

## New, safer molecules and biocontrol technologies for integrated pest management in crops\*

Increasing awareness among the public regarding the ill-effects of pesticides on human health has prompted the regulatory agencies to pull back pesticides from the market that are of concern to humans. Integrated pest management (IPM) strategy in India has stemmed out of the desire to reduce the reliance on chemical insecticides to manage pests. The current focus is on green IPM, which emphasizes the use of pesticides with reduced risk that in conjunction with bioagents.

Taking into cognizance the advances made in pesticide chemistry in developing new, safer molecules that could be used in tandem with bioagents, a national meeting was recently organized in Bengaluru. The meeting was attended by scientists and students drawn from 10 states across the country.

In his opening remarks, Abraham Verghese (Society for Biocontrol Advancement, and ICAR-NBAIR) mentioned that the meeting was unique as it attempted to blend insecticidal interventions and bioagents in IPM. The ideas churned out could be used to devise strategies for effective management of pests. He also opined that technologies developed at ICAR-NBAIR could be used in conjunction with chemical pesticides (if absolutely essential) to develop a robust pest management technique, keeping in view that the farmers realize maximum yields.

There were two technical sessions. The first session on new and safer molecules in IPM was chaired by T. M. Manjunath (formerly Monsanto, Bengaluru). He lauded the efforts taken to sensitize the need for bringing chemical pesticides manufacturers and bioagents multiplication units together to achieve desirable results that benefit the farming community.

\*A report on the national meeting on New, Safer Molecules and Biocontrol Technologies for Integrated Pest Management in Crops organized by the Society for Biocontrol Advancement in association with ICAR-National Bureau of Agricultural Insect Resources, Bengaluru on 23 February 2015 at Karnataka Veterinary Council Auditorium, Hebbal.

G. Pampapathy (DuPont India Ltd, Bengaluru) outlined a novel mode of action of anthranilic diamide-based Cyazypyr that selectively activates ryanodine receptors in insects. It had cross spectrum activity compared to conventional insecticides that have broad spectrum activity. Though, the insecticide caused mortality of insects 4–7 days after application, its bioaction caused immediate cessation of feeding, reduced honey-dew secretion in aphids, mobility of winged insects and fecundity that are essential features in pest/vector management. Pampapathy indicated that the compound has low to moderate effect on natural enemies and pollinators. Manjunath appreciated the entry of this molecule in pest management, but stressed to work out the cost–benefit ratio and insecticide resistant management (IRM) strategy that are involved in the use of newer molecules.

Sunil Naganur (Field Development, Bayer Crop Sciences) gave an update on the array of products from Bayer Crop Sciences. As a product development initiative, the company had over 23 new active ingredients with novel mode of action. He stressed upon the need for combining use of biologicals with chemical pesticides as an effective IPM strategy. Effect of flubendiamide on ryanodine receptors and their compatibility with natural enemies, birds, and humans was discussed. The impact of neonicotinoids and their safety to bees was highlighted.

K. Kumar (PAJANCOA, Puducherry) emphasized that Carbosulfan 6 G was effective against the rice stem borer and it was less toxic to natural enemies in the rice ecosystem. However, the house felt that data on the impact of Carbosulfan 6 G on beneficial insects need to be strengthened.

The second session on biocontrol technologies for IPM was chaired by S. Sithanatham (Sun Agro Biotech, Chennai). Topics on mass production technologies and safe use of bioagents with chemical pesticides were touched upon during the session.

Bioecology of coccinellid predator, *Coelophora bisellata* recorded on crop-

ping systems in Mizoram was discussed by T. Boopathi (ICAR, NEH). Considering the feeding potential of larval and adult stages, it fits in as a potential predator if mass-multiplied and supplied to farmers. During the deliberations it was suggested that impact of host and climate change on the predator development is to be considered prior to commercialization.

Anil Nakka (Sabala Agro Products, Bengaluru) spelt out that ‘ORGANO’ farming concept emphasizes more on crop health, ecology and fairness in crop husbandry. He informed that technologies developed by public-funded research institutes like ICAR-NBAIR were meeting the quality and standards prescribed by enforcement agencies and this brings confidence in private firms to invest in technologies that reach the farming community to produce a green and clean marketable produce. The bioformulations obtained from ICAR-NBAIR were efficient and stress-tolerant and this has helped Sabala Agro Products to deliver products that have gained the farmer’s confidence. He also mentioned the negative aspects of biocontrol market. Prevalence of spurious products in the market degrades confidence of the farmers on the effect of biocontrol technologies. He opined that this hurdle could be overcome by educating manufactures and farmers on biocontrol technologies and by initiating certification courses on augmentative biocontrol and setting up quality control laboratories for bioagents across the country.

Entrepreneurs like M. Balachander (Ponalab Biogrowth, Bengaluru) who have benefited from procuring the technologies from ICAR-NBAIR are producing bioagents to meet the farmer’s requirements in India. They have also extended their services to neighbouring SAARC countries. The bottleneck in commercialization of bioagents in India is the cumbersome process in biopesticide registration and voluminous data-generation discourages small-scale entrepreneurs to take up biopesticide production. Easing the norms for registering biopesticides will benefit small entrepreneurs as well.

