



## Session IV

### Crop Pest Management IV—Parasitoids and Predators

Chair Dr T M Manjunath ■ Co-chair Dr O P Dubey

#### Lead Speakers

**Keynote 1 – Dr R J Rabindra, India**

Use of parasitoids and predators in pest management: perspectives and prospects

**Keynote 2 – Dr D N Yadav, India**

'Entomophage Parks' restores and conserves entomophage biodiversity



Session 4 in progress



The session began with the keynote address by Dr R J Rabindra, a specialist in biological pest management. He focused on 'Use of parasitoids

and predators in pest management: perspectives and prospects' and gave the example of successful control of European corn borer by *Trichogramma*. He also focused on the use of wasp *Eurytoma erythrinae* resulting in successful control of Erythrina gall wasp. He further added that augmentative biological control has been used extensively as a major crop protection tool. Dr Rabindra also discussed various natural enemies like *Trichogramma*, *Goniozus*, and *Chrysoperla* used in commercial biological control.

He reiterated the involvement of NGOs in rice biocontrol, discussed the use of predators in GM crops, and emphasized on the need for increasing institutional linkages and creating market value.



Dr D N Yadav emphasized on the development of entomophage parks to restore biodiversity. He also discussed the efforts taken by

him for conservation of parasitoids and predators. He added that the first entomophage park was successfully established at Anand, Gujarat and after that in Mysore and Rajahmundry. In his view, 26 species of natural enemies have been successfully introduced in India. He discussed the biological control of the sugarcane pest and diamond back moth by *Cotesia plutellae*. He emphasized that chemical pesticide has ill effects on parasitoids and predators. About 18–20 chemical sprays can completely remove natural enemies from the treated area. He described the host plant selection for *In situ* conservation of entomophage and added that local flora can be exploited for that.

#### Speakers

Dr A Krishnamoorthy, India ■ Dr S Sithanatham, India ■ Dr R D Gautam, India ■ Dr B Mallik, India  
Dr M A Khan, India ■ E I Y Elsiddig, Sudan



Dr A Krishnamoorthy



Dr S Sithanatham



Dr R D Gautam



Dr B Mallik



Dr M A Khan



E I Y Elsiddig

**Dr A Krishnamoorthy** elaborated the use of natural enemies for the management of horticultural pest. *Trichogramma* has been exploited for the majority of insect pests at dose 2 predator/plant. Control of mealy bug by *Cryptolaenum montrouzieri* was demonstrated.

**Dr S Sithanatham** emphasized on the need for financial support from national governments as well as on regional initiatives to motivate stakeholders to develop new policies, build awareness, and on group action among the farmers to be sponsored through viable and vibrant commodity-based linkages, so as to access the products at the grass-root level. The commercial producers should be encouraged to jointly form national/regional consortia to undertake collective actions for policy support, besides in-house quality assurance.

**Dr R D Gautam** said predators and parasitoids are exempted from regulation in government policy and quality control parameters are not in place. This needs to be taken addressed. He emphasized that low-cost production in laboratories plays a crucial role. He also discussed about the mass production technique of Australian ladybird beetle, *Cryptolaemus montrouzieri*. He elaborated Pusa Entocool for mass rearing of predators.

**Dr B Mallik** spoke about mass rearing of phytoseiid, a predator of spider mite, responsible for 30% to 40% loss of rose, tomato, and apple. *Neoseiulus longispinosus*, *Transeius tetranychivorus*, *Euseius finlandicus*, *Euseius ovalis*, *Euseius alstoniae*, *Typhlodromus rickeri*, and *Amblyseius largoensis* are the major phytoseiid utilized as bio-agent. He described a model for mass rearing using French bean as host from several

species tested. With the model described it has been possible to produce 1000 predators at the cost of Rs 4.53.

**Dr M A Khan** reminded all that India stands fourth among 12 megabiodiversity countries. It accounts for 6.2% of hymenopteran fauna. The model developed by him for mass production of predators and parasitoids in cottage industries, has been implemented at several places in Uttarakhand. He also emphasized on the role of extension programme run by government agencies and NGOs in developing these.

