SOUVENIR

Foundation Day- 2024 & Awards- 2022 Ceremony

(22nd February 2024, Thursday)

ESI Foundation Day-2024 Lecture

on

Creativity of Haldane's God: Are insects really diverse and why so?

by

Dr. K. N. Ganeshaiah, INSA Senior Scientist, UAS, Bangalore

Chairman: **Dr. S.N. Puri**, Chief Patron, ESI

www.entosocindia.org

ESI Awards (2022) Ceremony

Chairman: **Dr. Subhash Chander**

Director

ICAR- National Research Centre for Integrated Pest Management, New Delhi

Venue

University of Agricultural Sciences (UAS)
GKVK, Bengaluru, Karnataka

Jointly Organised by

Entomological Society of India, New Delhi
Division of Entomology, ICAR-IARI, New Delhi
UAS, GKVK, Bangalore
ICAR-NBAIR, Bangalore

Souvenir

Foundation Day- 2024
&
Awards- 2022 Ceremony

Compiled & Edited by

S Subramanian
Sagar D

Published by

Entomological Society of India
Division of Entomology
ICAR- Indian Agricultural Research Institute
New Delhi 110012

Foundation Day- 2024
&
Awards- 2022 Ceremony

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Souvenir

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THE ENTOMOLOGICAL SOCIETY OF INDIA
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Foreword

The Entomological Society of India (ESI) with a membership base of more than 1500 entomologists is in its ninth decade of serving Entomology in India. The ESI has taken up various activities in the past, and these have undergone many revolutions. Of these few are focused towards identifying the excellence in how Entomology is practiced in India, and if possible, provide the required motivation and encouragement by embarking upon recognition and honouring the best. This has led to identifying the best of the Entomologists and awarding them. This is done with a view to encourage the performing ones based on some established criteria. This activity has led to recognizing and honouring significant accomplishments in various fields of Entomology. This activity is being sustained and the awards are being presented now for young and senior Entomologists along with best PhD thesis. The recognition and honouring of the Best teachers and Life Time Achievement Award for established Entomologists is a new addition this year. Besides these from amongst the Life Fellows (FESI), the ESI is recognising some of them for their significant contributions as Honorary Fellows. I am sure these activities will project and promote Entomology in India. Our motto is to bring dignity and value to the awards given away by the ESI following strict guidelines and criteria. Efforts are on to perfect these in order to ensure that the ESI awards are rated as the most valuable, and with due respect and honour as warranted in such recognitions. Mechanisms are being built in the procedural aspects of the due processes followed by the ESI to ensure these. The ESI is proud to state that it will be unwavering in following this motto in letter and spirit, and ensure that excellence will be

rewarded with respect and dignity.

An additional thing being executed now is the ESI Annual Lecture Series. The ESI is proud that these lectures are being delivered by eminent scientists. We have so far two such lectures and the third is being delivered this time. I am sure this Lecture Series will be sustained and will provide a potential platform for professional impetus to Entomology. The journal Indian Journal of Entomology (IJE) has also undergone many changes in line with current publication standards. The ESI has been behind these changes. I wish that in the ensuing years the ESI will move forward with more such promising changes. I seek the support of all Entomologists in these new activities of the ESI, so that together we can progress and face the challenges effectively.

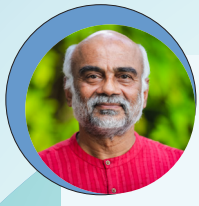
V. V. Ramamurthy
President, ESI

About ESI & ESI Awards

The Entomological Society of India (ESI) was founded in 1938, it is one of the largest professional societies in India serving entomologists and researchers in related disciplines. The society is publishing Indian Journal of Entomology since 1938; the Bulletin of Entomology since 1967, Bionotes since 2020, Indian Entomologist since 2020. The society has published a number of books, technical bulletins, reports, Conference and Symposium proceedings ever since its inception to spread the knowledge of Entomology. Indian Journal of Entomology (ISSN 0367-8288 for print and ISSN 0974-8172 for online) originated in 1939, and is a leading journal in entomological science published quarterly by The Entomological Society of India. Since 1956, it is being published as a quarterly Journal and the four parts are published each in March, June, September and December. Indian Journal of Entomology publishes high-quality original articles and reviews on various aspects of entomology – both basic and applied, covering taxonomy, toxicology, ecology, biodiversity, pest management and pesticides, bio-pesticides and botanicals, biotechnological approaches in entomology, inclusive of latest trends in frontier technologies like application of remote sensing, crop-pest modelling and molecular entomology. As per the recommendations of the Executive Committee, the Entomological Society of India (ESI) has introduced the ESI Young Entomologist Award in the year 2020. The society has introduced ESI Senior Entomologist Award and ESI Best Ph.D. thesis Award from 2021 and ESI Best Teacher Award in 2022. Accordingly every year, young entomologists, senior entomologists, best teachers and Best Ph.D. thesis will be awarded to encourage, recognize and promote the outstanding contribution of entomologists in the country. Each award carries a cash prize and a citation.

