NBAII Newsletter

National Bureau of Agriculturally Important Insects
Indian Council of Agricultural Research

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Renewed emphasis on pollinators and biocontrol agents

Flowering plants and insects are mutualistically related. On this relationship, a lot has been said especially about insect pollinators in agroecosystems. Here, an array of bees, flies, ants etc., which diligently rub the male germ cells (pollen) onto a stigma of a plant, has to adapt or co-evolve with the huge pesticide pressure, not uncommon, in all cross pollinated economic crops. Surely, there must be insecticidal resistant bees? Well, this would be one area to study and select strains of say *Apis cerana* or *A. mellifera* which have multipesticidal tolerance. Talking of pollinators, impact research, with socio-economic dimension is another area that needs to be scaled-up. While honey and apiculture have an 'industry' tag, pollination, economically speaking, is largely unnoticed. In the US, the pollinating services of insects are worth US$19 billion! In India and Asia, this figure could be equally mindboggling. So, it is worth investing in pollinator research and conservation, which are also mandated dimensions of NBAII.

The same is true for the myriad parasitoids and predators operating silently. The peering eyes of entomologists, therefore, need to look into all the nooks of our floral spread, both within the agrarian perimeters and far beyond, even into designated reserves, where, unknown to us, may linger many more potential bioagents than what we have now in our live and museum repositories. So, it is worth investing in research to explore these for use in non-insecticidal pest control. A fact that needs to be highlighted is that >50% of our agriculture (especially small and marginal farmers in small holdings) do not use pesticides! To them we owe biocontrol services. In the next Plan, AICRP on biological control envisages to have this dimension to search for new and useful winged invertebrates, whose biodiversity is high amidst mixed floral diversities we see in forests, grasslands, jungles, wetlands, etc.

So, in the XII Plan we will lay thrust on services through pollinators and biocontrol agents, and their conservation. Our approach would be to explore the unexplored, and identify and characterise new insects of agrarian value, for the social and economical upscaling of our farmers. NBAII is geared to this and will deliver in the years and decades to come.

Abraham Verghese
Director

NBAII licenses a new technology

The NAIP-sponsored "Agri-Tech Investors' Meet", held from 18–19 July 2013 in New Delhi, showcased and publicised the agro-technologies developed under the ICAR-NARS system. In the august presence of Dr K. Kasturirangan, Member (Science), Planning Commission, and Dr S. Ayyappan, Secretary, DARE & Director-General, ICAR, an MoU was signed between NBAII and Allwin Industries (Indore) for licensing of technology on the formulation of carbendazim/ salinity-tolerant strain of *Trichoderma harzianum*.

New Research

New species of an endoparasitoid

A new species of the gregarious endoparasitoid, *Dolichogenidea cinnarae* Gupta, Lokhande & Soman (Hymenoptera: Braconidae) (Fig. 1) was found parasitising the caterpillar of *Borbo cinnara*. In the course of its description, five species of parasitic wasps associated with hesperiids in peninsular India were also documented.

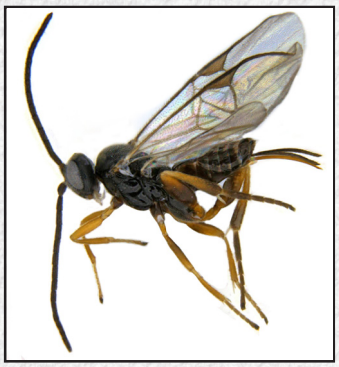

Fig. 1: ***Dolichogenidea cinnarae***

New host records

The solitary ichneumonid pupal parasitoid *Charops plautus* (Fig. 2) was bred from *Udaspes folus* on the host plant *Hedychium coronarium*. It constituted a new host record for the parasitic wasp genus *Charops*.

Ooencyrtus papilionis, an encyrtid wasp, was bred from eggs of *Bibasis jaina* on the host pant *Hiptage benghalensis*. This was the first documentation of a parasitic wasp from the genus *Bibasis*.