**Dr S I Y Elsiddig** discussed the effect of continuous rearing of the green lacewing, *Mallada desjardinsi* (Navas) (Neuroptera: Chrysopidae) on two laboratory hosts {eggs of *Corcyra cephalonica* (Stainton) and larvae of *Tribolium castaneum* (Herbst)} on longevity, fecundity, and sex ratio of the predator.

In his experiments, he found that longevity of male and female, oviposition period and fecundity were higher on *T. castaneum* larvae. Pre-oviposition period was shorter and sex ratio was in the favour of females. Average fecundity of the predator on *T. castaneum* larvae was significantly higher (544.15 eggs/female) than on *C. cephalonica* eggs (406.56 eggs/female)

Dr Manjunath commented that the major reason for the low interest in the commercial production of natural enemies is difficulty in demonstrating the bioagents to farmers. There is also dearth of documented results and quantitative data; if data is there, it is not reproducible. SAUs, KVKs, NGOs and other government and private institutions should come forward to look at viable options for mass multiplication.

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# Session V

## Novel Approaches I — Nanotechnology and Omics

Chair Dr P C Ghosh ■ Co-chair Prof. Ilan Chet

### Lead Speakers

**Keynote 1 – Dr Anil Kush, India**

**Crafting eco-friendly global pest solutions: the Omics way**

**Keynote 2 – Dr T M Manjunath, India**

**Transgenic crops for plant protection: analyses of performance, safety, and prospects**



In his keynote address, Dr Anil Kush from the Vittal Mallya Scientific Research Foundation, Bangalore, focused on 'Crafting eco-friendly global pest solutions: the Omics way'. He emphasized on the need to integrate biotechnology with traditional agricultural practices. He also explained how this would help in the development of target-specific biopesticides. Dr Kush pointed out that bioinformatics can prove to be a useful tool in designing novel insecticide molecules and study their interactions with the DNA and protein models. Also, in a reply to a query, he very nicely explained why different molecules have different affinity for enzymes. Dr Kush also discussed the metabolics of insect resistance and millet blast.



Dr T M Manjunath in his keynote address focused on 'Transgenic crops for plant protection: analysis of performance, safety, and prospects'. He explained the challenges and the need to develop crop biotechnology. He described the development in the area of transgenic technology at the international level and its national status. He informed that the major benefits from the crops developed by using such technology are higher yields, drastic reduction in chemical sprays, and net profit to farmers. He also mentioned the successful story of development of Bt-cotton in India in 2002 and its growth since then. He emphasized that effort should be made to appropriately integrate the transgenic technology with other technologies for sustainable plant protection.

### Speakers

Dr Errol Hassan, Australia ■ Dr Absar Ahmad, India ■ Dr K M Paknikar, India



Dr Errol Hassan



Dr Absar Ahmad



Dr K M Paknikar

is highly versatile. Dr Ahmad also discussed the reaction of aqueous gold ions with lemongrass extract for the system of gold nanotriangles. This system has potential application in smart delivery systems.

**Dr Errol Hassan** from the University of Queensland, Gatton, Australia discussed the potential application of nanotechnology for the development of sustainable agriculture. He explained how the natural extracts of pesticides can be encapsulated in a nanocarrier system to create a safe, cost-effective product in a delivery system that increases environmental and economic efficacy. He mentioned that the Australian agriculture system is actively considering employing such techniques.

**Dr Absar Ahmad's** presentation focused on the synthesis and applications of nanomaterials. Dr Ahmad explained how the plant micro-organisms and plant extracts can be used for the synthesis of metal, and so on. He said that the formation of nanoparticles occurs by an enzymatic process and

**Dr K M Paknikar's** presentation mainly focused on using nano-technology-based approaches for enhancing the effectiveness of biopesticides. He described how the enzymes or whole cells could be combined with nanostructures to generate hybrid systems with unique physical and chemical properties. This technique known as nanobiotechnology has numerous application in many fields including agriculture. Dr Paknikar emphasized that nanobiotechnology provides environmentally safe alternatives to chemical pesticides and is being promoted globally. He also discussed the challenges that need to be addressed before going for commercial development. Dr Paknikar discussed their recent research work on chitosan nanoparticles loaded enzyme preparations for pest control.

