



History and signing off...

History, they say, repeats. But it isn't true! Taj Mahal was built only once, and there cannot be another true-to-type Hitler! The present recedes to the past, leaving only trails for the future. In this quarter, January–March 2016, it was history that took a forefront at NBAIR. While it was nostalgic for some, it was putting history into perspective for the rest. NBAIR had its birth as an embryonic CIBC (Commonwealth Institute of Biological Control) Station, commissioned in 1957. A small plaque, commemorating the founding fathers, Dr V.P. Rao, Dr T. Sankaran, Dr M.J. Chacko, and subsequently Dr S.P. Singh, was etched into the CIBC building (which is now a guesthouse!). Our former Director-General Dr S. Ayyappan unveiled the plaque (*see picture below*), and appropriately so, as his tenure too as DG, has moved into history.



The CIBC building is a real beauty, made of cut stones and carries an aura of a semi-colonial architecture. The early research carried out here laid the foundation for the AICRP (Biocontrol)

and the Project Directorate of Biological Control, and subsequently the Insect Bureau. With the early research ethos, we also inherited the CIBC building. So this is now a “heritage” property of ICAR and stands as a historical iconic monument, reflecting the collective Indian and international team research that hallmarked such successes as biocontrol of papaya mealybug, sugarcane woolly aphid, eucalyptus gall wasp, salvinia, and many more, saving crores of rupees. These are all now part of history, and I wish sustenance of these and newer successes. From the ramparts of this historical building grew more buildings, housing the Bureau's national collections of Indian insects, now a recognised repository for insects. With a new state-of-the-art Insect Museum in the offing, a new “to be history”, begins at NBAIR.



Meanwhile, I thank all the readers who read my last 11 editorials in the *NBAII/NBAIR Newsletter*. This is my last editorial (!) as I too sign off... into the pages of history...

A big *namaste* to all!

Abraham Verghese
Director

National Science Day: NBAIR organises Insect and Insect Products Exhibition

NBAIR celebrated the National Science Day (28 February 2016) at its two campuses to mark the discovery of the Raman effect by Sir C.V. Raman in 1928. With the theme for this year being 'Make in India: S&T-Driven Innovations', NBAIR, which has been relentlessly working on pest management techniques that work in concert with nature, organised an “Insect and Insect Products Exhibition” depicting indigenously developed, ecologically non-disruptive, sustainable technologies that enable our farmers adopt agricultural practices without upsetting the intricate processes of nature. The exhibition on 27–28 February attracted many farmers, nearly 800 students and several entrepreneurs, who could see the technologies for harnessing the services of insects and microbes to combat other insects that damage our crops. At the Yelahanka Campus, about 50 children from the Government Lower Primary School, Attur Layout, participated in the event. The celebrations saw wide coverage by print media and Doordarshan in both English and Kannada. Dr Abraham Verghese, Director, NBAIR, personally coordinated the whole arrangement.



Research Highlights

Morphological and molecular characterisation of *Glyptapanteles* species

A phylogenetic study was conducted to resolve a diverse and geographically realistic subset of species within the hymenopteran genus *Glyptapanteles* (Fig. 1). The study was based on 60 populations from 12 geographical locations of the country that represent 26 provisional *Glyptapanteles* species within 8 species-

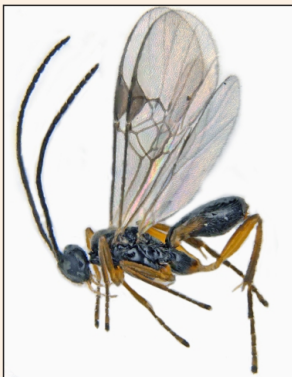


Fig. 1: *Glyptapanteles* sp.

groups. Phylogenetic analyses were performed on 38 populations based on mitochondrial cytochrome oxidase subunit I (COI) nucleotide sequences. Maximum likelihood and Bayesian inference methods displayed three and four major discrete *Glyptapanteles* clades, respectively. In clade A, very few Indian species were grouped along with Neotropical and Thailand species. Clades B and C grouped the majority of the Indian species and showed considerable host specificity.

Association of *Fusarium ambrosium* with tea shot-hole borer

The obligate fungal endosymbiont *Fusarium ambrosium* (Fig. 2) was isolated from *Enwallacea fornicatus*, the tea shot-hole borer, as well as from tea stem galleries (Fig. 3). The mycelium of the fungus was pale and cottony, and the thallus was whitish to pink. The ITS region of the fungus was amplified and the sequence deposited (GenBank Acc. No. KC6915561).

