regions during both summer and autumn seasons. The Barpathar eco-race had some of the highest cocoon parameters during the summer season, including effective rate of rearing (73.00±3.371%), cocoon shell weight (0.421±0.0.017g), shell weight ratio (12.44±0.0.536%), silk productivity (0.10±0.004g/day) and fibroin percentage (86.01±0.553%). The Borduar eco-race had remarkable cocoon parameters during autumn, including highest ERR (88.50±2.729%), cocoon shell weight (0.480±0.020g), second highest shell weight ratio (12.92±0.564) and silk productivity (0.10±0.005g/day). Based on the outcomes of this study, both the Barpathar eco-race during the summer and the Borduar eco-race during the autumn season could be considered. The study also indicates autumn as the optimal season for rearing eri silkworms, since most eco-races demonstrated superior cocoon performance.

Keywords: Eri silkworm; eco-race; rearing; seasons; cocoon characteristics

Oral Presentation

BO-03

Comparative evaluation of bioactive compounds and minerals in sesamum floral and bee pollen: Implications for health benefits

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The present study investigates the nutrient and mineral composition of Sesamum floral pollen and bee pollen, focusing on key components such as ash content, moisture content, total phenolic content, total flavonoid content, and essential minerals. Significant differences were observed between the two pollen types. The ash content of bee pollen (4.27 ± 0.02%) was higher than that of floral pollen (3.20 ± 0.02%). Similarly, moisture content in bee pollen (28.20 ± 0.04%) exceeded that in floral pollen (21.11 ± 0.05%) demonstrating a substantial variation between them. Total phenolic content in floral pollen (781.59 ± 2.47 mg/100g) was significantly higher than in bee pollen (586.05 ± 7.75 mg/100g). Additionally, floral pollen contained higher levels of total flavonoids (1104.57 ± 4.01 mg/100g) compared to bee pollen (830.65 ± 1.37 mg/100g). In terms of mineral composition, floral pollen showed higher levels of zinc (100.24 mg/100g) and copper (310.20 mg/100g) compared to bee pollen, which had slightly higher iron (249.10 mg/100g) content. Bee pollen, however, had significantly higher levels of manganese (502.60 mg/100g) compared to floral pollen (101.64 mg/100g), while floral pollen had more potassium (606.40 mg/100g) than bee pollen (312.23 mg/100g). These findings suggest that Sesamum floral pollen possesses higher concentrations of bioactive compounds such as phenolics, flavonoids and essential minerals, which could have significant implications for its nutritional and therapeutic potential. This underscores the importance of pollen type in determining its health benefits and nutritional value.

Keywords: sesamum floral pollen; bee pollen; total phenolic content; total flavonoid content; minerals

Oral Presentation

BO-04

Diversity of insect pollinators and pollination mechanism in chow chow (*Sicyos edulis*) in Manipur

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Chow chow (*Sicyos edulis*), flowers are monoecious consisting of 5 petals and 5 sepals with whitish to pale yellow in colour and occurs in groups in the axils of the nodes. Male flowers measure an average of 12.69 ± 0.43 mm in spread while female flowers measure an average of 16.68 ± 1.06 mm. Stamen length measured 3.78 ± 0.10 mm while pistil length measured 4.01 ± 0.22 mm. The basal gap between stamens measured an average of 0.40 ± 0.02 mm. The receptivity of the stigma was recorded by visual observation of stigmatic lobes. A yellowish green stigma with stigmatic exudation is considered to be the sign of receptivity while the stigma which are dull and dark brown were considered to be non-receptive. The nectar volume was highest in two days old flower with volume of 7.14 µl/flower whereas nectar concentration (TSS) was highest in 0 days old flower with 68%. The average number of pollen recorded was ranged between 415 – 999 pollens per flower with 95% viability. The different pollinators visiting Chow chow during flowering season of monsoon 2024 under Manipur valley conditions were *Apis cerana, Vespa sp. and Syrphus sp*. The maximum number of flower visit per minute by *Apis cerana* was found to be 7.00 ± 1.57 during 7.00 – 9.00 hrs and no visit was recorded after 14.00 hrs. In case of wasp, maximum number of flower visit per minute was found to be 3.23 ± 0.69 during 7.00 – 9.00 hrs and no visit recorded after 10.00 hrs while that for syrphid fly is maximum number of flower visit per minute was found to be 2.5 ± 0.50 during 10.00 – 12.00 hrs and no visit recorded after 14.00 hrs. The maximum time spent (in seconds) per flower by *Apis cerana* was recorded to be 8.05 ± 0.78 sec during 7.00 – 9.00 hrs while that for wasp was recorded maximum time of 7.02 ± 1.37 sec during 7.00 – 9.00 hrs and for syrphid fly observed as 5.42 ± 1.46 sec during 10.00 – 12.00 hrs.

