

# INTEGRATED PEST MANAGEMENT IN COCONUT GARDEN

Chandy Kurian and V. A. Abraham

Central Plantation Crops Research Institute, Regional Station, Kayangulam, Kerala.

The coconut palm being a perennial crop affords an abundant supply of food to its pests all through the year and hence many pests are found flourishing at the expense of the crop. The number of insects recorded as pests of coconut is alarmingly great. They are mostly Coleopterans, Lepidopterans and Hemipterans and they infest both living and dead tissues of the leaves, trunk, crown, root and flowers of the palm. In addition some birds and mammals are also recorded. Mammalian pests are mostly rats, bats, squirrels and porcupines and avian pests are mostly the common wood pecker and the Indian hoopoe. The assessment of damage caused by each pest and knowledge of its economic distribution and seasonal abundance are essential prerequisites for evolving effective control measures against them. A brief review of the more important results of the work done in India on management of the major pests is discussed.

With the advent of green revolution the great debate on production technology has yielded place to protection technology. The ingenuity of scientists' nature has developed a plethora of methodology and weaponry to fight these battles. The power of adaptability of his foes is however boundless. It is not possible to annihilate an insect pest completely. Efforts should therefore be directed towards suppressing the pests.

Insecticide revolution was a fortunate event to augment the green revolution. However the indiscriminate use of pesticides in the control of crop pests had resulted in many adverse side-effects. It has become imperative that alternate less hazardous and long lasting methods of pest management must be developed. Several methods of pest control like biological control, mechanical control, use of attractants, sterile male

technique and utilization of genetic resistance, apart from chemical control have been tried on crops with varying degrees of success. It is being increasingly realised that no single method of pest control is adequate to keep all the crop pests in check. And coconut is no exception



Fig.1. - Inflorescence damaged by rhinoceros beetle

to this. An integrated pest management making use of all available measures of pest control and exploitation of all natural factors which operate against the pest therefore appears to be the most sound and promising way of dealing with pest problems in coconut. Here we employ pest control techniques without disturbing the agroecosystem. Selected methods are employed at the most appropriate time with the least interference with the balance of life in nature. The following is an analysis of the possibility and feasibility of adopting integrated method in the field of coconut pest management.

The important pests that warrant our immediate attention are the following:

**Rhinoceros beetle (*Oryctes rhinoceros* L.)** : This is the most serious and ubiquitous pest of coconut in many of the coconut growing countries of the world. The beetle causes indirect and direct damage to the yield in coconut palm by

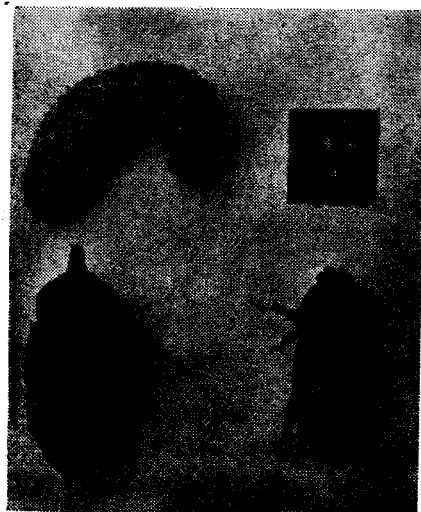


Fig. 2 Life cycle of rhinoceros beetle

boring through the unopened fronds and inflorescence (Fig.1). The cutting and chewing of the unopened foliage results eventually in considerable reduction of the functional leaf surface. Attack on unopened spathe and inflorescence directly prevents the production of nuts.

The rhinoceros beetle breeds in decaying organic debris. Common breeding sources are farm yard manure, municipal rubbish heaps, dead coconut



Fig. 3. Hooking out rhinoceros beetle

logs, decaying hay stacks, leaves, other vegetable matter etc. The egg, larval and pupal periods are completed in breeding materials in about 6 months (Fig.2). The adults soon after emergence fly to the crown of palms and feed on the tender leaves and spathes.

Several methods are adopted for the control of the pest, both prophylactic as well as curative. Prophylactic method includes mainly denial of breeding sites to the pest. Plant

