

Pheromone technology: An ecofriendly approach for coconut pest management

Bhanu K.R.M and Chandrasekharaiah

Bio-Control Research Laboratories, PCI, Bangalore, Karnataka

Coconut palm is inflicted by a number of pests of major and minor importance. All these are capable of causing considerable damage to the coconut palm resulting in reduced yields. Nearly 751 insect pests of coconut have been recorded world over. These pests attack leaves, stems, flowers, nuts and roots of the palm and coleoptera is the most numerous among them. Apart from coconut mite, the rhinoceros beetle, red palm weevil and black-headed caterpillar (BHC) are considered to be serious pests during growth period.

Pheromone technology

Pheromones are released by males or females of the insects and used to communicate among the same species. Pheromones are used in pest management as an attractant and trapping tool for males or females of the same species. This technology is standardized for mass trapping rhinoceros beetle (RB), red palm weevil (RPW) and black-headed caterpillar (BHC). RB and RPW

have aggregation pheromones which attract both males and females leading to reduction in pest population where as BHC has sex pheromones and can attract only males of *Opisina arenosella*. When most of the males are trapped, the unmated females will lay infertile eggs leading to larval reduction and there by population reduction of this defoliating pest. Continuous trapping is required for few generations to bring the pest population under control.

The red palm weevil (RPW) and rhinoceros beetle (RB)

The RPW, *Rhynchophorus ferrugineus* Olivier (Coleoptera: Curculionidae) is widely considered to be the most devastating insect pest of palms in south and Southeast Asia. This pest was first described as a serious pest of the coconut palm in 1906, while in 1917 it was described as a serious pest in the date palm in Punjab, India. RPW damages 34% of coconut groves in Cochin, India. It is very difficult to detect the presence of

the pest infestation in the earlier stages of attack. The grub begins its life inside the palm, and normally never comes outside. Sometimes, a few small holes occur in the crown or on the soft stem. In many cases the drying up of the young heart leaves or splitting of the petioles near the area of attack can be observed. But most often the attack by the weevil is noticed only when the tree has been fatally infested and is beyond repair. The damage caused by the pest is very severe and once the weevil gets access to the palm, the final death of the tree is more or less certain. The first indication is the presence of holes on the stem with chewed fibrous material, sometimes protruding out. Damage symptoms are indicated by the presence of tunnels in the trunk, oozing of thick yellow to brown fluid from the tree, the appearance of chewed up plant tissue in and around opening in the trunk, the presence of a fermented odor from the trunk or topping of the crown.

The rhinoceros beetle, *Oryctes*



Fig 1: A. Dead tree due to RPW; B. RPW Grubs; C. RPW catches in pheromone trap



Fig 2: 1. Damage due to RB; 2. Bucket trap with tender coconut pieces; 3. RB catches in pheromone trap

rhinoceros L. (Coleoptera: Dynastidae) (RB), is another most damaging insect to coconut palm and African oil palm in the Southern and South East Asia and the Western Pacific islands. The adult rhinoceros beetles feed on the growing point of the palm producing eventually ragged appearance of mature palm leaves. A severely attacked palm will die or damage by secondary pest attack. The eggs of this pest are laid in rotting vegetation, especially in the trunks of rotting palms or nearby FYM pits. The larvae bore and damage in the tunnel which constructed by feces and silk among the spikes of flowers. The life cycle lasts from 4 to 9 months allowing more than one generation per year. The beetle breeds in dead standing coconut palms which were killed by pest or disease & lightning; decaying organic materials like compost and sawdust heaps. Floating logs containing larvae in tunnels might spread the pest to new areas.

Pheromone mass trapping technology

Monitoring of RPW infestation can be done by installing 1 trap/ha. In majority of the studies it was established that the pest recorded throughout the year. But the entire emergence was constituted in two

peaks. First peak was in pre-monsoon *i.e.* May, June and July, and second one during post monsoon season (September, November and December). The monitoring gives us information of emergence pattern of beetle/weevil.

For effective mass trapping of RPW, bucket traps @ 2/ha should be installed at chest height on the trunk of any tree other than coconut is desirable for trapping the maximum number of traps. In addition to pheromone lure, the trap must be provided with food bait to increase the trap catches. The tender coconut outer layers along with 1 litre of water and 1 table spoon of detergent powder are desirable. To increase the efficacy of traps, the trap must be serviced once in 15 days and lures must be replaced once in 6 months. For rhinoceros beetles, similar type trap with RB pheromone lure should be used for monitoring and mass trapping of beetles.

BHC, *O. arenosella* is a defoliating pest on coconut. Its natural range extends in India, Sri Lanka, Burma, Bangladesh and Thailand. Damage to coconut in India was first recorded from Andhra Pradesh in 1909 and this pest menace is frequently noticed

in South India. BHC is an important and most destructive pest in many commercial and subsistence coconut cultivated areas, because moderate to high density population of *O. arenosella* do indeed cause considerable yield loss. The pest infestation is mainly confined to the lower fronds, and in severe infestation, several hundreds to thousands of larvae can be observed on a palm. The caterpillar feeds on chlorophyll by scraping lower epidermis of leaflets and constructs galleries of silk and frass. The infested fronds give burnt up appearance and affected palms often take several years to recover completely. Further, *O. arenosella* attack results in heavy yield loss (> 50 %) and the infested palms can regain to the normal yield potential during the fourth year following the pest attack, provided the pest infestation is brought under control.

The life cycle of coconut black-headed caterpillar begins with by laying eggs in small groups on the larval galleries. The eggs period on an average was three days. The hatch out larvae confined to below the larval galleries in a gregarious form. The larvae in the later instars will be found distributed throughout the leaflet individually in separate larval galleries. The larva



Fig 3: A. BHC infested field; B. BHC trap with moths; C. BHC trap on Coconut tree

undergoes 6-8 instars and pupated in the silken cocoon made out of silk, leaf bits and excreta. Adults were emerged in a short period of time. A total of five cycles of moth emergence was found in a year. The duration of emergence and non-emergence periods of moth varied from 34 to 45 days and 44 to 56 days, respectively.

Use of pheromone traps

The sex pheromone traps are used for trapping of the male BHC moths. For effective mass trapping of male moths 1 trap/tree is required for highly infested gardens. The moderately and low infested gardens require 1 trap/every two trees and in any infestation level, the traps must be placed at tip of the middle canopy level. The lures

must be replaced once in a generation for effective management of pest. The traps should be replaced as and when they get damaged and also after loss of stickiness of the gum. The commercial trap can be used for up to 6 months if it is maintained properly.

The trap densities per hectare-based on age and level of infestation

- ✎ 40 traps/ acre is effective for all ages of coconut trees with any level of infestation
- ✎ Severely infested gardens of any age group require one trap/tree

Integration of pheromone traps with larval parasitoids: The pheromone traps can be effectively

integrated with larval parasitoids without having any adverse effect. The pheromone trap density and number of larval parasitoids, as mentioned earlier, are selected for implementation. Before setting up of traps, release the larval parasitoids. The parasitoids should be released on to the tree trunk for effective dispersal of parasitoids.

Mass trapping should be implemented on a community basis, so that the chance of movement of insect pests of coconut palms, from infested area to new uninfested area is controlled. By adapting these eco-friendly management methods the red palm weevils, rhinoceros beetles and BHC moths can be managed successfully.