Keywords: Chow chow; Insect Pollinators; *Apis cerana;* nectar; pollen

Oral Presentation

BO-05

Effect of digestive enzyme for enhancing the productivity of Eri silkworm (*Samia ricini* donovan)

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Eri silk is also known as "poor man's silk" as it need minimal infrastructure for production. Nutrition is the basic need for growth and development of silkworms and silk production is dependent on the larval nutrition and nutritive value of leaves play a very effective role in producing good quality cocoons. The present study was carried out in the Department of Sericulture, AAU, Jorhat in the year 2023-24 to assess the effect of the amylase enzyme on the economic yield of eri silkworm (*Samia ricini* Donovan) which was administrated as food supplement by fortifying the castor leaves with amylase enzyme at three different concentrations *viz.,* 1%, 3% and 5%. This experiment has been conducted in four different groups of silkworms such as one control group and three experimental groups. The first feeding of each larval instar till maturity were fed with fortified castor leaves with three different concentrations of amylase enzyme. From the present investigation it could be inferred that fortification of castor leaves with amylase 3% concentration significantly increased matured larval weight, full grown larval weight, weight of silk gland, silk gland tissue somatic index, cocoon weight, shell weight, shell ratio, pupal weight, sericin and fibroin percentage and fecundity of eri moth except growth index when compared with amylase 1%, 5% and control group. Moreover, the nutritional indices of eri silkworm are also found highest in amylase 3% than the other groups of amylase concentration and control. Thus the castor leaves can be fortified with amylase 3% concentration for enhancing the economic productivity of eri silkworm.

Keywords: Eri silkworm; enzyme; cocoon parameters; shell weight; silk gland

Oral Presentation

BO-06

Enhancing mulberry silkworm (*bombyx mori* l.) performance through nano calcium and sulphur foliar applications

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The present investigation was carried out to evaluate the effect of green synthesized nano Calcium and Sulphur particles on mulberry and mulberry silkworm (*Bombyx mori* L.) at Sericulture Unit Department of Agricultural Entomology, College of Agriculture Raichur during 2021-2022. Green synthesis of Calcium and Sulphur nanoparticles was done by using curry leaf extract and pomegranate peel extract, respectively. The average particle diameters of CaO and S nanoparticles were 24.77 and 24.98 nm, respectively. Biosynthesized nanoparticles were sprayed to mulberry as a foliar spray at 25 and 35 days after pruning in different combinations. Mulberry leaves are harvested from 45th day after pruning and fed to mulberry silkworm replication and treatment wise from hatching to till spinning stage as per standard rearing package. The results indicated that combined application of nano Ca + nano S each @ 250ppm exhibited significantly higher leaf yield (756.67 g/plant), shoot yield (798.17 g/plant), total biomass (1554.83 g/plant), fresh leaf weight (301.17 g), dry leaf weight (86.53 g), average shoot length (194.10 cm), leaf area (207.67 cm^2) and biochemical constituents of mulberry. Further, silkworms were reared on mulberry leaves sprayed with nano Calcium + nano Sulphur @ 250ppm each was found to be effective for all the economic traits *viz.*, full grown larvae weight (30.14 g/10), effective rearing rate (89.33%), silk productivity (3.51 cg day^{-1}), cocoon weight (13.42 g/10), pupal weight (10.32 g/10), fecundity (593.67 eggs/laying), single cocoon filament length (714.69 m), weight (750.53 g) and denier (3.77). In conclusion, the findings of this study indicated that foliar spray of nano nutrient treatments enhanced the mulberry quality and larval parameters in turn increased the silk production.

Keywords: mulberry; silkworm; nano calcium; nano sulphur; foliar spray

Oral Presentation

BO-07

Extraction of bee venom from domesticated species of honey bees

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Honey bee venom is a well-known pharmacologically active compounds that can be extracted from worker bees. In the past, the venom gland was removed surgically from bees, or bees were individually squeezed until a drop of venom was extracted from the stinger tip. Presently, mild electrical shock was found to be effective in the bee venom collection where the bees do not lose their sting. An experiment using a mild electrical stimulation method of extraction was carried out from January to April, 2024 in Jorhat, Assam in order to gather and quantify bee venom from domesticated honey bee species, specifically *Apis cerana* and *Apis mellifera*. During the experiment, it was found that the maximum amount of bee venom that could be extracted from *A. cerana* and *A. mellifera* in April were 0.087 g and 0.199 g, respectively. In February and March, respectively, 0.0127 g and 0.057 g whereas 0.0288 g and 0.118 g of bee venom were collected from *A. cerana* and *A. mellifera*. The study suggests that April is the ideal month to collect bee venom from both domesticated honey bee species. Future research can focus on the qualitative characteristics of the venom produced by both the honey bee species.

Key words: bee venom; honey bees; *Apis cerana*; *Apis mellifera*; extraction

Oral Presentation

BO-08

Foraging pattern of major bee pollinators and impact of entomophily on yield attributing characters of sunflower