Programme schedule for ESI Foundation Day and Awards Ceremony		
Venue: Kuvempu Sabhangana, UAS, Bengaluru		
09.30 AM	Invocation	PG Students
09.40 AM	Welcome address	Dr. S. Subramanian, Zonal President (Delhi), ESI
09.50 AM	Introduction of Chairman	Dr. V. V. Ramamurthy, President, ESI
09.55AM	Introduction of Speaker	Dr. Sachin S. Suroshe, General Secretary, ESI
10.00 AM	ESI Foundation Day-2024 Lecture	Dr. K. N. Ganeshaiah, INSA Senior Scientist, UAS, Bengaluru
11.00 AM	Remarks by Chairman and felicitation of speaker	Dr. S. N. Puri, Chief Patron, ESI
11.15 PM	Vote of Thanks	Dr. Sagar D, Zonal Councillor (Delhi)
11.30 PM	Group photo and interaction of students with delegates	
LUNCH BREAK 1.00 PM to 2.00 PM		
ESI AWARDS CEREMONY		
2.00 PM	Welcome Address	Dr. Sachin S. Suroshe, General Secretary, ESI
2.10 PM	Felicitation to Life time achievement awardees and Honorary fellows	Dr. VV Ramamurthy, President and others
ESI 2022 Award Presentations		
Chair Dr. Subhash Chander Director, ICAR- National Centre for Integrated Pest Management, New Delhi Co-Chair Dr. S. N. Sushil Director, ICAR- National Bureau of Agricultural Insect Resources, Bengaluru		
2.30 PM	Presentation by ESI Best Teacher Awardee	Dr. Prabhuraj A., UAS, Raichur
2.40 PM	Presentation by ESI Senior Entomologist	1. Dr. Poonam Jasrotia, ICAR-IIWBR
	Awardees	2. Dr. Sanjay Kumar Sahoo, RPCAU, Pusa
3.00-3.20 PM	**TEA BREAK**	
3.20 PM	Presentation by ESI Young Entomologist Awardees	1.Dr. Amala U., ICAR-NBAIR 2.Dr. Basana Gowda G, ICAR-NRRI 3.Dr. Suresh M. Nebapure, ICAR-IARI
3.50 PM	Presentation by ESI Best Ph. D Thesis Awardees	1.Dr. M. Saranya, TNAU 2.Dr. Anamika Kar, BCKV 3.Dr. Ranjith M., KSNUAHS 4.Dr. M. Rashmi Manohar, BHU
4.30 PM	Remarks	Chair and Co-Chairs
4.45 PM	Presentation of Awards to ESI 2022 Awardees	Chair and Co-Chairs
5.00 PM	Vote of Thanks	Dr. Shashank, P.R. Joint Secretary, ESI

ESI Foundation Day Lecture 2024



Dr. K.N. Ganeshaiah
INSA Senior Scientist
Department of Genetics and Plant Breeding
UAS, GKVK, Bengaluru

Creativity of Haldane's God[1]: Are insects really diverse and why so?

Haldane believed that his God[1] must have had an inordinate fondness for beetles; why else would He create so many species of beetles? - Wondered Haldane. Based on this belief of Haldane, biologists have been propagating the idea that beetles (and by implication even insects) are the most diverse group of organisms. In fact, biologists, have always been fascinated by the rich diversity of insects in general, and that of beetles in particular.

However, the belief that beetles (and insects) are most diverse is based on the commonly held but highly questionable assumption that species richness is a direct reflection of biological diversity. In this paper I show that the diversity of beetles and of insects, is perhaps an over-estimated image of the reality. It is true that the beetles are indeed the most species rich among the insects and, thence the insects are most species rich among the known groups of living organisms. Therefore , beetles and insects continue to fascinate biologists for their species richness, if not for their diversity.

Understanding the evolution of high species richness of these two groups remains a challenge and several attempts to explain this are either unconvincing or are questioned. For instance, it is claimed that beetles may have become predominant in the early stages due to their shifting to feeding on angiosperms, or due to their wing flexion, or complete metamorphosis. While these are not unlikely, there is no way of ascertaining the veracity of these attributions.

In this presentation, I argue that the high species richness of beetles (and hence of insects) need not be viewed as a consequence of any unique event in evolution or a result of any biological

uniqueness of the groups. I show that the organization of diversity within a group follows a specific hierarchical pattern that is highly consistent among all biological groups examined. For example, when the numbers of species of different taxonomic orders are plotted against their size rank (rank based on species numbers per order), a very interesting and a highly revealing pattern emerges: the species richness of the orders increases exponentially with their size rank. This means the higher the size rank of an order, disproportionately higher the numbers of species in it. This pattern was consistent among all the groups of organisms and, insects are not an exception. Further, this pattern was observed even when the richness of different classes is plotted against their size rank. In other words, the species richness follows a specific pattern within and among the groups of organisms and, beetles and insects exist merely as a continuum of this pattern. Therefore, explaining the emergence of this pattern could be basic to understand the evolution of the high species richness of beetles and insects.

I show that such a pattern can be explained purely as a consequence of an autocatalytic feedback process of evolution where *diversity begets diversity*. In other words, the observed pattern of organization of diversity with in any group and among all groups of organisms can be simply explained by a process of self-organization where groups that initially add species merely by chance, enhance their probability of adding more species. Thus, I show that the species richness of beetles and hence of insects could be merely a consequence of chance event in evolution, and not necessarily a consequence of any unique biological feature.

In other words, Haldane's God seem to love an inordinate fondness for the patterns and not necessarily for the beetles.