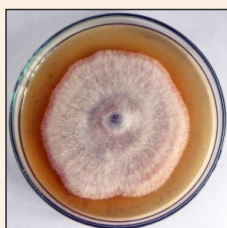


Fig. 2: *Fusarium ambrosium*



Fig. 3: Mycelium inside tea stem gallery

High incidence of the skipper *Hasora chromus* in Bengaluru

Hasora chromus (Lepidoptera: Hesperiiidae), a skipper commonly known as the common banded awl, was seen in large numbers fluttering in and around Bengaluru in March 2016. The Indian beech tree or pongamia, *Millettia* (= *Pongamia*) *pinnata*, was infested by the insect at the research farm on the NBAIR's Yelahanka Campus. Though the trees were entirely defoliated, soon they would rejuvenate/reshoot. Many insectivorous birds were seen feeding on the caterpillars. Since these caterpillars are harmless to humans, there is absolutely no necessity to spray any insecticide/pesticide for their control.



A report on the ICAR–NBAIR–Industry Interface Meet

The “ICAR–NBAIR–Industry Interface Meet” was held in Bengaluru on 11 March 2016 in association with the Society for Biocontrol Advancement. The objective of this event was



to showcase, promote and commercialise the biocontrol technologies developed at NBAIR. On offer were several technologies related to *Trichogramma*, *Chrysoperla*, predatory mites, anthocorids, *Trichoderma*, *Pseudomonas*, *Bacillus*, *Bt* and entomopathogenic nematodes. Also promoted were Eugalure, Dorsalure, alcohol-free cue lure, RepTer for termite control, sealer-cum-booster and biofumigants for storage pests. In attendance were around 60 people representing NGOs, government organisations and agripreneurs engaged in production of various biocontrol agents and formulations. Dr Abraham Verghese, Director, NBAIR, stressed the importance of technologies on superior biocontrol agents, biopesticides and pheromones/semiochemicals for the suppression of pests and diseases in this era of ecofriendly farming. Dr T. Venkatesan, Principal Scientist & Chairman, Institute Technology Management Unit, gave an overview of the various technologies available at the bureau for transfer to stakeholders. NBAIR entered into an MoU with the Kerala State Biocontrol Laboratory, Mannuthy, Thrissur, for transfer of three biopesticide technologies. During the meet, a B2B session was organised wherein all the stakeholders interacted with the inventors from the bureau to get details of the technologies, including production, facilities required and generation of toxicology data.



Saying 'no' to pesticides: the Kerala experience

The acreage under paddy in Kerala has come down by 70 per cent in the last four decades. This alarming decline is attributed to the increasing cost of cultivation coupled with pest and disease problems. The Palakkad district remains one of the last bastions of paddy cultivation in the state, despite the existence of similar impediments. The Vadakkencherry panchayat of the district has traditionally been growing paddy as the principal crop with 1,500 farmers raising the crop in 718 ha, predominantly during the second crop season (September–January). Till a couple of seasons ago, the cost of cultivation remained high due to the extensive use of chemical fertilisers and pesticides.



It was against this backdrop that the AICRP-Biological Control centre at Kerala Agricultural University (KAU, Thrissur), Vadakkencherry Krishi Bhavan, and ATMA under Kerala's Department of Agriculture, launched an initiative to popularise biointensive pest management (BIPM) in paddy in an area of 10 ha at Anakkappara padasekharam in 2015/16. NBAIR supplied nucleus cultures of the biocontrol agents.

The BIPM initiative was a resounding success: the farmers obtained higher yields, achieved significant reduction in cost of production and have developed a better understanding of the BIPM concepts. By adopting the BIPM practices, the farmers could save Rs 4,000–5,000/ha, only by avoiding the customary 4–5 rounds of insecticide sprays. The BIPM experience has unleashed a lot of energy among the agriculture department officials as well as farmers. Sale of insecticides has registered a 10–20 per cent drop this year. Farmers themselves are now taking up mass production of trichogrammatid parasitoids. The dynamic Agricultural Officer Ms Resmi Deepak avers: “I want to make sure that in five years' time every household in Vadakkencherry panchayat gets safe, pesticide-free and locally produced food to eat”. Finally, in recognition of their tireless efforts to popularise BIPM, the Vadakkencherry Krishi Bhavan was recognised as “Jaiva Karshika Panchayat” by the State Department of Agriculture, and Ms Deepak was nominated as the Best Agricultural Officer in the state during 2015/16.

Field Day-cum-Training Programme on Tomato Pinworm

In January 2016, there was 60 per cent fruit damage in tomato due to extensive pinworm (*Tuta absoluta*) infestation in Raichur district of Karnataka. Consequently, a “Field Day-cum-Training Programme on Monitoring and Management of Tomato Pinworm” was organised at Kadamagadoddi village on 29 January 2016 in collaboration with the University of Agricultural Sciences Raichur. The farmers were made aware of the importance of clean cultivation, destruction of crop residues and infested fruits, use of pest-free seedlings, treating of infested crates, monitoring the adult moths by pheromone traps and use of recommended insecticides and botanicals for the management of *T. absoluta*. Drs M. Mohan, A.N. Shylesha and B. Ramanujam from NBAIR interacted with the farmers and provided advice on the various biocontrol options available for the pest. Around 75 farmers participated.