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The present experiment was conducted in a farmer's field of Uttar Bhayna (23.3110° N, 88.6386° E), Nadia, West Bengal, during the summer season of 2023 using the sunflower hybrid KBSH-1. Foraging patterns of bees were studied using field trials designed with RBD having 4 replications, while impact of pollination on yield attributing characters (flower diameter, head weight, 1000 grain weight, no. of filled seeds, no. of chaffy seeds) and yield were assessed through field trials with RBD having 7 replications and three treatments (insect pollination, hand pollination and pollinator exclusion). Bee visitation in individual flowers was recorded at 5 days interval commencing from 5% flowering. Different observational times, viz., 8.00, 10.00, 12.00, 14.00, 16.00 and 18.00 hrs., were considered as treatments. Results on visitation frequency of the observed bee species revealed that 4 bee species, *Apis dorsata*, *Apis mellifera*, *Halictus* sp. and *Xylocopa* sp. were more frequently visiting the flowers. The number of individual bees, visited the heads at different time intervals differed significantly. Floral visitation of all the bees reached its peak during 8.00 to 10.00 hrs. but maximum foraging of *Apis mellifera* was observed during 16.00 to 18.00 hrs. Minimum bee foraging was observed during 14.00 to 16.00 hrs. Maximum yield (1485.24 kg/ha) and highest value of other yield contributing parameters were observed in hand pollination, followed by insect pollinated and pollinator excluded plots. Germination percentage of seeds ranged from 52-55 % in the case of hand and insect pollination, while pollinator exclusion provided seeds with 35.3 % germination only.

Keywords: foraging; honeybee; pollination; sunflower; yield

Oral Presentation

BO-09

Histopathological study on effect of spinosad feeding on Indian honey bees *Apis cerana*

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In the era of extensive use of chemical pesticides, biopesticides are gaining a rising popularity due to the demand of organic farming and safety concerns towards human health and residue in crop. Spinosad is widely used as a biopesticide in crop protection against thysanopteran, lepidopteran and dipteran pest species. However, many studies have come forward with a rising concern regarding the toxicity of spinosad against hymenopteran insects, specifically honey bees. Studies have shown that spinosad affects the behaviour of honey bees such as their walking ability and sense of direction. Further, it has been found to cause histopathological damage to the midgut cells and malpighian tubules of European honey bee *Apis melifera*. However, no histological studies have been conducted for the Indian bee *Apis cerana*. The current experiment was conducted to see the effect of spinosad on the midgut and other tissues of Indian bee. A group of caged honey bees were orally fed with spinosad concentration at LC30 value by mixing with sugar solution. Dead bees were collected, dissected and observed under microscope. The results showed that even at a low concentration of LC30, feeding on spinosad treated sugar syrup caused disorganization and disruption of the epithelia of the midgut and malpighian tubules. The results of this experiment suggests that although spinosad is effective as an insecticide, since it is harmful to honey bees, it should be applied on crops with utmost care to prevent exposure to the bees.

Keywords: honey bee; spinosad; histopathology; midgut; toxicity

Oral Presentation

BO-10

Insect pollination in cucumber (*Cucumis sativus* L.) cultivation: insights into diversity, efficiency, and yield enhancement

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Cucumber (*Cucumis sativus L.*), an extensively cultivated crop in India exhibits monoecious flowering system necessitating efficient pollination to maximize yield and fruit quality. Observations pertaining to insect visitors' diversity, abundance, foraging behaviour and the impact of different pollination methods on cucumber yield and fruit quality were taken. The study observed diverse insect visitors, belonging to 4 orders, 16 families, 26 genera and 28 species visiting cucumber flowers. Order of abundance was *Apis cerana* > *Gegenes niso* > *Apis mellifera* > *Halictus sp.* > *Ceratina sp.* > other insects. Among these, *A. cerana* emerged as the most abundant visitor, with a peak density of 1.042 ± 5.49 individuals/sq. m/5 minutes. Insect activity peaked between 09:00-10:00 with averaging 0.49 individuals/sq. m/5 min. *A. mellifera* exhibited the highest foraging rate, visiting 2.5 ± 1.18 flowers/min., and carrying the maximum loose pollen grains (171633 ± 20117). Non-bee pollinators skipper butterflies spent most time on flowers for foraging (7.07 ± 5.96 sec/flower). Based on the pollination index (abundance × foraging rate × pollen grains), *A. mellifera (74660.49)* was identified as the most efficient pollinator, followed by *Halictus sp.*, syrphid flies, *Ceratina sp.*, and *T. iridipennis* under ecological conditions of Varanasi. Pollination methods significantly influenced cucumber yield and fruit characteristics. Bee-pollinated cucumbers yielded the heaviest fruits (219.75 g), while open-pollination produced the longest (16.49 cm) and widest (3.92 cm) fruits. Self-pollination, however, resulted in the highest proportion of misshapen fruits (52.99%). Open pollination yielded the healthiest fruits, with 60.22% classified as marketable. These results highlight the vital role of pollinators, particularly bees, in improving cucumber production and fruit quality under the ecological conditions of Varanasi. Promoting pollinator-friendly practices can significantly boost agricultural productivity and sustainability.

