

NBAIR Newsletter

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ICAR–National Bureau of Agricultural Insect Resources



Chemoecological approach towards pest management

Entomologists all over the world have been trying to manage pests through several non-chemical modes, and insect ecologists have resorted to the chemoecological approach as a method for sustainable pest management. One of the core capabilities of NBAIR's Insect Ecology Division is to exploit this approach.

Use of semiochemicals for pest management through manipulation of the behaviour of insect pests has been highly successful in several crop ecosystems.

Cutting-edge technologies which involve biological and chemical detectors have been used to decipher the compounds that cause physiological and behavioural responses in insects.

The compounds so identified include both pheromones and kairomones which are used either in isolation or in tandem to attract/repel insect pests and to improve the performance of natural enemies.

Leptocybe invasa, an exotic pest which was causing extensive damage to eucalypt nurseries and coppices, could be effectively managed with a plant volatile-based attractant on a delta trap. Similarly, a synergised plant volatile “Dorsalure” was developed which attracted 2.5 times more adult fruit flies (*Bactrocera dorsalis*) than the normally used parapheromone, methyl eugenol which ultimately helps in reducing the number of traps required in mango orchards. Recently, one more technology was developed which trapped more females of *B. dorsalis*.

A new formulation technology was developed for trapping the melon fly, *B. cucurbitae*, wherein methanol and insecticides like DDVP are totally avoided.

Plant-based products often act as antixenosis substances that inhibit oviposition or feeding by insects. One such technology has been successfully used against the coffee stem borer in organically grown coffee. “Repter”, a plant volatile-based repellent has been commercialised for managing termites in woody trees and shadow trees, protecting the plants from reinfestation for at least four months.

An ovipositional attractant for the housefly, *Musca domestica*, has been identified, which can be used in tandem with a pheromone to attract both males and females.

Identifying a suitable delivery matrix is a key to success in using pheromones at field level. Nanomaterials are powerful platforms which can effectively release the volatile organic compounds. Nanomaterials have been identified for release of pheromones of rhinoceros beetle (*Oryctes rhinoceros*), red palm weevil (*Rhynchophorus ferrugineus*), fruit flies and tomato pinworm (*Tuta absoluta*). Nanosensors have also been developed to identify the pheromone released by *Helicoverpa armigera* and to identify the xenobiotics in food and fodder.

Identification of sex or aggregation pheromones for important borers like *Placaederus ferrugineus*, *Batocera rufomaculata* and *Anoplophora versteegi* has been completed and the products are in the pipeline.



Chandish R. Ballal
Director

Director-General Dr Mohapatra visits NBAIR

Dr Trilochan Mohapatra, Secretary, DARE & Director-General, ICAR, visited NBAIR on 14 January 2017 to address and interact with the scientists of ATARI, NBSS&LUP and NBAIR, the ICAR institutes based at Hebbal in Bengaluru. Presentations were made by Dr Chandish R. Ballal (Director, NBAIR), Dr Sreenath Dixit (Director, ATARI) and Dr Rajendra Hegde (Head, Regional Centre, NBSS&LUP).



Research Highlights

New species of *Tanaostigma*

A new hymenopteran species, *Tanaostigma indica* Gupta (Fig. 1), reared from *Millettia pinnata* (Fabaceae), has been described and illustrated from southern India. This is the first record of a *Tanaostigma* (Tanaostigmatidae) in the Old World.



Fig. 1: *Tanaostigma indica*

New pentatomid species

The pentatomid genus *Brachycoris* has been redescribed and its distribution expanded with the description of a new species, *Brachycoris tralucidus* Salini (Fig. 2), from southern India.



Fig. 2: *Brachycoris tralucidus*

A new thrips

A new thrips species, *Thrips laurencei* Rachana & Varatharajan (Fig. 3), has been described from specimens collected on flowers of *Hydrangea macrophylla* in Western Ghats range of Tamil Nadu. The new species shows sexual dimorphism in colour, with females being brownish yellow with brown shadings and males uniformly yellow.



Fig. 3: *Thrips laurencei*

Redescription of *Amyotea*

The pentatomid genus *Amyotea*, along with the species *Amyotea malabarica* (Fig. 4), was redescribed. The male and female genitalia of *A. malabarica* have been described and illustrated.



