PEST MANAGEMENT IN COCONUT GARDENS

AN INTEGRATED APPROACH

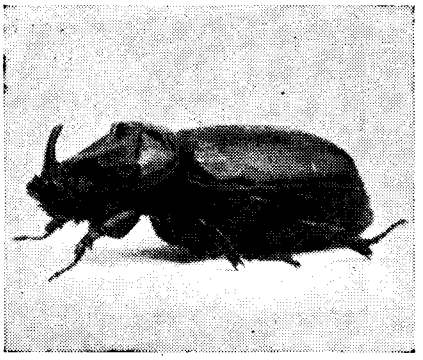
CHANDY KURIAN,[1] J. ANTONY[2], V.A. ABRAHAM[3] AND P. NATARAJAN[4]

COCONUT being a perennial crop affords an abundant supply of food to a variety of insects and other vermins all through the year and many pests flourish at the expense of the crop. The term 'pest' broadly includes all living organisms inimical to the interests of man. Insects are the most abundant and they infest the different parts of the palm at various stages of its growth.

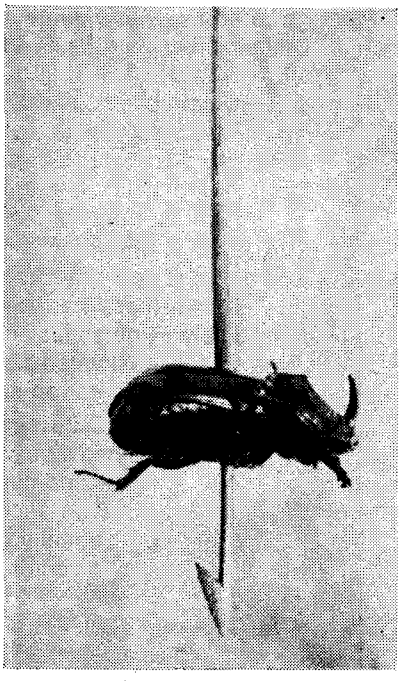
In India the most important among them are the rhinoceros beetle, *Oryctes rhinoceros* L., the leaf eating caterpillar, *Nephantis serinopa* M., the red palm weevil, *Rhynchophorus ferrugineus* F. and the cockchafers, *Leucopholis coneophora* B. and other allied species. Among the less serious enemies the more important one is the eucleid caterpillar *Contheyla rotunda* H., which at times appears sporadically in enormous proportions reaching the Economic Injury Level and causes severe damage to the crop. Termites attack germinating seednuts in nurseries. The lace wing bug *Stephanitis typicus* D. invites attention because of its dual role as a carrier of the pathogenic principle involved in the root (wilt) disease of coconut in Kerala and as a pest of the coconut palm there and elsewhere in India. Among new pests the coried bug (nut crinkler) *Paradasynus* sp. is now found in southern and central parts of Kerala and the small weevil *Myllocerus curvicornis* (F) a pest of foliage in many parts of Trivandrum, Quilon and Alleppey Districts of Kerala. Rats also pose a serious problem to coconut in that the burrowing rats destroy seedlings while the arboreal species *Rattus rattus* L. damage tender nuts.

Pest control is essentially a practice by man of modifying the numbers of a particular population and hence it is a practice of ecology. Though use of broad spectrum and long residual contact insecticides bring in immediate results, in the long run side effects create problems. It becomes imperative that alternate, less hazardous and long lasting methods of integrated pest management including biological, cultural, mechanical and ecological methods of control, apart from chemical control are developed. Pesticides used in integrated programmes must have a selective toxicity, toxic only to target organisms. Chemical control should be based on the solid foundation of fundamental ecological principles. Thus an integrated pest management making use of all available measures of pest control and exploitation of all natural factors that operate against the pests will be economical and give lasting results particularly in a perennial crop like coconut. The following discussion attempts to relate the prospects of using the various tactics of pest management on pests of coconut.

The rhinoceros beetle *Oryctes rhinoceros* L. is the most serious pest of coconut palm in many of the coconut growing countries of the world. The beetle causes direct and indirect damage to the crop by boring into unopened fronds and spathes. Consequently the yield gets reduced. The damage caused by the beetle attack also paves way for subsequent infestations by pests like red palm weevil. The beetle breeds in cowdung or any decaying organic debris. The total duration of life-cycle is about six months. To assess the combined on individual efficacy the following conventional methods of control have been successfully tested in the field. Extraction of the beetle from crowns of palms performed by hooked metal rod during the peak periodof incidence (June-August), will reduce the beetle population. Treatment of all possible breeding



Rhinoceros beetle



Beetle extracted with a hook

1. Entomologist. 2. Junior Parasitologist. 3. Asst. Toxicologist 4. Asst. Entomologist, Central Plantation Crops Research Institute, Regional Station, Kayangulam, Krishnapuram-690 533, Kerala.