Training Programme on Insect Bioinformatics

Under the Network Project on Agricultural Bioinformatics & Computational Biology, a national-level training programme on “Recent Advances in Insect Bioinformatics and its Applications in Pest Management” was conducted from 15–21 February 2016 at NBAIR. The trainees were exposed to various important insect genomic databases, modules and their implications in entomological research. The curriculum also covered various aspects of proteomics databases and included hands-on training on various



proteomics tools for structure prediction, molecular dynamics and dockings, because of their importance to studies on the molecular-level tritrophic interactions among plants, pests and natural enemies. The schedule also included a visit to the Institute of Bioinformatics and Applied Biotechnology. The programme was managed by Drs T. Venkatesan (Course Director), M. Prathepa and R. Gandhi Gracy (Course Coordinators).

Tribal Sub-Plan brings smiles to tribal farmers of Araku Valley

The tribal farmers of Araku Valley near Visakhapatnam in Andhra Pradesh benefitted from the ICAR's Tribal Sub-Plan (TSP) programme. The AICRP-Biological Control centre at the Acharya N.G. Ranga Agricultural University in Anakapalle implemented the programme for the tribal farmers who have small landholdings of 0.5–1 acre. Frontline demonstrations on organic farming techniques were conducted in 40 acres of paddy in two villages, Kothavalasa and Gunjariguda, during *kharif* and *rabi* of 2015/16. The programme was especially aimed at increasing the net incomes of small and marginal women tribal farmers.



NBAIR supported the AICRP centre by providing training on production of 'Tricho-cards', apart from supplying the cards for direct field releases. It also supplied back-up cultures of the host insect and *Trichogramma* species for further production and distribution to farmers. Furthermore, the Anakapalle centre trained 50 tribal farmers in organic farming techniques and provided inputs for paddy cultivation. The inputs supplied included seeds of a high-yielding paddy variety (MTU 1010), a biopesticide (*Pseudomonas fluorescens*), liquid biofertilisers (*Azospirillum* and phosphobacteria), *Trichogramma chilonis* and knapsack sprayers to the beneficiary tribal farmers.

In the TSP-implemented crop, there were more productive tillers (8–10 tillers/hill) than in the crop grown through traditional methods (4 tillers/hill). Also, there was neither zinc deficiency nor incidence of stem borer / leaf folder unlike in the case of the traditional crop. The tribal farmers adopting the TSP programme could record a higher yield (4,025 kg/ha) than those practicing traditional cultivation (2,100 kg/ha). Dr M. Visalakshi, Associate Professor of Entomology at the AICRP centre in Anakapalle, was behind the TSP programme. She motivated the tribal farmers for further spread of the organic farming techniques to reap higher yields and thereby get a better livelihood.

Workshop on Nanotechnology in Agriculture: a Focus on Insects and Insect Resources

NBAIR organised a day-long workshop on "Nanotechnology in Agriculture: a Focus on Insects and Insect Resources" on 19 March 2016. Forty-three researchers from various ICAR institutes, agricultural universities and R&D laboratories participated. There were talks by Mr Gadhadar Reddy (NoPo Nanotechnologies), Mr Rajnish Sharma (United Nanotech), Dr S. Angappane (Centre for Nano and Soft Matter Sciences), Mr Sandeep (Aimil) and others on as varied topics as the basics of nanotechnology, the use single-walled carbon nanotubes in agriculture, the importance of graphene, etc. The workshop was organised by Dr Deepa Bhagat, Senior Scientist, NBAIR.



Selected Publications

- Ballal, C.R., Yamada, K. & Joshi, S. 2016. Morphology and biology of the litter-inhabiting *Buchananiella indica* Muraleedharan (Hemiptera: Anthocoridae). *Entomon*, 41: 11–20.
- Sivakumar, G., Rangeshwaran, R., Yandigeri, M.S., Mohan, M., Venkatesan, T. & Verghese, A. 2016. Diversity of culturable gut bacteria associated with the field populations of cotton leafhopper *Amrasca biguttula biguttula* (Ishida) in India. *The Indian Journal of Agricultural Sciences*, 86: 208–215.
- Veenakumari, K., Rajmohana, K., Mohanraj, P. & Peter, A. 2016. An unusual, new, sexually dimorphic species of *Gryon* Haliday (Hymenoptera: Scelionidae) from India. *Oriental Insects*, 50: 40–49.
- Venkatesan, T., Sridhar, V., Tomason, Y.R., Jalali, S.K., Behere, G.T., Shanthi, R.M., Kumar, R., Vajja, V.G., Padma, N. & Reddy, U.K. 2016. Use of expressed sequence tag microsatellite markers for population genetic research of *Helicoverpa armigera* (Lepidoptera: Noctuidae) from India. *The Canadian Entomologist*, 148: 187–199.

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