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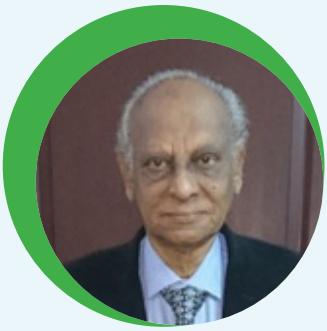
[1] *I am not sure if there was any Haldane's God! The famous incidence where Haldane is supposed to have made the now familiar quip on God's love for beetles , does not indicate whether or not he believed in God. He was only referring to the God of that the lady who asked him of his opinion on God's nature.*

Lifetime achievement awardees
&
Honorary fellows
2023

Lifetime Achievement Awardees 2023

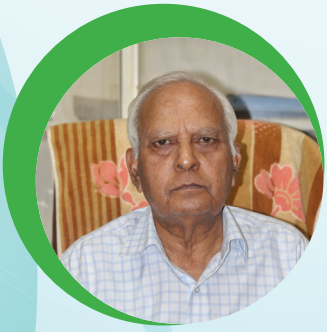


Dr. B.V. David

Dr. C.A. Viraktamath

Dr. G.P. Gupta

Dr. Krishan Singh Khokhar



Dr. Mohammad Hayat

Dr. N. Ramakrishnan

Lifetime Achievement Awardees 2023

Dr. S. Chelliah

Dr. S.N. Puri

Dr. Samiran Chakrabarti

Dr. Swaraj Ghai

Sri Rajnikant Shroff

Sri Ram Gopal Agarwal

Honorary Fellows 2023

Dr. Anand Prakash

Dr. B. Subrahmanyam

Dr. H.C. Sharma

Dr. J.R. Faleiro

Dr. Jagadish Sanmallappa Bentur

Dr. Jagbir Singh Kirti

Honorary Fellows 2023

Dr. Lakshmi Kanta Hazarika

Dr. N.K. Krishna Kumar

Dr. R.K. Seth

Dr. T.P. Rajendran

ESI Best Teacher Awardee-2022

Dr. Prabhuraj A.
Professor And Head (Ent.)
Project Leader (Esap)
Department Of Entomology
Uas, Raichur- 584 104

Abstract

Teaching is a noble profession and I am privileged to be in this profession. I have been in teaching throughout my service and thoroughly enjoyed it. Teaching not only gives an opportunity to transfer knowledge to young generation, but also provides continuous scope for self learning and enriching my knowledge. In the last 25 years of my service, I am offering fundamental courses like "Fundamentals of Entomology", "Insect Morphology", "Immature Insects", Advanced Insect Ecology" etc. I have experimented with all possible teaching methods and tools while teaching Under graduate (UG) and Post graduate (PG) students. A simple yet most powerful teaching method, I followed is "**Chalk andTalk**". It has a profound impact on the students' learning and many of my students even today remember lessons I taught. To induce self learning in PG students, I have adopted '**Interactive teaching and learning**" method through classroom reading and presentation assignments. To bring students more close to the subject, I have involved UG and PG students while conducting "**Insect Exhibitions**" for school children and general public. As the time passed and technology improved, I adopted more innovative teaching methods. I developed two Massive Open Online Courses (**MOOCs**) in association with IIT, Kanpur and Commonwealth of Learning (COL), Canada. The first MOOC on "**Integrated Pest Management**" was launched during 2016. Since then, the course was offered four times and over 25,000 students across the globe have successfully completed the course. During 2020 second MOOC on "**Diagnosis of crops and stored grains and their Management**" for which over

6,000 students have enrolled and completed successfully. For some courses like Advanced Insect Ecology, I have made students to enrol some international MOOCs and get the completion certificates as an assignment. I have also developed **e-courses** on "Insect Morphology" for PG programme and "Insect Morphology and Systematics" for UG programme under NAHEP e-Learning project which are now available to students online at national level. Apart from teaching, I am also involved in guiding PG and PhD students in entomological research. So far, 19 M.Sc. and 10 PhD students have completed their research in the field of Pest Ecology, Biological Control, Pest management, Insect behaviour etc. under my guidance. As Principal Investigator, I have operated Ad-hoc research project worth of over 1100.00 lakhs during my service period. Over 150 research articles have been published in national and international peer reviewed journals. As a team leader, I have designed and developed **e-SAP (Electronic Solutions against Agricultural Pests)**, a novel ICT application for crop health management. The technology is now deployed in Karnataka state providing real time crop advisory on pest management to the farming community.

ESI Senior Entomologist Awardees 2022

Dr. Poonam Jasrotia
Principal Scientist
ICAR-Indian Institute of Wheat and
Barley Research, Karnal, Haryana-132001

Advancing Ecologically-Based Pest Management Systems: Integrating Sustainable Practices for Agricultural Resilience

Abstract

Ecologically-based pest management systems play a crucial role in modern agriculture, emphasizing a holistic and sustainable approach to pest control. By relying on natural processes and ecological principles, ecologically-based pest management minimizes the use of synthetic chemicals that may have detrimental effects on the environment. This approach promotes biodiversity, soil health, and overall ecosystem resilience, besides mitigating the negative impacts on air and water quality, as well as non-target organisms. Ecologically-based approaches typically involve diverse strategies such as host plant resistance, biological control, cultural control making it more challenging for pests to develop resistance. This contrasts with the overuse of chemical pesticides, which can lead to the emergence of resistant pest populations, rendering traditional control methods ineffective. Host plant resistance is a key component of ecologically-based pest management systems, offering a sustainable and environmentally friendly approach to controlling pests. In recent years, molecular markers have been employed widely in crops for advancing our understanding of host plant resistance to insect pests. These markers enable researchers and plant breeders to identify, characterize, and manipulate the genetic factors associated with resistance. Specifically, these markers can help in identification and mapping of specific genes/QLTs associated with insect pest resistance and selection of plants with desired resistance traits more efficiently. In addition, molecular markers assist in the introgression of resistance traits from wild or exotic germplasm into elite crop varieties. This