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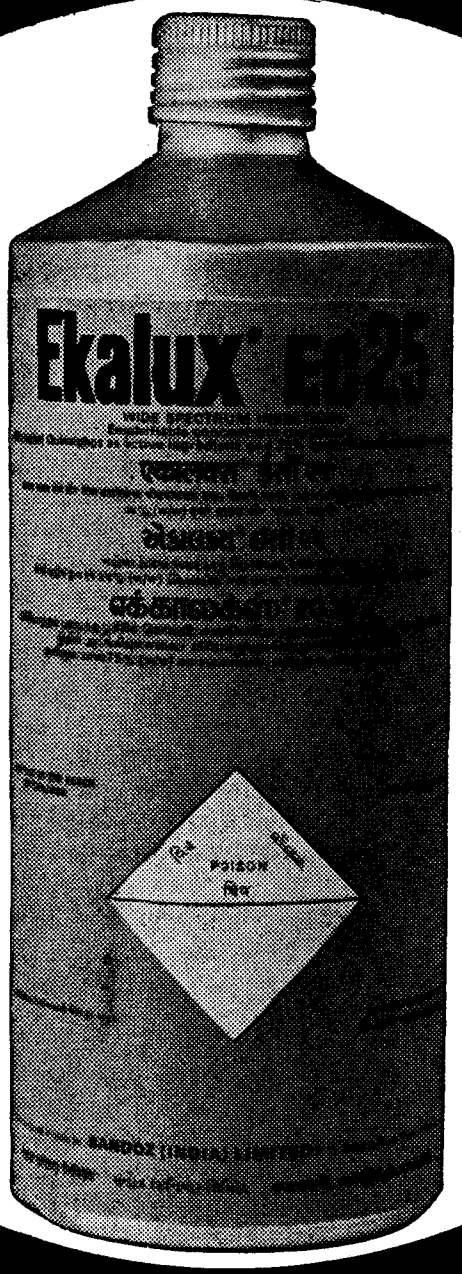

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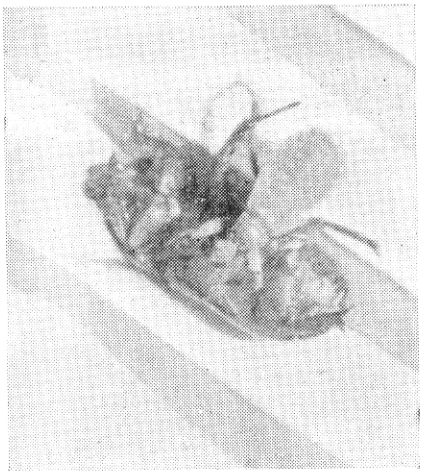
places of the beetle, where immature stages of the pest are present, is quite essential for its control. BHC/Carbaryl 0.01% is lethal to the grubs. The prophylactic method of filling the innermost 2-3 leaf-axils with 5 per cent BHC and sand mixture, twice a year during pre- and post-monsoon periods gives considerable protection to palms against ravages of this pest. Plant and field sanitation is also essential for checkmating the pest. By the exploitation of natural predators or pathogens including *Metarrhizium anisopliae* and introduction of exotic biological control agents including *Platymeris laevicollis* more lasting results could be achieved. Nematode cum bacterium culture DD-136 (*Neoaplectana carpocapsae* and the associated bacterium *Achromobacter nematophilus*) and the virus pathogen *Rhabdionvirus oryctes* and the associated bacterium are found to attack all instars of the grubs of the pest. Because of their selectivity, the use of pathogens, will prove feasible and economical as the same will reduce the pest and at the same time conserve parasites and predators. By utilising attractants the beetles could be attracted to traps and killed. Trapping could be done with attractive breeding materials treated with BHC, the concentration in the breeding material being 0.1 per cent. The beetles which visit the traps for mating and oviposition get killed. Pieces of tender coconut stem split longitudinally and treated with fresh toddy will also serve as a trap. Ecological manoeuvring will also be useful in controlling the pest. The beetle breeds within an optimal range of temperature (10-50°C) and moisture (30 to 60 per cent) conducive for its growth and is unable to complete the life-cycle if the breeding material is too wet or dry. By creating suboptimal or unfavourable conditions the pest could be denied facility for multiplication.

