

National meet of entomologists 2016*

As part of the year long Golden Jubilee celebrations of the Indian Institute of Horticultural Research (IIHR), the Division of Entomology and Nematology convened the Third National Meet of Entomologists in Bengaluru.

The meet resolved to sustain the momentum and vigilance to face the emerging challenges in entomological research. It identified the missing links and formulated the recommendations under the following themes.

Biosystematics, biodiversity and biological control

- There is a need to establish international collaborations to strengthen efforts on classical biological control and taxonomy.
 - Taxonomy of immature forms can be effectively used for identification of white grubs especially species that cause severe damage.
 - Taxonomists while identifying hymenopterans should look into utility aspects such as biological control agents.
 - Exploratory surveys should be conducted to collect potential invasives (including mealy bugs, scales and thrips) and their identity diagnosed through taxonomic experts.
 - AICRP biocontrol should support individual organizations to produce and utilize biocontrol agents through training and nucleus culture supply.

Insect physiology, insect genetics, nutrition and dietics, toxicology and pest outbreaks

- Entomologists should focus on pests of *Bt* cotton, viz. sucking pests and pink bollworm (PBW) in India and study the development of resistance to *Bt*. IPM-based management for cotton pests and

practical policy recommendations for tropics and sub-tropics are in urgent need.

- Researchable issues such as insecticides suitable for IPM, use of tank mix products, recommendations for insecticide application, recommendation of non-label claim insecticides on crops and monitoring insecticide resistance need to be addressed at the earliest. Collaborative research programmes in relation to studies involving pesticide residues should be established as there are only a few residue analysis labs in India.

- Chemistry of green molecules, challenges in developing newer molecules of insecticides and getting them registered should be quickly accomplished.

- There is a need for rapid monitoring of emerging pests of mango like *Belinota*, thrips, shoot gall psylla, twig galls, leaf webber, inflorescence midge and fruit borers.

- Since the leaf webber *Noorda blitealis* Walker and *Helopeltis antonii* Signoret incidence have become serious on *Moringa*, a low-cost net-house technology was suggested to obtain borer-free brinjal.

- Physiology of honeydew excretion by aphids has been understood. There is a need to study how honeydew composition and bacterial endosymbiotic fauna in aphids across various host plants can be exploited for pest management especially biological control.

- Low cost fruit fly traps are indispensable. Reasons for failure of fruit fly traps in certain areas of India need to be determined and addressed.

- Awareness on proper timing and appropriate dose of botanicals such as extracts from Chrysanthemum, neem, pongamia, Hexodes and other species should be prescribed among users.

- Botanicals such as neem cake, neem seed kernal extract (NSKE), neem seed kernal powder, etc. should be widely recommended on vegetables for the management of major vegetable pests.

Evolution, ecology, ethology, insect-plant interactions and relationships

- The regulations and rules stipulated in the biotechnology relations bill which

had its origin in Convention on Biological Diversity (CBD), Biodiversity Act should be implemented at the earliest after creating awareness. The aims and objectives of the bill in the context of new technologies in the field of agriculture/horticulture and other life sciences are important considerations.

- The ecology and chemistry of insect-plant interactions with sucrose in fruit fly management, future options and progress in harnessing it in pest management should receive attention. In addition, egg production enhancement in silkworm can be realized.

- The utilization of below-ground fauna in maintaining the productivity and sustainability of soils through use of biorational materials should be encouraged. These technologies should reach farmers through a network of extension agencies.

Emerging concepts in pest management

- Entomologists in India were suggested to combine new molecular techniques such as RNAi, gene-drive technologies and barcoding along with baseline data to effectively manage major pests.

- Awareness on slow-release-formulations of pheromones is essential.

- The application of sterile insect technique for area wide pest management needs to be explored.

- Further research on use of semiochemicals for the management of tea mosquito bug (TMB) and cashew trunk borer is important.

- Novel molecular techniques are needed for pest management and their feasibility in the field conditions needs to be emphasized.