targeted transfer of resistance genes helps improve the resistance of cultivated varieties without compromising desirable agronomic traits. Under cultural pest management practices, conservation agriculture has been recognised as one of the new approaches to pest management that contributes to the crop resilience in the face of climate change. Healthy and diverse agroecosystems help crops to withstand environmental stresses, reducing the susceptibility of crops to pest outbreaks triggered by climate variability. Moreover, it promotes the retention of crop residues on the soil surface that acts as a physical barrier, making it difficult for pests to access the soil and reach vulnerable plant roots. To develop an effective and sustainable pest management strategy, studying of insect behavior is crucial. Knowledge of insect behavior allows for the development of targeted control measures and help in determining the optimal timing for implementing control measures. Pheromones, chemical signals released by insects to communicate, can also be utilized for pest management. The specificity and versatility of pheromones make them a valuable tool in integrated pest management strategies, promoting sustainable and effective agricultural practices. Studying insect behavior helps identify and mimic these pheromones, enabling the development of attractants or disruptants that can manipulate insect populations. Insect behavior studies contribute to understanding how pests respond to changes in environmental conditions, such as temperature, humidity, and host plant availability. This knowledge is crucial for predicting and managing pest outbreaks in response to climate variability. In summary, ecologically-based pest management systems offer a comprehensive and sustainable approach to address pest challenges in agriculture. Their importance lies not only in effective pest control but also in promoting environmental health, biodiversity, and long-term resilience within agroecosystems.

The talk will highlight the work done under each above component of pest management briefly.

Keywords: Genetic resistance, QTLs, Tillage, Semiochemicals, Insect Ecology

Dr. Sanjay Kumar Sahoo
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Post Graduate College of Agriculture
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Understanding the nesting niches and behaviour of solitary and social bees – a prerequisite for their conservation and utilization

Abstract

Dr. S. K. Sahoo, is presently working as Professor in the Department of Entomology at Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar. He obtained his Ph.D. and M.Sc. from Punjab Agricultural University, Ludhiana. He has been engaged in Pesticide Residue Analysis during the last 18 years and associated with All India Network Project on Pesticide Residue (AINP-PR) in Department of Entomology, PAU, Ludhiana from Sept 2006 to February, 2019. He has made significant research contribution in the field of Pesticide Residue Analysis and conducted studies on dissipation of various pesticide-crop combinations to work out the waiting periods for the safety of consumers, standardized simple, sensitive, and cost effective analytical methodologies for the estimation of pesticide residues for new molecules likes imidacloprid, thiacloprid, thiamethoxam, emamectin benzoate, chlorantraniliprole, indoxacrb, pyripoxyfen, azoxystrobin and tebuconazole. As a part of mega project entitled "Monitoring of Pesticide Residues at National Level" different biotic and abiotic components of the environment were monitored to assess the magnitude and frequency of pesticide residues. Dr. Sahoo developed his expertise in handling various modern analytical instruments like GLC, HPLC, GC-MS and LC-MS used in pesticide residue analysis through training. He conducted about 80 supervised field studies on dissipation and persistence of various

pesticides crop combinations to work out the waiting periods and pre harvest intervals. Effect of processing like washing, washing with salt solution, washing with bicarbonate solution, washing with $KMnO_4$ solution, washing with acetic acid solution, washing with warm water were evaluated for reduction of pesticide residues in different vegetables. He studied the uptake, metabolism and persistence of imidacloprid in different fractions of cotton viz. cotton leaves, lint, seed cake and oil through seed treatment and foliar application. Metabolisms of thiamethoxam was also studied in mustard, okra, and soil and also evaluated the effect of microorganisms on degradation of pesticide residues in soil. Various experiments were carried out to assess the effects of neonicotinoids on overall dehydrogenase, phophatase and urease activity of soil when applied as seed treatment. He has been associated with various projects as PI and Co-PI's. He has more than 100 publications including 80 research papers in peer reviewed international and national journals.

Dr. Sahoo associated in making the Pesticide Residue Analysis Laboratory, Department of Entomology, PAU, Ludhiana, a NABL accreditated laboratory and performed the job of "Technical Manager" at first and later as "Quality Manager" in maintaining the accreditation status of the laboratory. Dr. Sahoo has been instrumental in establishing a processing laboratory for pesticide residue analysis at RPCAU, Pusa. He has been associated with seven recommendations which were included in PAU Package & Practices. He has guided four M.Sc. and two Ph.D. students as Chairperson of advisory committee. Also involved in teaching of various courses to M.Sc. and Ph.D. students of Entomology and published two teaching manuals. Participated and exhibited various charts in Kisan Melas of the University where the visiting farmers were advised regarding safe and judicious use of pesticides and various management practices as per farmers queries. Delivered more than 40 lectures as resource scientist in various training programme and published four technical bulletins. He is also the life member of several professional organizations and societies.

ESI Young Entomologist Awardees 2022

Dr. Amala Udayakumar
Senior Scientist (Entomology),
ICAR-National Bureau of Agricultural Insect Resources,
Bengaluru, Karnataka.