Keywords: pollinator; abundance; foraging behaviour; pollination index

Oral Presentation

BPP-01

Diversity and seasonal abundance of hymenopteran pollinators of a natural forest ecosystem of Uttarakhand

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The present study intends to evaluate the diversity and population of Hymenopteran species of Benog Wildlife Sanctuary (BWLS), a protected natural ecosystem, situated at 30°28'14" N latitude and 78°1'34" E longitude at an elevation of 1800 msl, offers a habitat for diverse flora and fauna. This is the initial attempt to study the diversity of pollinators in this sanctuary, with observation conducted using four methods: canopy trap, yellow pan trap, transect walk, and sweep net. During the study period, bees and wasps belonging to the order Hymenoptera were documented, with a notable total of 34 species of flower-visiting wasps and bees recorded. Among these, maximum diversity was exhibited of family Apidae with 16 species (47 %), followed by family Vaspidae with 07 species (20%), Halictidae with 06 species (18 %), Megachilidae 02 species (06 %), and with single species represented by Andrenidae, Colletidae, Ostroidae (03 %). These species were observed by different methods and it was uncovered that all the 34 species (100 %) were recorded in visual observation under transect walk method, though with sweep net 14 species (41.17%), with yellow pan trap 8 species (23.52%), and with canopy trap 3 species (8.82%) were recorded. The seasonal diversity of the wasps was recorded in three seasons and it was exhibited that maximum 58 per cent species (average 17.5 per month) were recorded during pre-monsoon season, followed by 33 species during monsoon season (average 9.75 per month) and 9 per cent species during winter season (average 2.75 per month). The biodiversity of these wasps and bees was also correlated with abiotic parameters, and exhibited negative correlation with RH and rainfall while positive correlation with temperature. This is the baseline diversity data of Hymenoptera pollinator of BWLS and the best method of their observation was transect walk and visual observation method. The pre monsoon season was the most suitable, while winter was the most adverse season for their abundance.

Keywords: sanctuary; pollinator; Hymenoptera; wasp; bees; climate change

Poster Presentation

BPP-02

Effect of syrphid pollination on yield parameters of mustard

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Pollination is critical for plants that depend on the sexual reproduction system; hence the plants are dependent on pollinating insects. More than 35 per cent of all crops utilize insect pollination worldwide. Various insects act as pollinating agents as well as predators of natural pests thereby, regulating the pest population. It is pertinent to recognize and preserve such ecological balance to reduce dependence on chemical controls and pesticides that harm beneficial insects. Mustard (*Brassica juncea* L.) is considered the most important oil-seed crop in West Bengal. It is one of the major edible oil-yielding crops in India. Several insect species have been observed in mustard crop fields that act as pollinators during the flowering stage. Although Honeybees are the most important pollinating agents that provide managed pollination for mustard other beneficial insects include Hymenoptera, Diptera, and Lepidoptera, which are accountable for pollination and improved fertilization. Hence, they enhance the fruit set, yield, and oil content in the seeds. Among the insects that visit the crop field, the syrphid flies (Diptera), commonly known as a hover fly or flower fly plays a dual role in pollination and biological control. Syrphids, primarily Eristalis tenax, have been demonstrated to help enhance seed production of various food crops, including oilseed rape. The current study focuses on the role of the syrphid fly as an efficient pollinator in the mustard crop field. We have also examined the impact of various pollination methods viz, open-pollinated, only syrphid pollinated, and pollinator exclusion on the qualitative and quantitative yield attribute of mustard. For establishing the yield enhancement by syrphid flies morphometric parameters like the number of siliqua per plant, number of seeds per siliqua, oil content, and test weight have been recorded. It has been observed from the study that pollinators greatly influenced oil content as significant differences were observed between pollinated and pollinator-excluded plots. It was also observed that plots pollinated exclusively by syrphids recorded a significant increase in morphometric parameters along with a several-fold increase in seed yield compared to pollinator-excluded plots.

Keywords: mustard; syrphid fly; pollinators; yield enhancement; pollination

Poster Presentation

BPP-03

Population dynamics and management of *Galleria mellonella* in *Apis mellifera* colonies in Punjab

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This study investigates the population dynamics of *Galleria mellonella* (greater wax moth) in *Apis mellifera* (European honey bee) colonies in Punjab, focusing on Pathankot, Amritsar, and Talwandi Sabo from June 2021 to May 2023. Continuous monitoring revealed significant fluctuations in larval, pupal, and adult populations, peaking in July at 13.4, 10.6, and 8.0, respectively, before declining to 3.1, 2.7, and 2.5 in March. Correlation analysis highlighted a positive relationship between larval and pupal populations with minimum and maximum temperatures, while relative humidity and rainfall had less pronounced effects. These findings emphasize the role of temperature in population fluctuations and the necessity for timely pest management strategies. The research also evaluated eco-friendly control methods, including neem-based treatments (Neem Seed Kernel Extract 7% and neem oil 7%) and sulphur fumigation. NSKE 7% proved most effective, reducing larval incidence (1.71%), comb damage (9.56%), and increasing larval mortality (20.39%). Sulphur fumigation showed excellent results in stored combs, with minimal damage (1.36%) after 90 days. Neem-based treatments and sulphur fumigation provide sustainable alternatives to chemical pesticides, safeguarding honey production, and pollination services. These insights can guide integrated pest management strategies to protect honey bee colonies and support agricultural ecosystems.

