MEETING REPORT

Invasive insects in agriculture, medicine and forestry*

The Ninth of the Chennai series of the Annual Discussion Meeting in Entomology was held in December 2008. Presiding over the inaugural session, M. S. Swaminathan (Chairman, MSSRF, Chennai) opined that necessary infrastructure has to be created for biosecurity. A virus from Hong Kong and Singapore, for example, had affected aquaculture units, and avian flu led to culling of birds in Assam. There was no local authority to control these alien pests, he added. He also indicated that by setting up quarantine centres in offshore islands with facilities to detect alien species, we would help prevent invasion of the species. The Chief Secretary to the Government of Tamil Nadu, K. S. Sripathi, mentioned that scientists and bureaucrats must work in tandem for the betterment of society and that there should be total cooperation between laboratory and land, whether it is forestry or medicine, or agriculture. T. N. Ananthakrishnan (Chennai) introduced the theme of the meeting and stressed upon the need for a dialogue on this emerging problem which has threatened agriculture, human health and forestry. He mentioned that invasion of insects was the result of globalization and the invasive species caused substantial damage to the native flora and fauna, and also resulted in the extinction of species.

Speaking on the 'Challenges in biological control of alien invasive pests', R. J. Rabindra (Project Directorate of Biological Control, Bangalore) mentioned that globalization has increased international agricultural trade, and movement of seeds and planting materials has enhanced the risk of introduction of alien pests into India. These species, if not accompanied by the natural enemies which keep them in check in their native range, can multiply in large proportion and cause damage to economically important plant species and crop plants. He quoted instances of such invasion by the coconut eriophyid mite *Aceria guerreronis*, the cotton mealy bug *Phenacoccus solenopsis*, the papaya mealy bug *Paracoccus marginatus*, the eucalyptus gall wasp *Leptocybe invasa* and *Brontispa*, a beetle pest of coconut. In addition to the alien invasives from across political borders, invasion of pests can also occur from one geographic location to another within the same country.

John Prasanth Jacob (Institute of Forest Genetics and True Breeding, Coimbatore) in his paper entitled, 'Invasive insect pests in monoculture forest ecosystem with specific reference to eucalyptus gall problem in India', indicated that the invasive insect *L. invasa* is presumed to have arrived from Australia on eucalyptus plantations and nurseries in several localities in Tamil Nadu, Puducherry, Karnataka and Andhra Pradesh. This tiny wasp induced galls on shoot terminals and on petioles and midribs in saplings and trees of eucalyptus. The likely source of introduction of this pest insect to India could be through exchange of vegetative materials of eucalyptus. In future, care needs to be taken to incorporate appropriate genetic diversity with periodic introductions and phasing out of different clones or provenances in plantation programmes to minimize economic damage due to invasive pest attack. A 'poly-monoculture' instead of a 'pure monoculture' of tree species would decrease exotic pest invasions and loss of forest resources.

The paper entitled 'Genetically modified mosquitoes for controlling vector-borne diseases: a futuristic approach gaining ground' was presented by B. K. Tyagi (Centre for Research in Medical Entomology, Madurai), who remarked that control of vector-borne diseases continues to depend upon vector-abatement strategies. The release of genetically modified (GM) mosquitoes may offer an alternative strategy to do so while circumventing the pitfalls of current vector-control methods. Current methodologies are stalling because of drug resistance, absence of vaccines and inadequate mosquito control techniques. GM mosquitoes have been developed that are resistant to pathogen infection and transmission, but the public health and environmental consequences of releasing such insects are unclear, mainly because of a lack of knowledge about the ecology and population biology of mosquitoes, not to mention the responsiveness and support by the communities. GM organisms have, in recent times, offered a good promise in controlling pest species, and it is now being seriously conceived if the GM mosquitoes, working on the principle of replacing or suppressing the wild population in nature, could also be directed to control a specific vector species, and thereby also the infection. As far as locally invasive species are concerned, the advent of the Indira Gandhi Canal in Rajasthan led to the invasion of several anophiline species in the Thar desert, which was influenced by irrigation in the desert.

The paper entitled 'Invasive alien species in rice – a global perspective' by Chitra Shanker, and J. S. Bentur (Directorate of Rice Research, Hyderabad) indicated that the rice ecosystem is no exception to such invasions and is probably more congenial for alien species to establish, since rice is grown in more than 35 countries spanning five continents. In rice, two classical examples of invasive alien species have been recorded. The first is the golden apple snail (GAS) *Pomacea canaliculata* (Lamarck), a native of Brazil. It is one of the world's 100 worst invasive alien species. The snail has become a major pest problem in many countries like the Philippines, Vietnam and Thailand, wherein direct seeding of rice is practised. Besides damaging the livestock, GAS poses threat to human health by hosting the nematode *Angiostrongylus cantonensis* that causes eosinophilic meningoencephalitis in man. The second example is that of rice water weevil *Lissorhoptrus oryzophilus*, which is a native of eastern USA and Cuba and has become a major pest problem in Japan since its introduction in 1976, and had expanded its range into Korea, Taiwan and mainland China by 1990.