Abstract

Pollinators, especially bees, are an important group of insects that provide vital ecosystem service of pollination that benefits the agriculture and economy. Pollinator decline is a growing global threat and in the current era of urbanisation and intensive agriculture, there is a vital need to develop tactics to conserve the bees. Conservation of bees involves maintenance of forage flora round the year, creation and protection of their nesting habits that favours their abundance and natural multiplication. Creation of on-farm habitats for cavity nesting leaf cutter bees is a viable way to increase their abundance that helps in pollination and increased seed set and seed weight in pigeon pea. Development of captive rearing techniques for the native buzz pollinating bees with an ability to sonicate the flowers with poricidal anthers is the need of the hour for their commercial utilization for pollination under protected cultivations. Identification of the efficient bee pollinator in the crops with unique floral morphology is vital for efficient pollination and yield enhancement. Floral specificity studies provide baseline data on the key bee pollinators for specific plants that could be employed to conserve the bees. Trap nesting provides an assemblage of beneficial solitary bees and wasps that could be easily replicated in urban settlements for conserving their population. Deployment of AI-based tools to track the movement of ground nesting buzz pollinating bees to identify their subterranean nesting sites is an emerging area of research that aids to understand its complex nest structures and will help to simulate similar techniques for their domestication. Devising sustainable hiving methods for social bees from sites of their natural swarming/colonization is of paramount importance to develop viable colonies without the loss of

the efficient foragers and perennial storage reserves (pollen/honey). Unravelling the behaviour of the social bees at colony level during vital hive management techniques like colony division is important to understand the natural buffer mechanisms in place that favour the establishment of colony. IoT based bee-hive monitoring systems will help to undertake timely intervention measures to safeguard the bee colonies and also to reduce the requirement of trained manual labour in the maintenance of the colonies in large apiaries. Studies on the development of crop refuges amidst the cropping systems to serve as protection sites for the beneficial bees and wasps is the need of the hour to conserve and sustain their native population during the adoption of intensive agricultural practices.

Dr. Basana Gowda, G
Scientist (Entomology)
Division of Crop Protection
ICAR-National Rice Research Institute
Cuttack-753 00, Odisha

Abstract

Dr. Basana Gowda, G., has contributed to effectively integrating biological and chemical control to manage rice insect pests. Pesticides can have both lethal and sublethal consequences on the exposed organisms. His research underscores the importance of considering sublethal effects of pesticides on insects. Dr. Gowda unveiled how sublethal concentrations can stimulate metabolic processes, biological and population parameters (*called hormesis*). He has demonstrated host-mediated hormesis by deltamethrin in a parasitoid, *Habrobracon hebetor*. Furthermore, he has showcased transgenerational stimulatory effects of phosphine, enhancing nutrient reserves and influencing gut bacteria of host, making it an improved host for parasitoid. In addition to investigating hormesis in host insects, Dr. Gowda has also demonstrated the mechanism of hormesis in *Trichogramma chilonis and* assessed the multigenerational sublethal effects on the functional response of this parasitoid across generations.

Biocontrol agents are often taken for granted, and the system fails because of their poor quality. Dr. Gowda demonstrated how the laboratory mass-rearing of parasitoids on a factitious hosts would influence their performance on natural hosts and suggested using *Ephestia kuehniella* for mass-rearing quality parasitoids of *T. japonicum*. Utilizing his results of hormesis in host and parasitoid, exploring their relevance in mass-rearing, he has standardized three field-deployable products, NRRI Trichocard (T.j), NRRI Trichocard (T.j) and NRRI Braconcard (B.h). His efficient and timely supply of high-quality bioagents to stakeholders in over 10 Indian states has resulted in generating revenue of ~ Rs. 9.00 lakhs for his institute.

In his efforts to create cost-effective production protocols for mass-rearing biocontrol agents, he has been granted an Indian patent for his innovation "Efficient Portable Insect Collector with Automated Counter" (Patent number: 480911).

He also worked on pesticide residue budgeting and non-chemical pest management approaches for field and stored grain pests, which have a larger implication for sustainable agriculture practices in rice. He has phenotyped several rice accessions to the gall midge and BPH resistance and identified resistant genotypes with their morphological, biochemical and molecular mechanisms known. He has also contributed to developing the rice variety CR Dhan 410 (Mahamani).

He has secured nearly Rs. ~5.00 crores external research grants as principal investigator (PI) from different funding agencies. He has associated in developing a mobile application, 'RiceXpert' (in 4 Indian languages) and three pest databases. He is also a DGCA-certified remote pilot for flying drones. His recent awards include the Dr. T. M. Manjunath Young Scientist Award by Society for Biocontrol advancement (SBA), Bengaluru; Best Young Entomologist from Plant Protection Association of India (PPAI), Hyderabad; Best Performer (2023) by NRRI, Cuttack; Best External funded project as PI by NRRI, Cuttack. He is fellow of Entomological Society of India and Society for Biocontrol advancement. Authored >50 peer-reviewed publications (citations-859; h-index-15; i10 index-21), edited 2 books, several book chapters, popular articles, technical bulletins and reports. Total impact factor of his peer-reviewed publications: 155.8.