Fig. 2: ***Charops plautus***

Cellulolytic microbes from Scarabidae

Research on identifying industrially useful microbes from the gut of soil insects has been initiated at NBAII. The foregut and hindgut of larvae of scarabids are reported to harbour cellulolytic microorganisms that can degrade plant debris containing cellulose and lignins into simple sugars. These simple sugars can eventually be converted into alcohol by other microbes. This research may lead to exploitation of insect gut microflora for biofuel production. Larvae of the soil-dwelling *Protaetia aurichalcea* (Fig. 3) harboured 42 culturable microbes, 2% of which were found to be cellulolytic.

Fig. 3: ***Protaetia aurichalcea***

Heat shock proteins in *Cotesia plutellae*

Variation in temperature tolerance is a bioindicator of geographical populations of insects. Heat shock proteins (HSPs), which are induced by various biological stresses, show altered expression during temperature stress. Temperature simultaneously affects the associated endosymbiont densities. In a study on the expression of HSPs assayed through SDS-PAGE in four different *Wolbachia*-infested populations of the parasitoid, *Cotesia plutellae*, the amplification of Hsp70 was lower at 15 °C than at 20 °C. Treatment at 15 °C reduced *Wolbachia* density in the parasitoid. Regulation of HSPs based on temperature would influence the symbiont density, which is known to influence the development and survival of the parasitoid.

Field evaluation of multiple insecticide-resistant strain of *Trichogramma chilonis*

Leucinodes orbonalis on brinjal and *Helicoverpa armigera* on tomato cause serious losses across India. In a trial conducted on about 2 ha of brinjal and tomato in Dharmapuri (Tamil Nadu), it was conclusively established that six releases of the multiple insecticide-resistant strain of *Trichogramma chilonis* during the growing season could increase the yield by 15–20% through control of the respective pests. Releases of the parasitoid also resulted in reduction of insecticide application by 80% on brinjal and 50% on tomato. In a similar trial on 4 ha of tomato in Patiala (Punjab), the same strain of *T. chilonis* brought down the mean fruit damage by 85.8% through reduction in pest infestation by 89%.

Host range of Jack Beardsley mealybug in Karnataka

Pseudococcus jackbeardsleyi, known as the Jack Beardsley mealybug, is a polyphagous species of neotropical origin commonly occurring in the Caribbean, Central and South Americas. This invasive pest, which is known to infest 93 different plant species, including several vegetable, fruit and ornamental crops, has recently entered India. Its distinguishing characteristics are greyish colour, thin filaments around the body, a caudal pair about one half of the length of the body, and an ovisac covering the hind part of the body. The presence of an ovisac differentiates it from *Pseudococcus longispinus*, the long-tailed mealybug.

Surveys for invasive insects in south India revealed the occurrence of *P. jackbeardsleyi* in Tamil Nadu and Karnataka. It was found associated with the papaya mealybug, *Paracoccus marginatus*, in Bangalore. Several other plants, including *Cordyline terminalis*, an ornamental plant native to Southeast Asia, Australia and New Zealand, was also found to harbour this new pest. It was also found on the flowers of custard apple (*Annona squamosa*), 'Purple Martin' (*Streptocarpus* sp.) and jasmine (*Jasminum multiflorum*). On tapioca, chrysanthemum and Indian spinach (*Basella alba*), *P. jackbearsleyi* was found along with the papaya mealybug. Similarly, it was noticed to be in association with *Phenacoccus solenopsis*, the cotton mealybug, on parthenium and chrysanthemum. In some crops, it was found along with aphids and the spiralling whitefly, as in the case of basil, chrysanthemum and jasmine.

It is disturbing to note that the host range of this invasive mealybug has been expanding steadily in India. Some of the local natural enemies, such as *Cryptolaemus montrouzieri*, *Spalgis epius* and some species of gnats, are keeping its spread under check. Dr A.N. Shylesha, Principal Scientist, has complete information.