IPM in partnership with nature for cleaner and healthier food was put forward by U. Bhat (Koppert Biological Systems). He opined that biocontrol agents have good market in India. The participation by private players in popularizing the technologies can be enhanced by streamlining the procedures involved in regulatory mechanisms.

Over 30 posters were displayed by research scholars and scientists from various research institutes across the country on topics ranging from new and safer insecticide molecules, biocontrol technologies, botanical insecticides and ecological approaches for green pest management.

The wrap-up and way forward session was chaired by Verghese. He lauded the interest shown by industry and academia

in trying to blend the chemical insecticides and bioagents for effective management of insect pests of crops and animals. The efforts of this attempt will be fruitful, if the concept of IPM turns to green IPM and this can be achieved by removing the barriers that stand against the simultaneous use of chemical insecticides and bioagents. He expressed concern on the policy issues related to import of bioagents, but emphasized that it was essential to safeguard the interest of the farmers. He informed that ICAR-NBAIR is in touch with NBA to address the policy issues of export of insect specimens or parts thereof for identification. Another issue that needs attention is the strict adherence to the IOBC standards with regard to chemicals and their safety to natural enemies.

This session was followed by the General Body meeting of the Society for Biocontrol Advancement. The Dr B. S. Bhumannavar Team Award was given to S. K. Jalali (ICAR-NBAIR) and his team for achievements in the area of biological control.

Mention of any products or opinions by the participants here does not imply endorsement by ICAR-NBAIR or SBA, Bengaluru.

**Abraham Verghese\***, **Kesavan Subaharan** and **P. Sreerama Kumar**, ICAR-National Bureau of Agricultural Insect Resources, Bengaluru 560 024, India.

\*e-mail: [directornbaii@gmail.com](mailto:directornbaii@gmail.com)

## MEETING REPORT

### Inspiring young minds to think out of the box\*

At the recently held Annual Meeting of TRendys in Biochemistry at Annamalai University, A. J. Rao (Indian Institute of Science (IISc), Bengaluru) described its genesis and evolution over the years to a national informal forum to inspire young minds to think 'out of the box'. T. Ramasarma (IISc) talked about the concept of TRendys and its role in promoting innovative thinking by open discussion on emerging concepts and breakaway ideas.

S. P. Modak (Open Vision, Pune) received the Oration Award from the University and delivered a talk on the co-evolution of chaperons and target proteins. He explained how co-evolution of chaperons and target proteins from comparable taxa can be examined on the basis of sequence similarity, secondary structure conformation and physical properties of the amino acid sequences. He showed that analysis of the phylogenetic tree indicates that the random coil and hydrophobic residues in the binding site play an important role in the inter-

actions between chaperones and their corresponding target polypeptide.

Ramasarma emphasized that locally beneficial 'small' research was no less important than making a major discovery. He illustrated this with the gripping episode that occurred in Muzaffarpur, Bihar, where undernourished children developed seizures, mental confusion and memory loss leading to coma and death. This was traced to consumption of litchi fruit that contained a toxin which caused hypoglycaemia by blocking gluconeogenesis. This finding is path-breaking, novel and beneficial for disease control and prevention.

The key roles played by mitogen-activated protein kinase in the replication of human immunodeficiency virus and simian immunodeficiency virus were elucidated by S. Mahalingam (IIT-Madras). He suggested with experimental data that the interaction of MAPK/ERK-2 with Gag polyprotein results in its incorporation into virus particles and may be essential for retroviral replication.

The use of naturally occurring bio-nanomaterials as potential tools for targeted delivery of drugs with special reference to lysosomal storage diseases was elaborated by N. Sivakumar (Univer-

sity of Hyderabad). He pointed out that new biomaterials from various sources, including the yeast O-phosphomannan and its hydrolysed products, plant homo- and heteropolysaccharides, protein-based purified plant/animal lectins, purified lysosomal enzymes as nanomaterials or synthetic dendrimers containing mannose 6-phosphate groups may be explored for targeted drug delivery to treat lysosomal storage disorders.

A. K. Dasgupta (University of Calcutta, Kolkata) spoke on the unreal Schrödinger's cat in real biology. He cited examples to demonstrate creation of a new space for quantum mechanics in functional biology in the last few years. He explained spin magnets in the brains of migrating birds, the coherent rhythms operative in the photoreception machinery in plants and photosynthetic bacteria, the phonons dictating odour perception in the quantum biology concept as well as the quantum mechanical principles that operate in the response of photosynthetic complexes PSI and PSII to perturbation in spin and selective effects of spin perturbation in normal and cancer cells. M. Bramanandam (University of Hyderabad) discussed the 'concept of estrogen receptor (ER) negativity' in breast cancer. He described how loss of ER

\*A report on the 22nd Annual Meeting of TRendys in Biochemistry, organized by the Department of Biochemistry and Biotechnology, Annamalai University on 28 and 29 August 2015.