Dr. Suresh M Nebapure
Senior scientist
Division of Entomology
ICAR-IARI, New Delhi

Abstract

My research mainly focuses on insect semiochemicals and insecticide toxicology for management of important insect pests. The behavior of insect pests is facilitated by chemical signals originated either from the insects themselves or from other organisms including the plants upon which they feed. These semiochemicals are associated with several insect behaviors such as the search for food, sexual partners and egg-laying sites, protection from adverse environmental conditions and natural enemies. We have identified efficient attractive pheromone blend of maize stem borer, *Chilo partellus* and also the male specific plant volatiles which could be used to develop combination blend of pheromone and plant volatiles. Similarly, attractant plant volatiles viz., eucalyptol, nerol, benzaldehyde and benzyl acetate have been identified and evaluated in the field for another important polyphagus pest blister beetle, *Mylabris pustulata*. Our research on oviposition deterrent compounds for invasive insect pest *Spodoptera frugiperda* has led to the identification of two compounds viz., pentadecanoic acid and linoleic acid which can be further utilized for developing management strategy for this pest. The studies on exploration of essential oils and plant volatiles for sustainable management of whitefly, *Bemisia tabaci* revealed Palmarosa oil as effective contact toxicant. Similarly, citral from *Cymbopogon flexuosus* leaf essential oil and 1,8-cineole from *Eucalyptus globulus* essential oil were identifies as a bioactive molecule responsible for the insecticidal and oviposition deterrent activity against *B. tabaci*. The systematic investigation into the cotton leaf curl virus (CLCuV) infection, alteration of plant volatile release pattern and its impact on behaviour modulation of *B. tabaci* has led to identification of two promising repellent and one attractant

compound against this pest. We have also identifies Potential new fumigant candidates, carvacrol & fenchone, a monoterpenoid class compounds and trans-anethole, a phenylpropanoid against storage pest *Callosobruchus maculatus.* The studies on alternative insecticides for storage pest management revealed spinetoram as effective contact insecticides against storage pests such as rice weevil *Sitophilus oryzae*, almond moth *Cadra cautella* and Saw toothed grain beetle *Oryzaephilus surinamensis*. Dr Suresh Nebapure has published more than 45 research papers, 3 book chapters and several popular articles. He has guided 8 M.Sc. students and involved in teaching PG and Ph.D. courses. He is recipient of many awards by other professional societies.

ESI Best PhD Thesis Awardees 2022

Dr. M. Saranya and Dr. J.S. Kennedy
Tamil Nadu Agricultural University
Coimbatore-641003

Exploring the potential role of parasitoid adaptation to endosymbiont mediated defenses in rugose spiralling whitefly, *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae)

Abstract

Rugose spiralling whitefly, *Aleurodicus rugioperculatus* Martin (RSW) is an invasive pest on coconut and other horticultural crops found in India. The nymphal parasitoid, *Encarsia guadeloupae* Viggiani is a potential natural enemy of RSW reported to co-exist naturally in the ecosystem. Gut symbiotic bacteria harboured in host provides the protection and nutritional function to the host insect against their natural enemies. Present investigations were carried out on the biology of RSW, parasitization potential and biological parameters of *E. guadeloupae* on RSW reared on different hosts *viz*., coconut, banana, sapota and guava. Further, gut bacterial communities associated with RSW were assessed and aposymbiotic population were developed by direct antibiotic feeding of RSW adults through parafilm feeding chamber. Also, the parasitoid efficiency experiment was performed to study the adaptation behaviour of parasitoids against defensive bacterial endosymbiont associated with insect hosts.

The developmental period of RSW from egg to adult stage is 36.6 days in coconut and sapota, followed by 37.9 days in banana and 38.6 days in guava. *Encarsia guadeloupae* more preferred to parasitize second (60.60 ± 0.02%) and third (50.50 ± 0.06%) than first (8.10 ± 0.04%) and fourth (43.40 ± 0.14%) nymphal stages of RSW. *E. guadeloupae* adult emergence (70.58%) was higher in the third nymphal stage of RSW reared on banana and was significantly superior to other nymphal

stages. The developmental period of *E. guadeloupae* was shorter (10.60 and 11.27 days) and adult longevity was longer (11.10 and 12.17 days) in the third nymphal stage of RSW reared on guava and banana plants.

16S rRNA gene sequencing results revealed that the cultivable bacterial isolates belong to 16 different species namely, *Bacillus licheniformis*, *Exiguobacterium mexicanum*, *Acinetobacter refrigeratoris*, *B. manliponensis, B.velezensis*, *B.zanthoxyli*, *B.albus*, *B.altitudinis*, *B.aryabhattai*, *B.xiamenensis*, *B.subtilis* subsp. *stercoris*, *B.siamensis*, *Lysinibacillus xylanticus*, *Arthrobacter nitrophenolicus*, *Pseudomonas stutzeri* and *B.tequilensis*. Non-cultivable gut bacterial isolates were identified by 16S rRNA metagenomic sequencing revealed the presence of *Candidatus Portiera*, *Lactobacillus*, *Wolbachia*, *Pseudomonas*, *Dialister*, *Faecalibacterium*, *Bacillus*, *Candidatus Tremblaya*, *Oscillospira*, *Lysinibacillus*, *Burkholderia*, *Gluconobacter*, *Clostridium*, *Vibrio*, *Ruminococcus*, *Streptomyces*, *Serratia*, *Acinetobacter*, *Streptococcus* and *Paenibacillus* in RSW.

