

Visitors

Shri. N. Kumara, Member, ICAR Governing Body visited the laboratories of NBAIL on 23-7-2011 and discussed with the scientists to appraise himself on the activities of NBAIL. Sh. Kumara evinced keen interest on the activities of NBAIL and appreciated the scientists on the efforts made on the development of useful technologies for the benefit of farmers.



Dr. M. Mahadevappa, former VC, UAS-D and former Chairman, ASRB visited NBAIL on 22 August 2011. He appreciated the efforts made by the scientists of NBAIL on the classical biological control of papaya mealy bug.



Commercialisation of technologies

Provisional Patents Filed

1. Design and development of solid state bioreactor for the mass production of fungal bioagents 2271/CHE/2011, DT. 04/07/2011

2. Bioformulations of carbendazim tolerant isolates of *Trichoderma* with biocontrol potential 2272/CHE/2011, DT. 04/07/2011
3. Bioformulations of salinity tolerant isolates of *Trichoderma* with biocontrol potential and also capable of inducing salinity tolerance in crop plants 2273/CHE/2011, DT. 04/07/2011

Technologies commercialised

In vivo production, down-stream processing and wettable powder formulation of *Heterorhabditis indica* NBAIL isolate (Hi1) by transfer of technology on sale to M/S. Sri Vekateshwara Chemicals, Hyderabad, M/S. Sri Biotech Laboratories India Ltd., Hyderabad and M/S. Multiplex Bio-Tech Ltd., Bangalore through MOUs.

Research papers published:

Bakthavatalam, N. Ravi, G., Deepa Bhagat and Tandon, P. L. 2011. Electrophysiological response of *Tetrastichus schoenobii* Ferriere (Hymenoptera: Eulophidae), an egg parasitoid of rice stem borer, *Scirpophaga incertulas* (Walker) (Lepidoptera: Crambidae) to the extracts of plants collected from rice ecosystem. *Journal of Biological Control*, 25(2): 98-102.

Patil, S., Sriram, S. and Savitha, M. J. 2011. Evaluation of non-pathogenic *Fusarium* for antagonistic activity against *Fusarium* wilt. *Journal of Biological Control*, 25(2): 118-123.

Poorani, J., Vandenberg, N. J. and Booth, R. G. 2011. A revision of the genus *Stictobura* Crotch and description of a new species of *Sticholotis* Crotch (Coleoptera: Coccinellidae: Sticholotidae). *Zootaxa*, 3031: 1-13.

Srinivasa Murthy, K., Rajeshwari, R., Jalali, S. K., Venkatesan, T. and Ashok Kumar, G. 2011. Intraspecific variation among populations of *Goniozus nephantidis* Muesebeck (Hymenoptera: Bethyridae) based on RAPD and ITS-2 rDNA sequences. *Entomon*, 35(3): 1-10.

Sriram, S., Roopa, K. P. and Savitha, M. J. 2011. Extended shelf-life of liquid fermentation derived talc formulations of *Trichoderma harzianum* with the addition of glycerol. *Crop Protection*, 30: 1334-1339.

Ms. P. Anitha has joined as LDC at NBAIL on 1-7-2011. Ms. Anitha has done her diploma in secretarial practice and has previous work experience in reputed organisations like TIFR-CAM. The NBAIL family extends a warm welcome to her and wishes her great success in her career.



Priorities of Entomology research for XII plan



The National Bureau of Agriculturally Important Insects organised the National Meeting on Agricultural Entomology for 21st century: The Way Forward: at Bengaluru during 25-26 August, 2011. This meeting was a big success with more than 300 agricultural entomologists, selected nematologists and pathologists representing all parts of India from ICAR, SAU, and other private and public sector participated in the two day brain-storming session to prioritize researchable issues in the area of agricultural entomology and plant protection for the 12th Five Year plan period. Renowned entomologists viz., Dr. S. N. Puri, Dr. G. K. Veeresh, Dr. S. P. Singh, Dr. K. Krishnaiah, Dr. Virakthamath and Dr. S. Lingappa were conferred with life time achievement award for their distinguished contributions to teaching, research and extension in agricultural entomology.