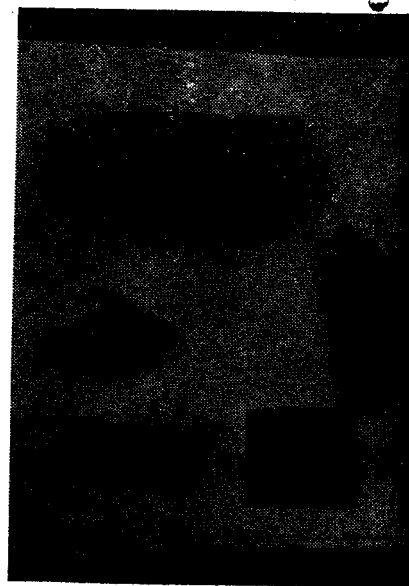


Fig.4. Life cycle of red palm weevil

and field sanitation is a must. All possible breeding materials are to be removed so as to reduce the breeding of the pest. As far as possible cattle manure may be stored in dry or wet condition which will not be conducive for multiplication of the pest. Burning or deep burying of the breeding material is also helpful in denying the pest the facility for breeding. Extraction of the beetle from the crown of palms in July -August months, the top season of beetle emergence, using a pointed and hooked metal rod of about half metre long with a handle at the base (Fig. 3) is a very effective mechanical method in bringing down adult population. The beetles can also be attracted to split tender coconut logs cut surfaces smeared with fermented toddy. The traps are set in evening and collection and destruction done early next morning.

Filling the innermost three leaf axils with 200g of BHC 5% dust mixed with equal volume

of sand, soil or saw dust, three to four times a year, preferably in the dry months, helps in reducing the beetle attack on palms.

Treatment of the breeding material having the immature stages of the pest, is quite essential in suppressing the multiplication of the pest. 0.01% BHC/Carbaryl is quite suitable for this. This may have to be repeated at quarterly intervals.

*Baculovirus* of *Oryctes* is a pathogen found causing a fast spreading disease in these beetles. Successful control is reported from Fiji and Malaysia using this virus. Work in progress at CPCRI, Kayangulam is likely to pave way for the effective utilization of this organism in India also, particularly in Laccadives and Andaman and Nicobar Islands, where it will be new. Introduction of exotic predators like *Platymiris laevicollis* is also attempted.

Timely and judicious application of the above control measures will keep the pest below the economic injury level.

**Red Weevil** (*Rhynchophorus ferrugineus* F.): It is the most dangerous pest of coconut palm in India and a menace to the crop in other countries as well. The period from egg to adult takes about three and a half months (Fig. 4). Grubs tunnel inside the palm and feed on the soft and succulent portion particularly at the cabbage area containing the meristematic tissues (Fig. 5). This invariably lead to death of the palms in a few months. Usually young palms below 20 years are preferred by this tissue borer.

Infestation should be detected quite early to adopt appropriate and timely control measures. Observational study of infested palms revealed many symptoms associated with infestation viz. presence of holes on stem, protrusion of chewed up fibres from the holes, exudation of a viscous brown fluid, yellowing and wilting of inner leaves, easy coming away of green leaves, splitting leaf bases and audible sound of feeding.



Fig. 6 Filling leaf axils with BHC

Dead palms or palms beyond recovery harbour the pest and serve as a source for further spread. Hence such palms may be destroyed and different stages of the pest killed. Mechanical method of trapping the free floating weevil population is a good method in pest suppression. Tender coconut logs 50 cm long, split longitudinally into two equal halves and cut surface treated with toddy fermented with yeast/acetic acid and both pieces kept on the ground facing one above the other serve as traps. Crushed sugarcane or minced pine apple, cashew apple, grapes or papaya fermented with molasses, yeast or acetic acid can also be used as an attractant.

The weevil lays eggs on injuries on palm. As far as possible injury to palm may be avoided. Decay of leaves caused by leaf rot/bud rot also are ideal sites for oviposition. These infections are also to be treated and cured with appropriate fungicides. Cut portions of stem and leaves should be treated with BHC. If need be the leaves may be cut only at a distance of 100 cm



Fig. 5 Grubs of red palm weevil



Fig. 7 Injection of insecticide

away from the leaf base. This is to ensure that the grubs do not reach the stem before the petiole base is shed. All leaf axils of all young palms may be prophylactically filled with a mixture of BHC 5% dust and sand, soil or saw dust, thrice a year during the dry periods to reduce weevil incidence (Fig. 6).

With all the above precautions and prophylactic treatments, still if palms are infested and timely detected curative control measures should be adopted. After cleaning the infested area at crown or stem, plug the holes on the stem with cement or sticky soil, drill an artificial slanting hole on the trunk just above the affected portion to a depth of 15 cm with the help of an auger. Insert the tail end of the funnel-like injector into the hole and pour the insecticide suspension into the mouth (Fig. 7). The contact insecticide will gradually, by force of gravity, percolate into the hole and come in contact with the different stages of the pest inside. Pyrocon/Carb-

aryl 1% or Endosulfan 0.1% are very effective chemicals that could be used for this curative control.

A phased and integrated approach employing the different techniques described above is quite appropriate in management of this dangerous tissue borer.