- Private entrepreneurs should work in close collaboration with public sector institutes/universities.

Climate change

- Adaptation strategies by farmers to combat climate change should be discussed and implemented. Elevated CO₂ and temperature effect on insect biology needs to be documented.

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- Effect of elevated CO₂ and temperature together, may be worked out for major pests.

- Linking bioclimatic models and empirical/simulation models may be focused to predict the impending situation of the pests.

- Research should focus on potato tuber moth response to climate change.

- Plants chosen through genetic selection procedures and transgenic crops should be evaluated under diversified conditions.

- Forecasting models for major pests must be developed and their efficacy demonstrated.

- Insecticide resistance in major pests especially sucking pests is detected. There is a need to evolve strategies for resistance management (IRM).

- Virus–vector relationships for major pests should be understood.

Productive and beneficial insects

- Emphasis on conservation of pollinators is essential to utilize them in seed and food production.

- Studies on honey bee breeding need to be conducted to develop highly productive and disease tolerant bees.

- Production technologies for bee products such as royal jelly should be deciphered.

- Focus on indoor rearing of tasar and oak-tasar silkworms is required.

- Hibernation in the silkworm should be addressed through research to increase the productivity of silk.

- Silkworm breeding programmes may be derived for exporting silkworm hybrids.

- Location-specific integration of lac host plants and agricultural crops is highly recommended to reap the benefits of all components appropriate in lac integrated farming systems (LIFS).

- Whole genome sequencing of the Indian lac insect, *Kerria lacca* (Kerr) is the need of the hour to understand and utilize this unique insect resource more effectively.

- Formulation of artificial diet for lac insects will open up more avenues in research and development of lac.

Non-insect pests

- Development of insecticide resistance in major mite pests is an issue of critical concern. Mass rearing of predatory mites and field releases should be made feasible.

- State policy issues concerning vertebrate pest management need to be clearly spelt out.

- Successful technology is available to manage rodents. However, much research effort is required to manage rodents on a community basis under field conditions.

- Technologies are accessible to reduce crop losses by birds, but implementation under field conditions is required.

- Recently elephants, nilgai and wild boar have become pestivorous. Multi-pronged strategies are required for their management.

- Since elephants, nilgai and wild boar fall under the Wildlife Protection Act (WPA) of 1972, no killing/shooting/catching can be performed. Non-lethal methods to manage these animals need to be evaluated.

- Creation of database on species raiding crops, damage caused, ecology and behaviour of these species specific to region is required.

- Networking of scientists on vertebrate pest management is urgently needed.

- Studies in traditional universities/institutes on vertebrate pest management should be undertaken.

- Novel approaches to regulate monkey population in an area by fertility regulation methods should be attempted.

Veterinary and medically important insects/arthropods

- The delivery of promising biological agents on the animals should be taken care.

- Collaborative work between veterinary and agricultural institutes is essential for better implementation.

- The basic behavioural studies on insects of veterinary importance need to be explored.

- Collaborative work with medical sciences to be initiated at the earliest.

Entomology-based entrepreneurship, commercial entomology, entrepreneurs-scientists interface

- Semio-chemicals available in India are strongly recommended for monitoring or mass-trapping of insect pests. Mating disruption technology should also be exploited in India as in several other countries.

- Only 15–20 natural enemies are mass-produced and utilized globally in augmentative biological control and this number has remained more or less the same for the last five decades. There is a need to develop technologies for others seemingly difficult-to-breed. Suggestions were given to develop technologies for long-term storage (inducing diapause) and improved packing of natural enemies; to exploit genetic tools to impart more desirable traits like tolerance to adverse temperature (high/low), insecticides, etc. to make a minimum release of natural enemies against known pests in certain crops in the beginning of the season as a routine practice.

- Chemical insecticide, Spinetoram was suggested for management of thrips, certain lepidopteron pests and dipteran leaf miner.

- An in-depth, integrative study on semio-chemicals of the host plant and the target arthropod is required to decipher the molecules suitable for the management of the pests.

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