Nineteen antibiotics tested were against cultivable gut bacterial isolates and among these Erythromycin E^{15}, Ciprofloxacin CIP^{5}, Carbenicillin CB^{100} and Cefotaxime CTX ^{30} were selected for the development of the aposymbiotic RSW population. Among the antibiotic treatments, combinations of $CB^{100}+CIP^{5}$ were the most effective in reducing the host fitness parameters through the elimination of gut bacteria associated with RSW. Parasitic efficiency experiment results revealed the increased per cent parasitism, decreased emergence per cent and prolonged developmental time of *E. guadeloupae* was recorded in aposymbiotic RSW nymphal stage than in endosymbiotic RSW nymphal stage. This might be due to the elimination of endosymbionts associated with RSW through antibiotic treatment which suppress the host immune system and caused physiological stress to increase the susceptibility towards the parasitoid attack. Also, elimination of endosymbionts in host insect caused depletion of nutrients for the parasitoid development and emergence of *E. guadeloupae*. Gut bacteria-based management strategy can be used as rational insecticides for the effective control of whiteflies.

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Taxonomic description and illustration of Phytoseiid mites (Acari: Mesostigmata) from West Bengal and north eastern states of India

Abstract

Phytoseiid mites belonging to family phytoseiidae are seeking global attention for their importance in biological control of many sucking insect and mite pests. So far, a total of 2720 phytoseiid mite species have been described globally, of which India alone contributes 295 species. The North Eastern States of India are considered one of the hot spots of biodiversity. A study was carried out during 2018-2021 with a view to explore phytoseiid mite fauna in diverse plants and weeds from North Eastern states that comprising Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim, Tripura and West Bengal. A great diversity of phytoseiid mite fauna was observed from surveyed locations with discovery of seventy species belonging to three subfamilies and ten genera during the study period. Among them, thirty one are known species while thirty nine are new to the science. A great assortment with sixteen species of *Euseius*, three species of *Okiseius*, two species of *Amblyseiulella*, three species of *Paraphytoseius*, thirteen species of *Amblyseius*, two species of *Proprioseiopsis*, one species of *Paraamblyseius*, four species of *Neoseiulus*, two species of *Scapulaseius*, two species of *Typhlodromips*, ten species of *Phytoseius* and eleven species of *Typhlodromus* (*Anthoseius*) have been identified. Twenty-two species have been collected and identified from West Bengal, of which, *Amblyseius largoensis* recorded as the most dominant species in alluvial, red laterite and coastal and saline zone; while *Amblyseius guajavae* and *Amblyseius herbicolus* recorded dominant species in terai and hill zone, respectively. In Assam, *A. largoensis* has

been recorded the predominant species (21.6%) followed by *T.* (*A.*) *dahungensis* (16.9%). A great diversity of phytoseiid fauna have been observed from the state Meghalaya where *Euseius arunachalensis* recorded as the most dominant species with 11.4% occurrence, eleven species were described as new species from this state. Twenty-four species including seven new species belonging to eight genera were identified and described from Tripura where *Amblyseius conulus* (10.7%) as the most dominant species. The diversity of phytoseiid fauna of Nagaland and Manipur showed *A. largoensis* as predominant species. Again, out of fifteen species of phytoseiid species collected from Sikkim *Typhlodromips cinchonai* (20.0%) found as the predominant species and nine species described as new. Ten species of phytoseiid mites including seven new species were identified from the state Arunachal Pradesh of which *Euseius arunachalensis* (17.9%) was observed as predominant species. Hence, the diversity of phytoseiid mites revealed *A. largoensis* as the most dominant species in all the surveyed plain zone while *A. conulus* in terai zone and *A. herbicolus* in hill zone, though all belonging to same genera. This unique distribution recorded during this study which also reflects the habitat of the preference by the species. Interestingly, the dominant species of plain areas were absolutely absent in hilly areas and vice versa. The outcomes of this study will certainly help acarologists to carry out more advanced research in exploring phytoseiid mites as to their predatory potential and mass multiplication in the field of biological control programme.

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Morphological and molecular identification of termites (Blattodea: Isoptera) of south India

Abstract

Termites are eusocial cockroaches in the order Blattodea and are considered ecological engineers, play an immense ecological role in tropical ecosystems. The species determination in termites is a challenging task due to the lack of species-specific morphological characters and overlapping morphometrics of various closely related species. In present the study, a total of 72 species comprising of 26 genera of three families were collected from south India. Family Termitidae recorded highest diversity of species and genus followed by Rhinotermitidae. Two new species were identified, *Neotermes viraktamathi* (Kalotermitidae) from Karnataka and *Ceylonitermellus sahyadriensis* (Termitidae: Nasutitermitinae) from Kerala part of western ghats. The study also identified a new record of *Pericapritermes ceylonicus* in Indian main land. A maiden attempt was done to understand the worker gut morphology and enteric valve and gizzard armature of the digestive tube. This realized that the gut morphology can be used as an aid to differentiate workers of different genus. Molecular characterization based on *16S rRNA*, *12S rRNA* and *mtCOI* genes of termites resulted in 16 new submissions of partial gene sequences of different termites to the NCBI's GenBank. The phylogenetic analysis of the termite species revealed monophyly of Kalotermitidae and Termitidae. Within subfamilies of Termitidae, Macrotermitinae and Nasutitermitinae formed monophyletic clustering

