Molecular modalities in the manipulation of insect natural enemies: Role of biosemiotics*

Several entomologists from diverse organizations took part in the meeting on molecular modalities in the manipulation of insect natural enemies. Inaugurating the meeting, M. S. Swaminathan (MSSRF, Chennai) stressed the need to go from generalized breeding to restricted breeding, with emphasis on creation of new technology, education and efficient delivery systems, etc. Underlining the importance of the biovillage concept, he noted the need for agriclinics catering to soil health and nutrition as well as plant health, so that plant protection could be taken care of by such clinics. Joseph Thomas (SPIC Science Foundation, Chennai) in his keynote address discussed the role of insects as tools to understand human genetics and that of pheromones in insect control.

Initiating the discussion, T. N. Ananthakrishnan emphasized the need to recognize involvement of biosemiochemicals in tritrophic interactions, particularly in view of recent opinions regarding Integrated Pest Management (IPM), involving a 'push–pull strategy' or 'stimulant–deterrent strategy'[1], wherein semiochemicals and host plant resistance, on the one hand, as well as regulated use of chemicals and use of natural enemies on the other, play important roles. Emphasis was laid on the involvement of current technologies, notably relating to the molecular aspects of tritrophic interactions, wherein plants respond to insect herbivory by synthesizing and releasing complex blends of volatile compounds which provide important host location cues for natural enemies of insect pests. Chemically-mediated plant–insect interactions are more sophisticated and complex, with great practical potential. Techniques for suitable spraying of volatiles such as linalool, jasmonic acid, caryophyllene, etc.[2,3], to attract parasitic wasps need to be developed to achieve positive results, in view of the increasing evidence of diverse factors interfering with successful biological control.

In the first technical session on the molecular inputs for efficient manipulation of natural enemies, R. S. Annadurai (Vittal Mallya Scientific Research Foundation, Bangalore) indicated that knowledge gained from the use of plant volatiles gave ample scope for application in the area of biological control. Variation in the production of plant volatiles by plants may be successfully employed to select plant cultivars that enhance the foraging efficiencies of natural enemies.

G. Suresh (SPIC Science Foundation) discussed the method of extraction, and identification, for terpene mixtures, indicating that gas chromatography (GC) coupled with mass spectral detectors provide detailed information on the identity of compounds. S. Narasimhan (SPIC Research Foundation), discussing the importance of pheromone-linked parasite behaviour, indicated that a detailed study of behavioural responses of parasitoids to volatile chemicals is essential to increase the effectiveness of parasitoids in host selection.

For a better understanding of the basic responses of the chemosensory system of insects and monitoring biological activity during isolation and purification of attractants from plant sources, Alok Sen (Entomology Research Institute) discussed the use of electroantennogram (EAG) technique, also involving the development of an electroantennographic detector in which GC is coupled to a basic EAG set-up.

Prasanth Jacob and S. Murugesan (Institute of Forest Genetics and Tree Breeding, Coimbatore) indicated that inundative release of parasites holds promise, though consequences of different varieties or clones of teak on defoliators as well as their natural enemies warrant further investigations. Having understood the biochemical and physical variations in teak clones against defoliator incidence, studies on the variations in the ability of natural enemies of teak pests to identify and utilize their prey on different clones of major forestry species will pave the way for considerable progress in breeding resistant candidate trees in forestry.

In the second technical session on current approaches of biological control of some crop pests, current methods of biological control relating to crops such as tea, cotton, cardamom, pepper and other spices, plantation crops and forest pests were also discussed to obtain an overall picture of their effectiveness, with suggestions for future plans for utilization of plant volatiles in the manipulation of natural enemies. The need for the use of new technologies, standardization of production techniques and the need for proper appraisal of these techniques to farmers was highlighted by S. Chelliah (MSSRF, Chennai).

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