The status of Erythrina gall wasp (EGW) (*Quadrastichus erythrinae* Kim; Eulophidae: Hymenoptera), an invasive

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insect pest on *Erythrina* spp. in major black pepper (*Piper nigrum* L.) areas of Kerala and Karnataka, was outlined by S. Devasahayam and T. K. Jacob (Indian Institute of Spices Research, Calicut). EGW was first reported damaging *Erythrina* spp. in Taiwan in 2004, and was recorded in India from the southern districts of Kerala, including Thiruvananthapuram District in 2006. Later, it was observed on *Erythrina* spp. in Pune, Satara, Sangli and Kholapur districts of Maharashtra, and Belgaum and Dharwad districts of Karnataka during the same year. Surveys conducted recently by the Indian Institute of Spices Research, Calicut, in major black pepper areas of Kerala and Karnataka, indicated that the EGW was present in all the districts surveyed (Idukki, Kozhikode, Kannur and Wayanad in Kerala, and Kodagu in Karnataka), damaging *Erythrina* spp. to various levels. The percentage of trees and branches infested by EGW was highest in Wayanad District (59.6 and 41 respectively). Kozhikode and Kannur districts recorded the lowest EGW infestation on trees (31.7%) and branches (15.6%) respectively. The surveys indicated that infestation of *Erythrina* spp. by EGW is one of the major constraints for growth and production of black pepper vines in recent years.

Invasion of the litter beetle, *Luprops tristis* and its emergence as a serious pest in the moist western slopes of the Western Ghats were brought to light by Sabu K. Thomas (St Joseph's College, Calicut). Massive seasonal invasion as of huge aggregations of the litter-dwelling detrivorous beetle, *L. tristis* (Tenebrionidae), has been a regular event for the past three decades in the rubber plantation tracts in Kerala. Though they do not sting or bite, their annoying presence and nocturnal movements inside living rooms along with the release of an irritating odoriferous secretion on accidental squashing that causes skin burns, makes daily life miserable for the people. No beetles were recorded from the region prior to 1970s and their current staggering abundance and huge population build-up occurred after the introduction of rubber plantations in the moist western slopes of the Western Ghats during 1970–80; however, they were prevalent in the dry, eastern slopes of the Western Ghats and across Sri Lanka prior to the 1970s. Further, in view of the introduction of rubber plantations in the North East region of the subcontinent, precautions need to be taken.

The paper entitled 'Implications of two invasive adventive whiteflies, *Bemisia tabaci* (Gennadius) and *Aleurodicus dispersus* Russell (Aleyrodidae: Homoptera)' was presented by R. W. Alexander Jesudasan (Department of Zoology, Madras Christian College, Chennai). He mentioned that among the insect species that have invaded several parts of the world causing concern to economically important flora in the past two decades, two whiteflies, viz. the silver leaf whitefly, *B. tabaci* (Gennadius) and the spiralling whitefly, *A. dispersus* Russell are well-known adventive species. *B. tabaci* has been reported from all continents, except Antarctica and is now nominated as among 100 of the 'world's worst' invaders. Over 900 plants have been recorded for *B. tabaci* and it reportedly transmits 111 virus species. It is believed that *B. tabaci* has spread throughout the world by transport of plant products that were infested with whiteflies. *B. tabaci* is believed to be a species complex with 20 recognized biotypes and regarded to have been possibly originated in India, though the whitefly has been first described as a pest of tobacco in Greece. In India, the biotype B of *B. tabaci* was first noticed in October 1999 in Kolar District, Karnataka, owing to an outbreak of tomato leaf curl disease resulting in the failure of tomato crop in that region. Subsequently, a survey of *B. tabaci* revealed the occurrence of B biotype in other parts of the country.

A. dispersus is a native of Caribbean region and Central America and is highly polyphagous, affecting a wide range of host plants – 481 plant species, including horticultural plants and intensively managed teak plantations. During the 1970s, it started spreading from the Central American countries and was first reported in Hawaii outside its native range, and started spreading westward in the Pacific Islands to the Philippines. It was reported from Sri Lanka in 1990 and India in 1994.

Chairing the concluding session of the discussion meeting, T. M. Manjunath (former Director, Monsanto Research Centre, Bangalore) indicated that we should work ceaselessly to unearth invasive species from different environments, so that there may not be a repetition of the colossal loss inflicted by *L. invasa* on eucalyptus.

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