Pseudococcus jackbeardsleyi **on: (a) Chrysanthemum; (b)** ***Basella alba;*** **(c) Papaya**

"Hindi Pakhwada" celebrations

NBAII celebrated "Hindi Pakhwada" from 14–28 September 2013 with enthusiasm and fervour. In an event held on 18 September, Dr Abraham Verghese, Director, spoke on the importance of the Hindi language and read out the message from Mr Sharad Pawar, Honourable Union Minister of Agriculture & Food Processing Industries. The message was circulated in the Bureau and was prominently displayed on all the notice boards on the campus. Dr Ankita Gupta, Scientist & Member-Secretary (Official Language Implementation Committee) read out the appeal of Dr S. Ayyappan, Secretary, DARE & Director-General, ICAR, to all the staff members. Mr J.N.L. Das, Administrative Officer, spoke on the duties and responsibilities of staff members in respect of usage of Hindi in day-to-day official activities. Dr Sunil Joshi, Principal Scientist, presented the vote of thanks. An essay-writing competition and voluntary performances by NBAII staff members formed part of the celebrations. Mr Satandra Kumar, Technical Officer, coordinated the programme.

Brainstorming on fruit flies

A "One-Day Workshop and Brainstorming on Agriculturally Important Fruit Flies" was organised by NBAII on 27 July 2013 to review and analyse the status of fruit fly research in India and orient our research efforts to address the emerging issues. The varied topics and issues presented and discussed during the session included: fruit flies on mango and gherkin; quarantining; molecular taxonomy and barcoding; application of sterile insect technique in fruit fly management; and taxonomy of adult and immature stages of fruit flies. The best part of the meet was the combination of presentations and a hands-on practical session on the identification of adults and immature stages of fruit flies. Among the participants were distinguished entomologists, Dr C.A. Viraktamath (University of Agricultural Sciences, Bangalore), Dr V.V. Ramamurthy (Indian Agricultural Research Institute, New Delhi) and Dr Ramesh Arora (Punjab Agricultural University, Ludhiana). Several research gaps were identified based on the day's deliberations and the best way forward was suggested. Mr K.J. David, Scientist, organised the meet.

Training on insecticide resistance

An ICAR-sponsored short course on "Detection and Measurement of Insecticide Resistance Including Molecular Aspects in Insect Pests" was held from 2–11 September 2013 at NBAII. It was a focused, practically relevant training programme, considering the number of insect pests that have developed resistance to insecticides and reports of control failure of insect pests by farmers in the recent past. There were 25 participants, including 10 women. Dr M. Mohan, Senior Scientist, directed the course.

International fellowship for NBAII scientist

Dr P. Sreerama Kumar, Principal Scientist, was awarded the *Prasad Family Fellowship* for 2013 by UK-based Taylor & Francis Group, the publishers of *International Journal of Acarology*. This fellowship enabled his participation in the "Acarology Summer Program" at The Ohio State University, Columbus, USA, from 24 June–12 July 2013.

Congratulations!

Dr Prashanth Mohanraj, Principal Scientist, took charge as Head of Division of Insect Systematics on 17 July 2013. Dr Chandish R. Ballal, Principal Scientist, joined as Head of Division of Insect Ecology on 18 July 2013. Congratulations to both from all staff members of NBAII.

Selected Publications

Gupta, A., Lokhande, S.A. & Soman, A. 2013. Parasitoids of Hesperiidae from peninsular India with description of a new species of *Dolichogenidea* (Hymenoptera: Braconidae) parasitic on caterpillar of *Borbo cinnara* (Wallace) (Lepidoptera: Hesperiidae). *Zootaxa*, **3701**(2): 277–290.

Srinivasa Murthy, K. Rajeshwari, R, Jalali, S.K. & Venkatesan, T. 2013. Evaluation of pesticide tolerant strain of *Cotesia flavipes* Cameron (Hymenoptera: Braconidae) on maize stem borer, *Chilo partellus* (Swinhoe). *International Journal of Biodiversity and Conservation*, **5**(9): 567–571.

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