Keywords: seasonal incidence; greater wax moth, neem seed kernel extract; neem based treatment

Poster Presentation

BVP-01

Comparative foraging behaviour of different *Megachile* bees in pigeonpea (*Cajanus cajan* (l.) millsp.) in the new alluvial zone of West Bengal, India

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Pigeonpea (*Cajanus cajan* (L.) Millsp.) is a vital legume crop contributing significantly to food security in African and Asian countries as a key protein source. While its dependence on insect pollination for optimal yields is well-recognized, there remains a substantial knowledge gap regarding the role of solitary bees, particularly *Megachile* species, in its pollination ecology. Previous studies have largely focused on social and eusocial bees, overlooking the contributions of Megachilidae, which are critical pollinators in pigeonpea ecosystems. This study addresses this gap by investigating the pollinator fauna of pigeonpea crops in the New Alluvial Zone of West Bengal, India, with a specific focus on the comparative foraging behaviour of four *Megachile* species (*M. lanata*, *M. conjuncta*, *M. disjuncta*, and *M. bicolor*). A total of 26 floral visitors, spanning multiple insect orders, were recorded, with Megachilidae and Apidae emerging as dominant pollinators. Foraging activity peaked during mid-morning (0800–1000 h) and early afternoon (1400–1600 h). Among the *Megachile* species, *M. conjuncta* exhibited the highest foraging rate, particularly between 1000–1400 h, while *M. lanata* and *M. bicolor* showed consistent foraging rates, peaking during early morning and mid-day, respectively. *M. disjuncta* demonstrated high foraging efficiency during peak flowering periods. The foraging speeds highlighted temporal variation, with *M. lanata* spending more time per flower during early and mid-morning, whereas *M. conjuncta* and *M. disjuncta* displayed faster foraging speeds in the afternoon. These findings underscore the ecological importance of *Megachile* bees as pollinators of pigeonpea and reveal their distinct temporal and behavioural niches. By bridging the knowledge gap regarding solitary bee contributions, this study provides critical insights for optimizing pollination services in legume crops. We propose targeted conservation strategies and policy interventions to harness the potential of *Megachile* bees in sustainable agricultural systems, offering a pathway to enhance crop yields and ensure food security.

Keywords: *Megachile* sp.; pollination ecology; pigeonpea; foraging behaviour; conservation strategy

Rapid Virtual Oral Presentation

BVP-02

Diversity and abundance of insect pollinators on onion (*Allium cepa* l.) in northern transition zone, Karnataka, India

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Amidst the present ecological turmoil, the survival of pollinators is imperiled by habitat destruction, climate change, and pesticide exposure, critically undermining biodiversity and agricultural resilience. In today's context, recording and conserving pollinators is paramount to maintaining ecological balance and biodiversity in the face of human-induced threats. In this scenario, we have cataloged insect pollinators from the Northern Transition Zone within the onion ecosystem, which entirely depends on external pollination services. We report, in total 27 insect pollinator species on onion. The study observed the diversity and abundance of pollinators at four locations, recording 11, 14, 15, and 21 species respectively at Kurubgatti, Garag, Belawadi, and Bailhongal. Across all sites, the onion pollinator fauna comprised four insect orders, with Hymenoptera (12 species) as the predominant order, followed by Lepidoptera (7 species), Diptera (6 species), and Coleoptera (2 species). Pollinator activity peaked at 90% flowering stage, with Apidae being the most abundant and diverse family within Hymenoptera. Garag and Belawadi showed higher diversity indices than Bailhongal and Kurubgatti. Among honey bees, Apis florea dominated Kurubgatti, while Apis dorsata was prevalent in the other locations. Tetragonula sp. spent the most time on individual flowers, whereas Apis cerana indica spent the least. Apis florea had the highest number of visits in five minutes, contrasting with Tetragonula sp. The study's findings underscored the significant variations in pollinator diversity and abundance across the four surveyed locations, attributable to the differing micro-climatic conditions and bee behavior. Pollinator diversity and abundance may be closely linked to the micro-climatic conditions of each location, including surrounding flora and habitat quality, and bee behavior on onion umbels was influenced by the size and resource requirements of the respective bee species, leading to differing pollination efficiencies. So, tailored conservation efforts based on local micro-climatic conditions and bee behavior are crucial for effective preservation.

Keywords: diversity; onion; pollinators; foraging; karnataka

Rapid Virtual Oral Presentation

BVP-03

Effect of different pollen trapping frequencies on collection of pollen by *Apis mellifera* l. colonies in mustard

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Honeybees (*Apis mellifera* L.) play a pivotal role in enhancing agricultural productivity through adequate pollination. During this, pollen gets attached to the body hairs of worker honeybees and is collected and stored. When the pollen is abundant, pollen traps can be utilized to collect the surplus pollen. The collected pollen is stored safely and is used to meet the protein requirements of the colony during dearth. In the study region, pollen and nectar floral sources are abundant during the mustard bloom from December to February. Thus, the present experiment was carried out at the apiary of Krishi Vigyan Kendra, Morena, and at the beekeeper's apiary in Morena, M.P. during 2022-23 and 2023-24 to evaluate the effect of different pollen trapping frequencies on the quantity of pollen collected by *Apis mellifera* colonies in mustard fields. Front-mounted wooden pollen traps were mounted under five different pollen trapping frequencies as treatments, including control, and the amount of pollen collection was recorded per colony per day. The results revealed that colonies with daily trapping had the highest average pollen collection rate (167.45 and 157.34 g/colony/day), and the lowest average pollen collection rate (13.34 and 12.79 g/colony/day) was observed in weekly trapping across the trapping period of both the consecutive years (2022-23 and 2023-24). However, the control group, with no pollen trapping, was observed with no pollen collection. Additionally, the total pollen collection across the trapping frequencies was highest in daily trapping (1.340 and 1.259 kg/colony) and lowest in weekly trapping (0.107 and 0.102 kg/colony) during 2022-23 and 2023-24, respectively. Across weeks, the lowest amount of pollen (17.89 and 20.67 g/colony/day) was collected in 1st week, i.e., 03 – 09 December at the initiation of the mustard flora. However, the highest amount of pollen collection (101.03 g/colony/day pollen) was recorded in the 4th week (24 - 31 December 2022), while during 2023-24, it was recorded highest in the 6th week (8 - 14 January) with 99.24 g/colony/day pollen. The correlation of pollen collection with abiotic factors showed that the average amount of collected pollen was significantly negatively correlated with wind speed during both consecutive years.