Fig. 4: *Amyotea malabarica*

Mitochondrial genomes of entomopathogenic nematodes

The complete mitochondrial genomes of two entomopathogenic nematodes, *Heterorhabditis indica* (14,556 bp; AT ratio: 65.2%) (Fig. 5) and *H. bacteriophora* (14,679 bp; AT ratio: 65.4%), have been sequenced on Illumina Nextseq 500. Thirty-six genes, including 12 protein-coding genes (encoding ATP6, CYTB, COX1, 2 & 3, ND1-6 and ND4L), two *rRNA* genes and 22 *tRNA* genes, were identified in the genomes. The generated data will be helpful in understanding the distribution, genetic diversity and phylogenetic relationships of these two species across taxons.

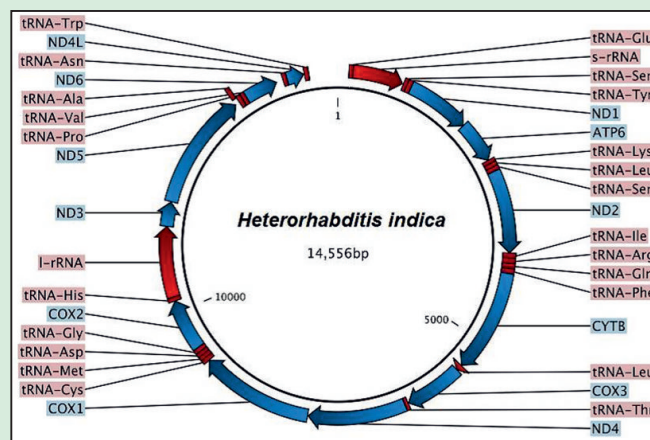


Fig. 5: Mitochondrial genome sequence of *Heterorhabditis indica*

Brainstorming on Rugose Spiralling Whitefly, *Aleurodicus rugioperculatus*



A “Brainstorming on Invasive Rugose Spiralling Whitefly (RSW), *Aleurodicus rugioperculatus* Martin” was organised by NBAIR in collaboration with the Tamil Nadu Agricultural University (TNAU) and the Society for Biocontrol Advancement at the Department of Entomology, TNAU, Coimbatore, on 20–21 March 2017. On day one, an expert team identified by ICAR visited farmers' fields in Pollachi and Aliyarnagar to study the extent of damage caused by the pest and the presence of natural enemies such as *Encarsia guadeloupe*. Addressing the session on the second day, TNAU Vice-Chancellor, Dr K. Ramasamy, emphasised the need for sustenance of earlier successes in the management

of invasives, measuring the level of success through continuous monitoring of the pests and natural enemies and maintenance of separate databases for the same. Dr M. Maheswaran (Director of Research, TNAU) appreciated NBAIR for playing a vital role in identification of this invasive pest and associated natural enemies and also emphasised the need to intensify studies on RSW biology and ecology for the development of integrated management strategies. NBAIR Director Dr Chandish R. Ballal's address focused on the importance of conservation of natural enemies. She appreciated all the organisations for their work on various aspects of this new invasive pest. Dr T. Venkatesan (Principal Scientist, NBAIR) and Dr K. Selvaraj (Scientist, NBAIR) presented an account of the invasion of RSW in India. Dr K. Ramaraju (Director, Centre for Plant Protection Studies, TNAU), Dr S.K. Jalali (Head, Division of Molecular Entomology, NBAIR), Dr R.J. Rabindra (Former Director, NBAIR) and Dr H.H. Khan (Former Project Coordinator, ACRIP on Palms) and representatives from the Coconut Development Board actively participated in the discussion. The meeting ended with sound recommendations for continuous monitoring and containment of the pest, and suggestions on researchable issues for its sustainable management.