The inaugural session of the brain storming session was held under the chairmanship of Dr. S. Ayyappan, DG, ICAR and Secretary, DARE, who emphasized the important role of entomology in sustaining and strengthening food security in the country. Dr. S. Ayyappan emphasized upon the inter-institutional collaboration between the ICAR institutes for capacity building in this important area of research. Multiplication and distribution of parasitoids may be taken up by KVK across the country, he suggested.

Dr. Swapan Kumar Datta, DDG (CS), ICAR appreciated the developments taking in the field of molecular entomology and commented that the gene sequencing and DNA barcodes are helping the entomologists to resolve the problems of closely related species, sub-species and their variations. The development and use of bio-pesticides, nano-pesticides and molecular tools may be encouraged to manage the insect pest problems effectively, he added. Dr. T. P. Rajendran, ADG (PP), emphasized that the Council needs real -time solutions for the sudden pest outbreaks. He stressed the need for research on organic agriculture, technologies for protected cultivation of vegetables & ornamentals, storage pest management and need based application of pesticides in combination with safer eco-friendly methods for managing the crop pests.

There were six sessions covering a range of thematic areas viz. i. Insect Biodiversity & systematics including molecular systematics/bar-coding, ii) Pollination Ecology & Crop Production, iii) Management of Alien invasive pests & Quarantine, iv) Pest management and food safety, v) Molecular Entomology, and vi) Veterinary Entomology and Parasitology.

Important recommendations emanated from this meeting paving way for future entomological research in the country. Network projects on identification and management of stored pests of commodities, management of sucking pests, identification and management of invasive species, effect of climate change on pollinators & beneficial arthropods, management of insecticide resistance, RNAi technology based host plant resistance, xenobiotic-supported resistance against pest, gene discovery through transgenic crops, veterinary entomology, biodiversity mapping, ICAR consortium on molecular entomology and synthesis & evaluation of semiochemicals on priority are a few in this regard. The meeting also suggested infrastructure development for arthropod biodiversity, insect museum, and capacity building of systematic entomologists. The detailed recommendations can be referred from NBAIL website : www.nbail.res.in

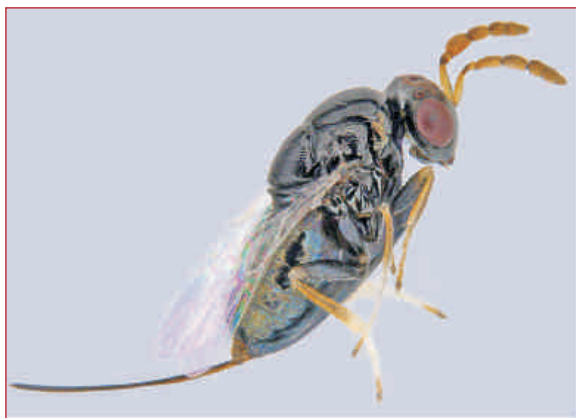
For a period under report a vision 2030 document of NBAIL has been formulated with major thrusts.

As I take over from such eminent predecessors' such as Dr. S. P. Singh and Dr. R. J. Rabindra, I assure that I will build on their hard work and success with the support of all the fellow entomologists of the country and my colleague at NBAIL.

N. K. Krishna Kumar
Director

Taxonomic studies on Coccinellidae and Chalcidoidea

Sticholotis magnostriata Poorani *et al.* (Coccinellidae) was described from Assam. Two new species of Chalcidoidea belonging to *Poropoea* (Trichogrammatidae) and *Assamencyrtus* (Encyrtidae) were recorded from Karnataka and are being described.



Poropoea sp.