Keywords: bee pollen; daily trapping; floral period; pollen trap; trapping frequency

Rapid Virtual Oral Presentation

BVP-04

Entomophagy and its socioeconomic significance: A study on edible insects among the Tiwa community in myriagon district, Assam

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Entomophagy, or the consumption of insects as food, has deep cultural and historical roots in many developing countries, particularly in the Northeastern region of India. Among the Tiwa community of Morigaon district in Assam, edible insects serve as an integral component of their diet and economy. The Eri Silkworm (*Samia ricini*) was found to be the most commonly consumed insect due to its ease of domestication, year-round availability, and nutritional value. Other seasonal insects, such as red ant larvae, giant water bugs, wasps and termites were consumed during festivals like Bohag Bihu. Data gathered from surveys and interviews in seven Tiwa villages shows that Eri Silkworms serve as both a food source and a commercial product. This study examines the consumption patterns, cultural practices, and market dynamics associated with edible insects, with a specific focus on the Eri Silkworm *(Samia ricini)*. Eri Silkworms are cultivated, making them a reliable and sustainable food source, their market price ranges between 600 to 800 rupees per kilogram, with processed forms like roasted or fried silkworms sold for 100 rupees per stick (including 8-10 larvae). The availability of Eri Silkworms in local markets such as Sani Bazar and Nelie Market underscores their economic importance, while other insects remain confined to traditional diets within families and communities. The findings of the study emphasize the preservation of indigenous knowledge systems and cultural heritage, with the Tiwa community exemplifying the sustainable integration of edible insects into their socio-economic framework.

Keywords: entomophagy; eri silkworm; tiwa community; edible insects; indigenous knowledge; Morigaon; assam; market dynamics

Rapid Virtual Oral Presentation

BVP-05

Foraging behaviour and pollination efficiency of stingless bee, *Tetragonula ruficornis* on bitter gourd grown under protected conditions

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Bitter gourd vine is a monoecious crop and pollination plays important role in the bitter gourd production. Foraging behaviour and pollination efficiency of stingless bees was studied on Pusa Rasdar variety of bitter gourd grown under net house condition. Two colonies of stingless bees with an estimated population of 1800-2000 worker bees were introduced at 10 % flowering in 100 m² insect proof net house. Results revealed that the foraging activity of the stingless bees on the bitter gourd flowers was observed after 15 days after installation in the net house. Foraging intensity of *T. rufiicornis* on bitter gourd flowers was maximum at 1000-1200 hrs with 6.75± 0.48 bees/sq. m/5 min. Foraging speed of *Tetragonula ruficornis* was maximum during 1000-1200 and 1200-1400 hrs with an average time spent per male flower was 15.6± 2.55 sec and 31.23± 8.47 sec, respectively. Whereas, the mean time spent for nectar collection on male flowers (71.43± 19.81 sec) was more compared to pollen collection (59.97± 14.58) during 1000-1200 and 1200-1400 hr, respectively. Average time spent on female flowers (4.6±1.75 sec/flower) at 1000-1100 hr was very less in due to no nectar production. Foraging rate of *Tetragonula ruficornis* is maximum during 1200-1400 hrs in net house condition with 2.90± 0.21 flowers visited/min. Maximum number of outgoing bees (23.8± 1.93 bees/5min.) and incoming bees (24.2± 0.92 bees/5min) at the nest entrance was observed during 1000-1200 hrs and 1200-1400 hrs, respectively. Stingless bee pollinated flowers produced superior quality fruits as compared to hand and open pollinated flowers. Number of seeds produced per fruit wasalso highest in stingless bee pollination as compared to hand and open pollination. However, per cent fruit set was minimum in stingless bee pollination (55.94± 0.79 %) as compared to hand pollination (89.55± 2.96). Managed pollination with stingless bees can be an alternative to laborious hand pollination for bitter gourd production under protected conditions. However, further studies are required on stocking rate and timing of stingless bee introduction in the net house to improve the percentage of fruit set.