while, Termitinae formed paraphyletic clustering. The distribution maps of termites collected from south India recognized many new additional records of termites in different parts of south India. Two species of *Odontotermes*, *O. gurdaspurensis* and *O. peshawarensis* and two species of *Dicuspiditermes*, *D. cornutella* and *D. fontanellus* were identified new to south India. Two genera namely *Rinacapritermes* and *Ampoulitermes* are new to Karnataka. *Cryptotermes bengalensis* was recorded for the first time from Kerala. *Coptotermes beckeri* recorded for the first time from Karnataka and Andhra Pradesh, while *C. kishori*, *Heterotermes indicola* *Microcerotermes. annandelei* and *M. beesoni* recorded from Karnataka for the first time. Genus, *Euhamitermes* identified from Kerala as a new record to the state with two new records to south India *viz.*, *E. chhotani* from Kerala and *E. lighti* from Karnataka. *Speculitermes chadaensis* and *S. dharwarensis* are recorded for the first time from Karnataka and Tamil Nadu respectively. *Odontotermes escherichi* and *O. globicola* are recorded for the first time from Andhra Pradesh, while *O. vaishno* recorded from Andhra Pradesh and Tamil Nadu for first time. The nutritional analysis of termites indicated a higher per cent of protein in *C. heimi* followed by *O. obesus*. The proximate analysis of *O. obesus* imagoes revealed higher proportion of crude fat followed by crude protein.

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Morphometric and Genetic Variability in *Maruca vitrata* (Fabricius) Populations across India

Abstract

The present study highlights the combination of phenotypic and molecular-based analysis of the *Maruca vitrata* populations occurring in different geographical conditions of India. *M. vitrata* populations showed significant variations among populations from different geographical locations for some of the morphometric traits. The biology of *M. vitrata* populations varied significantly across the geographical locations, also confirmed by the correlation studies. The genetic variation and population structure of *M. vitrata* was assessed from diverse agro-ecologies in India using the mitochondrial *cytochrome c oxidase* I gene. Phylogenetic analysis based on *COX*-1 gene inferred low genetic differences among the populations. . A low number of segregating sites (10), haplotypes (13), nucleotide diversity (0.00136), and overall mean genetic distance (0.0013) were observed among the populations. The negative values of the neutrality tests and unimodal mismatch distribution supported its demographic expansion in the country. The analysis of molecular variance (AMOVA) revealed that the variation among populations or groups was only 13.91%, and the geographical distance did not significantly contribute to the genetic differentiation. The clustering of haplotypes was also independent of the geographical location.

Screening of the populations based on 25 microsatellite markers also depicted a low to moderate degree of genetic variability. Variation among morphometric traits, biology, and genetic analysis indicates the possibility of the existence of homogeneity within *M. vitrata*

populations in India. SSR markers developed in this study will be useful in future studies of the gene flow, demography, biotype differentiation, host dynamics and developing appropriate integrated management strategies for this pest. Microsatellites are valuable molecular markers for population genetic studies; however, an inadequate number of *M. vitrata* microsatellite loci are available to carry out population association studies. Thus, we utilized this insect's public domain databases for mining expressed sequence tags (EST)-derived microsatellite markers. In total, 234 microsatellite markers were identified from 10053 unigenes. Based on the analysis, twenty-five markers were selected for validation in *M. vitrata* populations collected from various regions of India. The number of alleles (Na) observed heterozygosity (Ho) and expected heterozygosity (He) ranged from 2 to 5; 0.00 to 0.80; and 0.10 to 0.69, respectively. The polymorphic loci showed polymorphism information content (PIC), ranging from 0.09 to 0.72. Based on the genetic distance matrix, the unrooted neighbor-joining dendrogram differentiated the selected populations into two discrete groups. Overall, our results suggest the existence of low genetic variation and high gene flow among populations of *M. vitrata* in India may be attributed to the high migratory ability and a recent population expansion. The SSR markers developed and validated in this study will be helpful in population-level investigations of *M. vitrata* to understand the gene flow, demography, dispersal patterns, biotype differentiation, and host dynamics.

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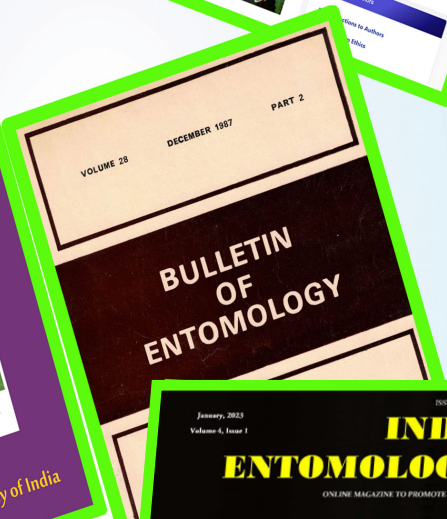
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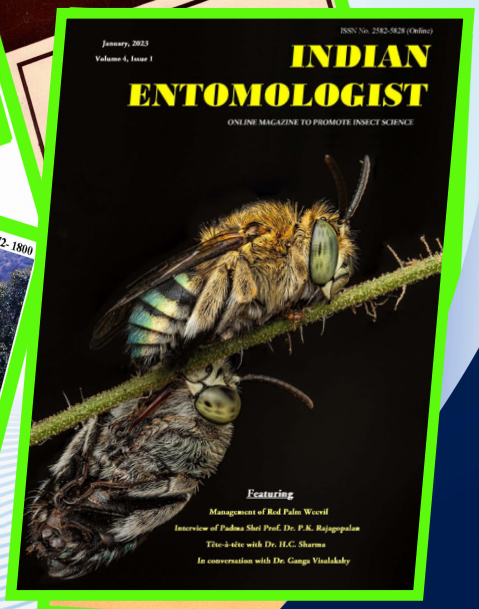
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