**Leaf eating caterpillar (*Opisina arenosella* Wik):** The leaf eating caterpillar is mainly distributed along the east and west coast of India. The caterpillars live on the lower surface of leaflets inside galleries and feed voraciously on the chlorophyll containing functional tissues. (Fig.8). The damage thus caused by numerous larvae affect the health of the palms adversely resulting in loss in yield.

The badly infested leaves/portions of leaves must be cut and burned. If the infestation is very severe dichlorvos 0.02% must be sprayed thoroughly on the lower surface of the leaflets. Spraying may be continued at periodic intervals till the infestation is brought down.

Stem/root implantation of 15 ml of 40 per cent monocrotophos is practised in some parts of India for the control of this pest. Though it is claimed that the insecticide residue does not remain above the internationally accepted tolerance limit in coconut kernel 21 days after injection, it is better to avoid the systemic use of such a dangerous chemical.

There are several natural enemies of this pest which are amenable to laboratory breeding. They are bred in the different state managed centres in the important coconut tracts of India and liberated in the pest infested areas. Bethylids, Elasmids and Chalcids are the most effective ones and can be utilised to bring down mild and medium infestations. They are liberated close to infested leaves (Fig. 9), early in the morning or late in the evening when there is no strong wind. There should be a gap of three weeks between the parasite liberation and insecticide application.



Fig.8 Leaf eating caterpillar

**Cockchafer beetle (*Leucopholis coneophora* Burm.):** Grubs of cockchafer beetle do considerable damage to coconut roots in Kerala and some parts of Karnataka. They have an annual lifecycle and the damaging grub phase is for about 10 months (Fig. 10). Beetles emerge *en masse* during the monsoon and lay eggs in coconut gardens. Grubs are seen in soil from June to April of the succeeding year. Grubs feed on the tender roots of the coconut and other inter/mixed cultivated crops like tapioca, yam, cacao, plantain etc. Damage done to roots render the plant unable to absorb nutrients. They become weak, leaves show sickly appearance and poor yield is the net result.

The following would essentially be the different constituents of an integrated control programme for the effective management of this subterranean pest. Mechanical - cum - sanitational/cultural methods like deep ploughing or digging of the soil to expose the immature

stages to desiccation in the sun or predation by natural enemies like birds and mammals, are quite essential. Chemical treatment of soil with Heptachlor 5 per cent @ 28kg/ha in June or BHC 5 per cent dust @ 100 kg/ha each in June and September is effective in combating the pest.

Mechanically collecting and killing the adults during the emergence season also helps in



Fig. 10. Life cycle of cockchafer beetle bringing down pest population and should also form part of an integrated control programme.

**Other Pests:** The coreid bug *Paradasynus rostratus* D. causes shedding of nuts or makes the nuts barren. The bugs suck sap from below the perianth of tender nuts. During feeding saliva passes into the tissues which is toxic to the developing nuts. They attack other host plants like guava, cacao, tamarind, cashew etc. Spraying the bunches except the newly opened ones with 0.05% Carbaryl / 0.1% BHC is effective in control of the pest. Spraying may be done on other alternate host plants also which are found harbouring the pest.

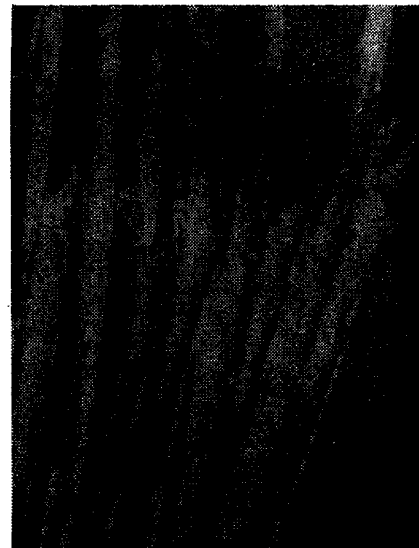


Fig. 11. *Contheyla* infested leaf

Outbreak of the slug caterpillar *Contheyla rotunda* (Fig. 11) causes severe damage to leaves and consequent fall in production in certain years. Cutting and burning badly infested leaves checks spread of pest to the neighbouring palms and 0.1% BHC/0.05% Carbaryl spray at monthly intervals controls sporadic outbreaks of the pest.

**Rats:** Rats can breed every two months and produce litters of 8 to 12 young ones. In coconut *Rattus rattus* damages tender nuts and causes heavy loss of nuts. The burrowing rats destroy seedlings.

General cleanliness and sanitation are essential pre-requisites for rat control. Trapping could be resorted to in dwellings and fields as well making use of box and guillotine traps. Against burrowing rat *Bandicota bengalensis* bamboo snap back-cum-noose trap could be effectively used, while plank trap or death fall trap has proved to be the best against *Bandicota indica*.