Henosepilachna verriculata Pang & Mao, (Coccinellidae) was recorded for the first time from India (Manipur). *Ortalia vietnamica* Hoang from Himachal Pradesh and *Illeis confusa* Timberlake from Manipur (both Coccinellidae) and *Psyllaephagus mycopsyllus* Singh and *Neocladia narendrani* Hayat (both Encyrtidae) from Karnataka, were documented, all of which are new distribution records.



Neocladia narendrani

Predatory mite for the management of thrips on chilli.

A single release of the exotic predatory mite *Amblyseius swirskii* resulted in the establishment of the mites on polyhouse chilli and could check the population of thrips up to 50 days from the date of release, beyond which there was a drastic increase in thrips population, indicating a need for an additional release of predatory mites.

Ichneumonid parasitoids from baron

Caterpillar of *Euthalia aconthea* (Cramer) (Lepidoptera: Nymphalidae), commonly known as

“baron”, feeding on *Mangifera indica* was found to be parasitised. On laboratory rearing the hyperparasitoids belonging to the genus *Mesochorus* (Ichneumonidae) were obtained.



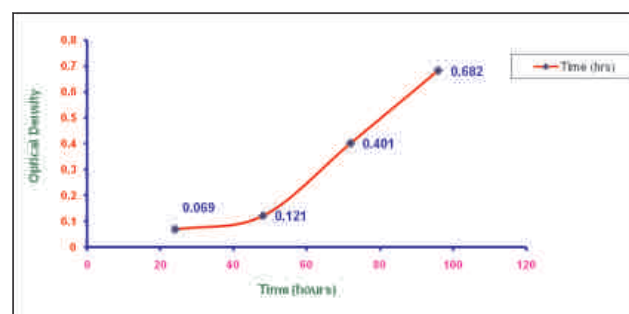
Parasitized larva of *Euthalia aconthea*

Endosymbionts from chrysopids

Endosymbiotic yeasts were isolated from the diverticulum, gut and fat bodies of different geographical populations of *Chrysoperla zastrowi sillemi* and identified as *Kodamaea ohmeri* (175 bp), *Candida apicola* (200 bp) and *Candida blankii* (175 bp) using yeast ITS-1. Also, endosymbiotic yeast was isolated from the diverticulum of pesticide tolerant strain of *C.z. sillemi* (PTS-8) adults and was characterized and identified as *Candida pimensis* using yeast ITS-1.

Endosymbiont isolated from larval gut of *C.z. sillemi* (PTS-8) was characterized and identified as *Bacillus cereus* based on 16S RNA (1200 bp).

Studies on minimal media with different concentrations of endosulfan (50ppm, 100ppm, 150ppm and 200ppm) inoculated with *C. pimensis* revealed that the yeast growth increased from 0.124 to 0.390 at 24 and 72 h when 100ppm endosulfan was provided as the carbon source. Further, minimal media with different concentrations of endosulfan (50ppm and 100ppm) inoculated with *B. cereus* revealed that growth of the bacteria increased, from 0.069 to 0.682 at 24 h and 96 h, respectively, when 100ppm endosulfan was provided as the carbon source as compared to other treatments.



Growth curve of *Bacillus cereus* (isolated from pesticide tolerant strain of *C. z. sillemi* larval gut) in minimal salt media supplemented with endosulfan (100 ppm)

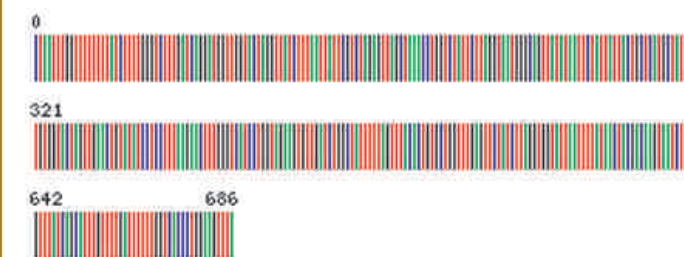
Preliminary study shows that the endosymbiotic bacteria was able to degrade the pesticide in *C. z. sillemi* larvae.