Keywords: Stingless bees; Pollination efficiency; net house; foraging rate; foraging speed; fruit set

Rapid Virtual Oral Presentation

BVP-06

Influence of several bee attractants on the attractiveness of *Apis cerana indica* and their effect on seed yield of niger [*Guizotia abyssinica* (*l.f.*) cass] crop

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A study was conducted at experimental farm of PC Unit Sesame and Niger, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, during *Kharif* 2022. To determine the impact of bee attractants on the attraction of *Apis cerana indica* and their impact on seed yield of niger crop, the experiment was set up using a Randomized Block Design with nine treatments and three replications. Research found that the both at 10% and 50% flowering stage *Apis cerana indica* visit was numerically the highest with flower extract of *Madhuca longifolia* 10%, rose water 10% (16.50 *Apis cerana indica*/m^2/5min) with 17.50 and 12.17 *Apis cerana indica*/m^2/5min, respectively. This was followed by rose water 10% with 16.50 and (sugar solution 50%) 10.08 *Apis cerana indica*/m^2/5min, respectively. The population of *Apis cerana indica* was received from controlled condition 5.67 and 2.92 *Apis cerana indica*/m^2/5min at 10% and 50% flowering stage, respectively. This was followed by water spray (7.08 and 4.42 *Apis cerana indica*/m^2/5min) at 10% and 50% flowering stage, respectively. The foliar spray of flower extract of *Madhuca longifolia,* sugar solution 10% and rose water 10% were found significantly superior over others in respect to record higher seed yield and recorded 6.90 q and 6.70 q/ha seed yield, respectively.

Keywords: *Apis cerana indica; Madhuca longifolia;* flowering stage; niger crop; foliar spray

Rapid Virtual Oral Presentation

BVP-07

Lac insect dye- a natural source of livelihood

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Lac dye, a natural red colorant secreted by *Kerria* spp. (Hemiptera: Kerriidae), has long been valued for its applications in textile dyeing, food coloring and traditional medicine. This study focuses on the extraction, dyeing properties and applications of lac dye, emphasizing its advantages over synthetic counterparts. Standardization of natural lac dyeing parameters in cotton yarn using various synthetic mordants was carried out in Department of Entomology and Department of Textile and Apparel Designing, Assam Agricultural University, Jorhat-13. Optimum concentration of acid and alkali for extraction of lac dye was standardized among different concentrations. Temperature and time required for extraction of lac dye in aqueous, acidic and alkaline medium were also evaluated and the optimum temperature and time were recorded as 100°C for 90 minutes for aqueous, 60°C for 60 minutes for acidic media and 40°C for 75 minutes for alkaline medium. Three mordanting methods were selected for the dyeing process *i.e.* pre-mordanting, simultaneous mordanting and post mordanting, where in the highest absorption of dye was observed in simultaneous mordanting with tea waste as natural mordant and aluminum potassium sulphate as synthetic mordant at the concentration of 1 gm per 100 ml of dye solution among different concentrations. Simultaneous mordanting has also shown best results in terms of color fastness. Antibacterial properties of dye solution, dyed yarns against two bacteria *viz. Escherichia coli* and *Staphylococcus aureus* were evaluated, in which acid extracted dye has shown antibacterial properties compared to the alkaline and aqueous extracted dye solutions. Thus, the present investigation on the extraction of lac dye and its application on cotton yarn was a novel approach, opening up new possibilities in the textile industry to reduce the use of synthetic resources to some extent.

Keywords: Lac insect dye; mordant; temperature; time; standardization.

Rapid Virtual Oral Presentation

BVP-08

Nectar feeding and dearth period management in Indian honey bee *Apis cerana* (fabricius)

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In many countries of the world, there have been many attempts to reduce the loss of *Apis cerana* (Fabricius) (Apidae: Hymenoptera), Indian honeybee colonies during the dearth period by supplementing nectar feeding substitutes. Supplementary feeding of *A. cerana* assists the shortfall of naturally occurring pollen and nectar. The experiment on development and evaluation of nectar feeding substitutes was conducted at an apiary maintained at the Division of Entomology, SKUAST-K, Shalimar from July to September during the year, 2020-21. Syrup containing apple juice, sugar and mixture of both was evaluated as a diet supplement to develop an efficient feeding substitute. *A. cerana* were provided with the 4 nectar feeding substitutes viz., T_1- apple juice and sugar in the ratio of 1:1; T_2- apple juice and sugar in the ratio of 1.5:1; T_3- apple juice alone and T_4- sugar syrup in the ratio of 1:1 and compared with T_5 natural feeding to determine their impact on desirable attributes of colonies. A gradual increase in the Colony Performance Index (CPI), space covered by eggs (sq cm), larvae (sq cm) and pupae (sq cm) was observed, which were maximum in T_2, apple juice and sugar in the ratio of 1.5:1 viz; CPI (13.28); space covered by eggs (204.25 sq cm); larvae (296.12 sq cm); pupae (484.41 sq cm). All desirable parameters were found to be least in T_5 (natural feeding). So, among all the evaluated feeding supplement treatments; apple juice and sugar in the ratio of 1.5:1 (T_2) was the best nectar feeding substitute.