Fifth National Conference on Biological Control

The Society for Biocontrol Advancement (SBA) in association with NBAIR conducted the “Fifth National Conference on Biological Control: Integrating Recent Advances in Pest and Disease Management” in Bengaluru from 9–11 February 2017. Professor H.A. Ranganath, a renowned insect geneticist and former Vice-Chancellor of Bangalore University, was the Chief Guest. Dr T.M. Manjunath, a legendary figure in biocontrol research and development in India, was the Guest of Honour. Dr P. Sreerama Kumar, Chief Organising Secretary, delivered the Welcome Address and Dr Chandish R. Ballal, President, SBA & Director, NBAIR, presented the Presidential Address. The inaugural programme included release of new publications, felicitation of senior biocontrol workers, distribution of SBA Awards and honouring biocontrol-practising farmers. Over 200 delegates from academic institutions and private industries across the country participated in the conference. Oral and poster presentations on various theme areas under five technical sessions were held and best oral and poster presentation awards were given away. There was also an exclusive session entitled 'Bioresources–Biocontrol Interface: Panel Discussion' during which experts on the panel discussed various issues related to bioresources vis-à-vis biocontrol. The national conference ended with the Annual General Meeting of SBA.



Farmers' meeting on biological control in Ramanagara district of Karnataka

A “Farmers Meeting on the Management of Insect Pests of Crops Through Biological Control” was organised by NBAIR in cooperation with B.V. Foundation of Horahally at P. Rampura village on 28 January 2017. Around 75 farmers, most of whom grow mulberry, and many enthusiastic schoolchildren from nearby villages participated in the meeting. Addressing the gathering in the local language, Dr Chandish R. Ballal (Director, NBAIR) explained about the effective biological control agents and the methods available to manage leaf-roller, thrips and mealybugs that infest the mulberry crop. She also



advocated the adoption of eco-friendly measures to control whitefly infestation. NBAIR scientists Drs T.M. Shivalingaswamy, Richa Varshney, Amala Udayakumar and Omprakash Navik, and technical officers Dr Y. Lalitha and Ms Shashikala Kadam, were on hand to clarify the doubts of the farmers. Mr Anjanappa (Senior Assistant Director, Horticulture), Mr Muthuraju (Assistant Director, Sericulture), Dr Jayaram (Principal Scientist, Central Silk Board) and staff of B.V. Foundation participated in the deliberations.

NBAIR at Regional Horticultural Fair and Krishi Unnati Mela

NBAIR participated in the “Regional Horticultural Fair” at the ICAR–Indian Institute of Horticultural Research, Bengaluru, from 15–17 January 2017. The biocontrol technologies exhibited at the stall attracted farmers, students and extension workers alike.

NBAIR put up a stall at the exhibition arranged during “Krishi Unnati Mela” at ICAR–Indian Agricultural Research Institute, New Delhi, from 15–17 March 2017, to familiarise farmers, students and extension specialists with the institute's research activities and technologies.

Recognitions

Dr T. Venkatesan:

Prof. T.N. Ananthakrishnan Award from The Prof. T.N. Ananthakrishnan Foundation, Chennai, 23 February 2017.

Dr Deepa Bhagat:

Best Scientist (Research) Award 2015 for Nanoscience from Society for Scientific and Social Development, Meerut, 26 February 2017.

Gandbian Young Technological Innovation Award from Society for Research and Initiatives for Sustainable Technologies and Institutions, New Delhi, 5 March 2017.

Dr P. Sreerama Kumar:

Dr Mahesh K. Upadhyaya Lecture Award from Indian Society of Weed Science, Udaipur, 1 March 2017.

Drs S.K. Jalali, T. Venkatesan, R. Rangeshwaran, G. Sivakumar & S. Sriram:

Societal Innovation Award for 2015 from National Research Development Council, New Delhi, 24 March 2017.

Selected Publications

Gupta, A. & Joshi, S. 2016. The first record of the genus *Tanaostigma* (Hymenoptera: Tanaostigmatidae) in the Old World, with the description of a new species from India. *Zootaxa*, 4193(1): 197–200.

Rachana, R.R. & Varatharajan, R. 2017. A new species of the genus *Thrips* (Thysanoptera: Thripidae) from the Western Ghats of India. *Zootaxa*, 4221(4): 491–493.

Salini, S. 2017. First record of *Brachycoris* Stål (Hemiptera: Heteroptera: Pentatomidae) in India, with description of a new species. *Zootaxa*, 4236(3): 563–572.

Sindhu, T., Venkatesan, T., Gracy R.G., Jalali, S.K. & Rai, A. 2017. Exploring the resistance developing mutations on Ryanodine receptor in DBM and binding mechanism of its activators using computational study. *Biochemical Engineering Journal*, 121: 59–72.

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