

## Non-chemical insect pest management\*

The intense application of synthetic chemical pesticides in different crops has created many complications such as pesticide resistance in insects, secondary pest outbreak and health hazards. Many alternatives are being proposed as ecofriendly and economically viable non-chemical methods. Biopesticides, biological control, cultural control and traditional pest management (TPM) are the important postulates that govern non-chemical insect pest management. Since our country has a rich source of plants and unexplored microbes, there is a scope of finding numerous active principles from plants and microbes for the purpose of insect pest management.

To discuss the methods and developments in various non-chemical insect pest and vector management tactics, a two-day national symposium on 'Non-Chemical Insect Pest Management' was organized. The symposium focused on the following themes: Preparation and application techniques of plant-based pesticides and their efficacy in field and stored product pest management and vector control; novel microbial pesticides; mass rearing techniques for biocontrol agents, new potential biocontrol agents, new techniques to evaluate the biocontrol potential; cultural control methods and field efficacy and economics of non-chemical methods, including pheromones, traps and attractants. Sixty-five research papers were presented by invited speakers and other contributors.

The keynote address delivered by B. Vasantharaj David (Sun Agro Biotech Research Centre, Chennai) spelt out the challenges in pesticide usage in the current context of climate change. He stated that climate change would bring in changes in the pest behaviour and its population dynamics, and crop yields will drop by 3–5% for every degree Celsius increase in atmospheric temperature. M. Kalyanasundaram (Vector Control Research Centre, Puducherry) discussed the larvicidal, pupicidal, repellent and

oviposition deterrent activities of some plant extracts against vector mosquitoes. Malarvannan (M. S. Swaminathan Research Foundation, Chennai) reported that an ethyl ester compound isolated from the petroleum ether extract of *Clausena dentate* (Indian wampee) leaves was responsible for the insecticidal activity against *Helicoverpa armigera*. A. Babu (UPASI Tea Research Foundation, Valparai) reported that neem seed kernel extract inhibited moulting and growth in tea pests and recorded 80–82% mortality.

P. S. Vimala Devi (Directorate of Oilseeds Research, Hyderabad) emphasized that registration of microbial insecticides with the Central Insecticides Board is compulsory to ensure commercial availability of quality products in the Indian market. P. Philip Samuel (Centre for Research in Medical Entomology, ICMR, Madurai) discussed the susceptibility status of *Culex tritaeniorhynchus* and *Mansonioides* mosquitoes, *Mansonia indiana* and *Ma. uniformis* from Kuttanadu, Kerala for Japanese encephalitis virus. V. Ambethgar (Regional Research Station, TNAU, Vridhachalam) reported that developing fungal agents in oils, granulating fungal agents in clay materials and adding UV protectants can help overcome some limitations with the development of fungal-based bioinsecticides. Nethi Somasekhar (Directorate of Rice Research, Hyderabad) and K. Narayanan (Research and Development Centre, Multiplex Biotech Pvt Ltd, Bangalore) emphasized the use of nematodes for the management of crop pests and mosquitoes.

R. J. Rabindra (National Bureau of Agriculturally Important Insects, Bangalore) stated that increase in the climate variability and elevated CO<sub>2</sub> levels as well as temperature are known to reduce the activity, longevity, fertility and fecundity of entomophages like parasitoids. Dunston P. Ambrose (St. Xavier's College, Palayamkottai) discussed the challenges in the mass rearing of entomophagous insects and solutions to prevail over them. A. Regupathy (Biofuels Research & Development Centre, Enhanced Biofuels and Technologies (India), Coimbatore) reported that *Jatropha* plants, which were known to be less prone to pest damage earlier, are recently

affected by many injurious pests, including thrips, *Retithrips syriacus* (Mayet) and *Rhipiphorotherips cruentatus* H., leaf webber cum fruit borer, *Pampelia morosalis* (Saalmüller) and tailed mealy bugs, *Ferrisia virgata* (Ckll.)

O. K. Remadevi (Institute of Wood Science and Technology, Bangalore), M. Sujatha (Directorate of Oilseeds Research, Hyderabad) and P. Narayanasamy (Annamalai University, Annamalai Nagar) emphasized the need for non-chemical measures of pest management such as physical, cultural and biological methods and transgenic techniques. D. S. Rajavel (Agricultural College and Research Institute, Madurai) proposed the idea of using 2-phenoxy ethanol to attract and kill subterranean termites. K. Rajasekhara Rao (Regional Centre, Central Tuber Crops Research Institute, Bhubaneswar) said that (Z)-3-dodecenyl (E)-2-butenate can be used to trap the males of citrus trunk borer *Anoplophora versteegi* (Rits) emerging during the first showers in Meghalaya.

The panel discussion called for efforts to develop formulations against major pests and to initiate further research on structure modifications of active compounds to develop new synthetic insecticides; basic research is needed on the ideal weather conditions and field situations for efficient use of biopesticides and biocontrol agents; time and season of collection of plant materials for extraction is important and isolation and screening of active compounds are essential; research on botanicals as fumigants to manage stored product pests is needed; biological control should be promoted to manage early season pests like aphids, thrips and mealy bugs; in any evaluation, the existing standard methods need to be compared (e.g. house-fly trap) and bring to light the advantages of non chemical methods; evaluation of fungus against stored-product insect pests is not advisable, but fungi may be screened against crop pests.

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