Among chemical methods, use of baits containing single dose



Fig. 9 Liberation of parasites

poison zinc phosphide is recommended (Fig 12). Anticoagulants such as fumarin, warfarin and rodafarin are also found to be effective, particularly when after repeated use with the single dose zinc phosphide rats become prone to develop bait shyness. Fumigants, particularly aluminium phosphide tablets like phostoxin, celphos etc. are effectively used against burrowing rats in their burrows.

In order to ensure that our coconut production drive does not fail due to inadequate plant protection efforts, strategy for pest management should be as bold as the new strategy for crop production. It may also be seen that the integrated pest management programmes in general have to be based upon a high level of scientific ground work. Besides, the plant protection

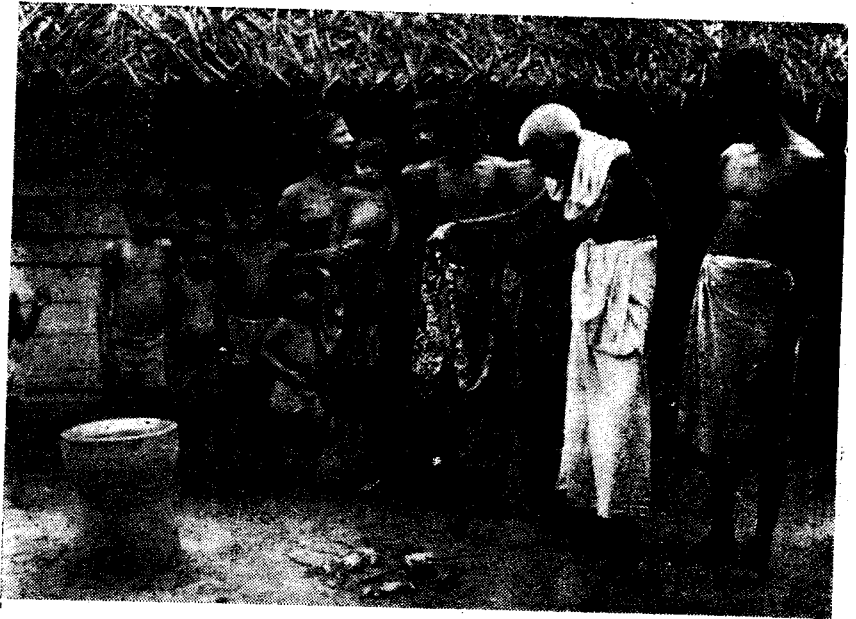
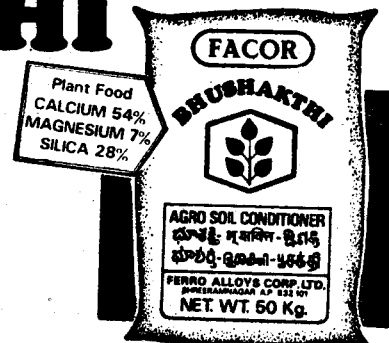
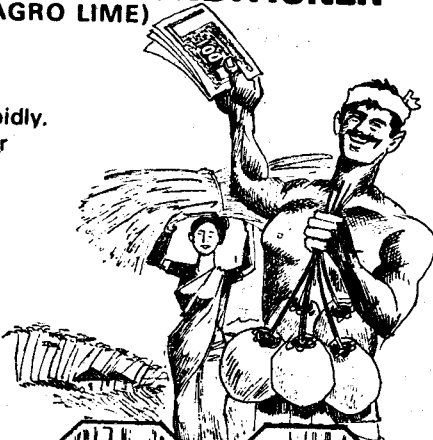


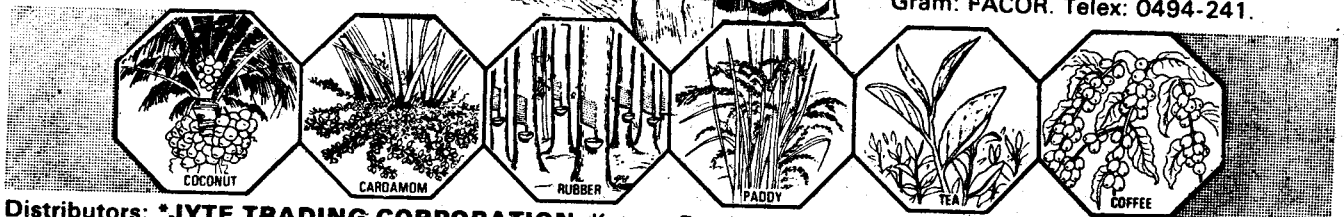
Fig.12. Overnight success with zinc phosphide workers should be vigilant with the cultivator in the agroecosystem and watch for any tilting/eruption constantly being introduced by in the pest and disease complex.

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