# Session VI

## Pests of Public Health Importance

Chair Dr V M Katoch ■ Co-chair Dr Bejar Barua

### Lead Speakers

**Keynote – International: Prof. Mir Mulla, USA**

**Entomopathogenic bacteria – Their fermentation products employed in vector control programs**

**Keynote – National: Dr M Mahdevappa, India**

**Allergic plants associated with public health and environmental degradation with special reference to *Parthenium*: Sharing the management protocols**



Session 6 in progress



Dr Mir Mulla's keynote focused on 'Entomopathogenic bacteria: their fermentation products employed in vector control programmes'. He mentioned that 80% efforts on vector control are being directed against mosquitoes, which are vectors of diseases like malaria, dengue, and filariasis. *Aedes aegypti* is the most important species. Now microbial agents are being extensively deployed and promising results are being recorded. *Bacillus thuringiensis* and Spinosid, a product from *Sacharopolyspora spinosa* is being used. Spinosad and Bt formulations as tablets have been used in jars and found to be active for over 112 days. Spinosad as WDG has been found effective for 55 days.



Dr M Mahdevappa delivered the keynote address on 'Allergic plant associated with public health and environmental degradation with special reference to *Parthenium*: sharing the management protocols'. He mentioned that *Parthenium* has spread in the whole country and causes harm to human beings, cattle, and so on. It causes allergic reactions as well. Replacement of *Parthenium* with other plant species like *Cassia*, *Sericea*, *C. tora*, *C. curiculata*, *Amaranthus sp.*, wild *tulsi*, *Hyptis*, *Tephrosia*, and *Croton sparciflorus* has been tested. In 15 out of 20 districts of Karnataka IWM of *Parthenium* has been adopted and 70% control achieved. He emphasized that right adoption is important.



Dr V P Sharma



Dr R S Chandran



Dr C J Geden



Dr S L Hoti



Dr Steven Krause



Dr Subbiah Poopathi

use of predatory fishes like Guppy and Gumbusia has been done in some of the areas of Maharashtra and Karnataka. Disease incidence has been reduced by over 80%–90%. Mass production technique for these fishes in villages has been perfected. In Maharashtra, the expenditure on insecticide has gone down drastically due to adoption of the fish culture.

**Dr Rakesh S Chandran** mentioned that weeds alter the shape and spoil turf and compete for nutrients and water. He gave an outline of establishing new turf grass by using poultry composed litter by removal of top soil, mowing, and irrigation.

**Dr C J Geden** focused on 'Prospects for development of salivary gland hypertrophy virus of *Musca domestica* as a population management tool'. He mentioned that the housefly is a nuisance and is difficult to control. It has developed resistance to insecticides also. Salivary gland hypertrophy virus has been found to be ineffective to three species of fly including *Musca domestica*. The insect infected with this virus produced no eggs. The virus can be applied as dry bait, liquid bait or through surface applications.

**Dr S L Hoti** mentioned that microorganism have shown good promise in vector management. More than 12 mosquitocidal agents have been identified. Formulations like WP or WDP have been tested in different locations. This has been found non-harmful to silkworms and human beings. He suggested working on better strains and formulations.

**Dr Steven Krause** focused on 'Impact of microbial insecticides on mosquito life-history and role in IVM programs'. He spoke on *Bt israelensis* and *B sphaericus*, which are host specific and eco-friendly. These work against larva and adult and their control is highly economical. As a result, egg hatching is reduced and larval survival goes down drastically. He emphasized work on fermentation and formulation, and development of media as dispenser.

**Dr S Poopathi**, mentioned that the production of biopesticides through conventional methods is costly. Among cheaper products, bird feathers, coffee waste, dairy waste, and bagasse can be used as a substrate. Bird feather has been found to be a very good media for mass production of biopesticide.

### Speakers

Dr V P Sharma, India ■ Dr Rakesh S Chandran, USA ■ Dr Christopher J Geden, USA ■ Dr S L Hoti, India ■ Dr Steven Krause, USA ■ Dr Subbiah Poopathi, India

**Dr V P Sharma's** address focused on the 'Indian programme of biological control of the vectors of human

diseases'. Mosquitoes are vectors of human diseases like malaria and dengue. For their control, effective