Keywords: *Apis cerana*; brood; carbohydrate; colony performance index; dearth period; egg laying;

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BVP-09

Seasonal activity of predatory wasps (*Vespa velutina*) attacking *Apis mellifera* L. colonies in Zabarwan Himalayas of Kashmir

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Predatory hornets/wasps are considered as one of the major constraints to beekeeping industry. To ascertain the identity of wasps attacking *Apis mellifera* in Zabarwan Himalayas, the collection of predatory hornets was done at 3 sites *viz*, Apiary at RTCPPPM, SKUAST-K, Shalimar, Apiary at Chak-e-Dhara and Apiary at Rangil (Ganderbal). The population of hornet/wasps was considerably higher in the Apiary at Shalimar followed by Apiary at Rangil (Ganderbal) and lowest at Chak-e-Dhara. During the study period, 947 hornet species were captured around the honeybee colonies at all the three locations and were identified as *Vespa velutina* Lepeletier. Studies were conducted on the number of wasps attacking honeybees (*Apis mellifera*) colonies in three different times of the day for six continuous minutes every day on ten honeybee colonies. The study period was divided into 35 Standard Meteorological Weeks (SMW) with which the wasp incidence varied significantly, as recorded and low in early spring with a gradual increase in the late summer and the highest peak was observed in the autumn. The results showed that the maximum weekly population of predatory wasps at morning, mid-day and evening was (8.667), (27.394) and (13.052) respectively, during 38th SMW. Weekly mean population of wasps exhibited positive correlation with the maximum temperature and negative correlation with the minimum relative humidity. Monitoring the seasonal activity and spatial population variations, along with weather parameters indicate the estimate of peak period of their activity by which sustainable management strategies/plans of these predatory wasps will be developed.

Keywords: *Apis mellifera*; seasonal activity; colony loss, predatory wasp, *Vespa velutina;*

Rapid Virtual Oral Presentation

BVP-10

Techniques for propolis collection from *A. mellifera* L. colonies of Himachal Pradesh

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Honey bees play a critical role in global ecosystems and biodiversity besides producing a variety of valuable hive products, each with unique uses and benefits. Propolis (bee glue) is a sticky dark coloured material that honey bees collect from living plants, mix with wax and use in construction and adaptation of their nests. Propolis increases the bee productivity and bee economy throughout the world and is valued in traditional medicine for its antimicrobial and anti-inflammatory properties. Study was conducted at Dr. YSP UHF Nauni, Solan, Himachal Pradesh during the year 2023-2024, investigate the best technique for propolis collection from *A. mellifera* L. colonies. Different techniques (traps) were used for propolis collection viz., Nylon net traps: 18 and 26 mesh size of the size of inner cover were fixed on the inner side of inner cover, Plastic net traps: Plastic net traps of 5 mesh size, Glass trap: Plain glass (5mm thickness) and by Scrapping. The traps were fixed on the inner side of inner cover of honey bee hive in a single layer for a period of two year 2023-2024. Maximum amount of propolis was harvested in the month of July i.e., 5.25g/colony/month in year 2023 and 5.51g/colony/month in year 2024. Nylon trap method was the cheapest and best suitable for propolis collection in *A. mellifera* L. colonies and can be used by commercial beekeepers for collection of propolis.

Keywords: propolis; hive; colonies; *Apis mellifera* L.; plastic net traps; beekeepers

Rapid Virtual Oral Presentation

BVP-11

Unveiling pollinator diversity and abundance in cucurbits: Insights from cucumber and bitter gourd

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Pollination is vital for sustaining biodiversity on Earth. In India, over 80% of crops benefit from insect pollination, with insects being the most important pollinators globally. Our research focuses on pollinator diversity in cucurbits like cucumber and bitter gourd, which depend on cross-pollination due to their large, sticky pollen requiring pollinators for fruit production. During our study on cucumber, we identified 25 species across four orders and 13 families: Hymenoptera (13 species), Diptera (5 species), Lepidoptera (5 species) and Coleoptera (2 species). Hymenoptera emerged as the most abundant order, accounting 72.17% of the total pollinators, followed by Diptera (16.49%), Coleoptera (5.77%) and Lepidoptera (5.57%). Among the families, Apidae was the most dominant, with 49.48% of the total abundance and a high level of species diversity. Other significant families included Formicidae (14.44%), Syrphidae (9.28%), Halictidae (7.22%), Muscidae (4.12%), Chrysomelidae (4.12%), Pieridae (2.48%), Nymphalidae (2.06%), Sarcophagidae (2.06%) and Coccinellidae (1.65%). The least abundant families, each with 1.03%, were Sphecidae, Hesperiidae, and Calliphoridae. In bitter gourd, we documented 25 species across four orders and eight families: Hymenoptera (13 species), Lepidoptera (4 species), Diptera (4 species), and Coleoptera (4 species). The Hymenopteran order was the most abundant, comprising 75.28%, followed by Diptera (12.5%), Lepidoptera (6.82%) and Coleoptera (5.4%). Apidae was the most abundant among the families, contributing 39.77% and exhibiting high species diversity. Other prominent families included Formicidae (18.46%), Halictidae (17.05%), Syrphidae (11.36%), Coccinellidae (5.4%), Pieridae (4.26%), Nymphalidae (2.56%) and Rhiniidae, which had the lowest abundance at 1.14%. Shannon-Wiener Diversity (H) index which reveals the community diversity for both the abundance and evenness of the species in cucumber and bitter gourd is noted as 2.941 and 2.74. Simpson index of cucumber and bitter gourd is noted as 0.7571 and 0.91. In recent years due to urbanization and fragmentation, there has been a decreased trend in pollinator activity.

Keywords: pollinators; pollination; cucumber; bitter gourd

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