Endosymbionts from Trichogramma spp.

Endosymbionts were identified in different *Trichogramma* populations by ITS and 16S rDNA sequencing analysis. Eight endosymbiotic yeasts and two endosymbiotic bacteria were isolated and identified. *Pichia anomala*, *Candida cf. apicola*, *Wickerhamomyces anomalus*, *Metschnikowia reukaufii*, *Wickerhamomyces sp.*, *Candida pimensis*, *P. guillermundii*, *Zygosaccharomyces rouxii* were the yeast endosymbionts and *Bacillus cereus* and *Bacillus subtilis* were the bacterial endosymbionts. All the sequences were deposited in GenBank and accession numbers were obtained. The transmission of different yeasts in *Trichogramma japonicum* and *T. chilonis* indicated that after 5 and 10 generations of feeding, the per cent female emergence ranged from 69-82% (*T. japonicum*) and 45-57% (*T. chilonis*) compared to those which were honey fed (41% and 40%, respectively). The percent parasitism ranged from 85-93% in *T. japonicum* and 60-92% in *T. chilonis* in yeast fed population compared to 45% and 40% in those which were fed with honey.

Barcoding of Entomophilic Nematodes

Bar codes for *Steinernema abbasi*, *Heterorhabditis bacteriophora* were developed for the first time from India for NBAll isolates using Col gene.



DNA barcode of *Heterorhabditis bacteriophora*

Bio fumigants for stored grain pests

Lantana camara and *Artemisia pallens*, the aromatic shrubs which grow widely in the tropics exhibit insecticidal activity against *Sitophilus oryzae* and *Tribolium castaneum*. The extracts of leaves of *L. camara* and *A. pallens* showed fumigant and contact action against *S. oryzae* and *T. castaneum* in the laboratory bioassays. Gas chromatography-Electro antennogram detector (GC-EAD) studies for *S. oryzae* and *T. castaneum* indicated the presence of potent fumigant molecules in *L. camara* and *A. pallens*,

Protein elicitor from Trichoderma virens inducing systemic resistance in plants

RNA coding for Sm1 protein (acts as an elicitor of ISR mechanism in crop plants) was isolated from *Trichoderma virens* isolates (NBAll - Tvs12, NBAll - Tvs5, NBAll - Tvs8), *T. asperellum* (NBAll - Ta30) and *T. harzianum* (NBAll Th10). Bioinformatic analysis confirmed the identity of the protein as Sm1. Proteomic analysis using EXPASY proteome server revealed that Sm1 protein of *T. virens* belonged to cerato-platinin family.

Successful establishment of Quadrastichus mendeli in gall affected eucalypts coppices in Malur, Kolar district



The eulophid gall wasp *Leptocybe invasa* Fisher and La Salle (Hymenoptera: Eulophidae), an invasive pest caused serious damage to eucalypts plants in 2007 and 2008 resulting in reduced supply of eucalypts material to pulp and paper industry. Biological control of the pest was attempted through the introduction of a co-evolved species *Quadrastichus mendeli* which was introduced to India in November 2008

after quarantine screening as per standard protocols. *Q. mendeli* has established in various parts of the country, and along with *Megstigmus* sp., is playing an important role in the suppression of the gall insect. The parasitoid has given substantial control of 66-80% eucalypts gall wasps in the released locations in Bangalore, Hessaragatta and Malur in Karnataka.

Management of bacterial wilt of tomato caused by Ralstonia solanacearum through Bacillus spp. under field condition

Results of field studies on tomato revealed that combined application of talc based formulation of *Bacillus megaterium* NBAll 63 (10^8 cfu/ml) as seed treatment (4g /kg of seed), soil application (5g /kg of soil), seedling root dip (10g /L of water) and foliar spray (10g /L of water) resulted in highest seedlings establishment (87.5 %) and highest reduction (62.1 %) in wilt incidence.