The leaf-eating caterpillar, *Nephantis serinopa*, is a problem to coconut growers in the coastal and backwater tracts of India. The pest in its larval



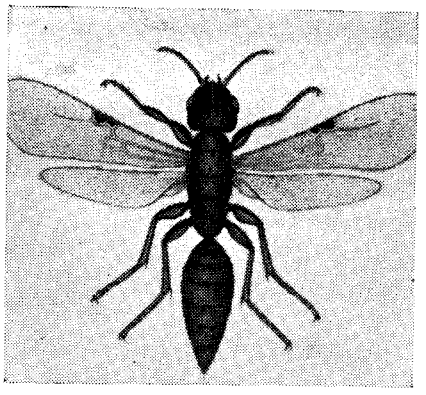
Exotic predator *Platymeres laevicollis* feeding on oryctes

stage feeds on the leaf, remaining inside galleries. This adversely affects the productivity of the palm. The duration of life-cycle from egg to adult lasts for about two months. In cases of stray infestation the infested leaflets could be clipped off and burned so as to prevent further spread. Among the various insecticides tested, BHC, 0.2 per cent gave immediate knock down and effected satisfactory control. It is advisable to cut off and burn very badly infested or damaged leaves before the insecticidal application. Since the pest is lodged in galleries on the lower surface of leaflets, it is necessary that the spray is directed towards the lower surface of leaves so that the larval galleries may get branched with insecticide suspension. Malathion at 0.05 per cent was also found to be

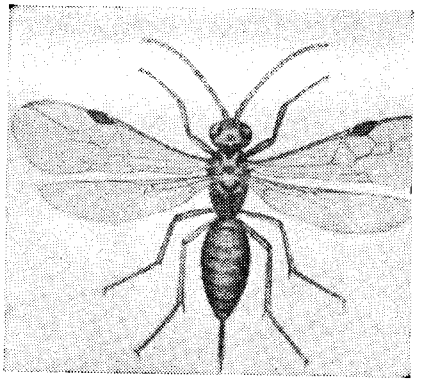
Beetle trap

effectively controlling the pest under field conditions though in the laboratory it proved detrimental to laboratory bred parsites. Insecticides with comparatively less residual toxicity, namely trichlorphon or dichlorvos could be used with advantage, since the deleterious effects would be less on the beneficial parasites and predators. In nature this pest is subject to the attack of a number of natural enemies—parasites, predators and pathogens. Many of them are amenable to laboratory multiplication. By mass multiplication, liberation and colonization of some of the important parasites this pest could be kept under check. Alongwith these the exotic parasites like *Spoggosia bezziana* could be employed. The Nematode DD-136 and the bacteria *Serratia marcescens* and *Bacillus thuringiensis* could also be used, against the larval stages of the pest.

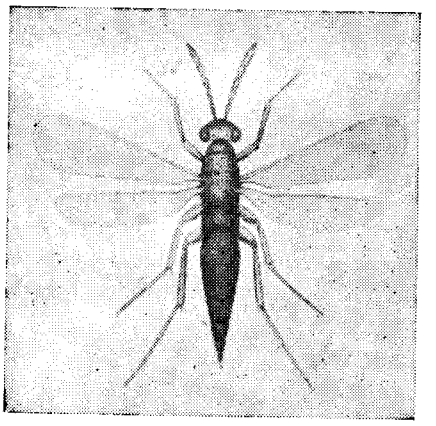
Red palm weevil, *Rhynchophorus ferrugineus* is a widely growing menace to the coconut palm particularly in young plantations. It is the most dreadful and damaging because infestation by this tissue borer mostly goes undetected and leads to sure death of the palm, unless it is treated sufficiently early. The period from egg to adult takes about three and a half months. It becomes possible to resort to the curative chemical control, only if detection of infestation is made before it reaches the growing point or cabbage. A knowledge of the symptoms of infestation is quite essential for timely detection. An integrated control schedule formulated against the pest include the following. Mechanical cum sanitational control methods are essential prerequisites for effective pest management. Adult weevils could be attracted into traps, made of split tender stem with cut surface smeared with toddy, and killed. The adult females lay eggs on the wounds in the palm and through wounds young grubs bore into the interior. So prevention of injury to the palm is also an essential prerequisite for checkmating the pest. Cutting of



Perisierola nephantidis



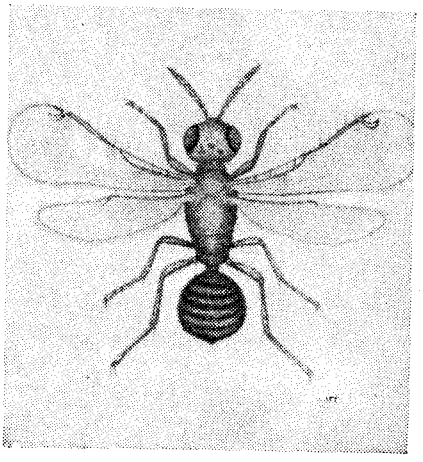
Bracon brevicornis



Elasmus nephantidis

petioles, if need be, at 125 cm away from the trunk or treatment of wounds with BHC is effective in preventing entry of the pest to the palm trunk. Decayed spindle leaves attract weevils for oviposition and so, as a prophylactic measure, the trees affected by the rhinoceros beetle, leaf and bud rot diseases, have to be treated with appropriate pesticides. Leaf-axil filling with insecticide dust and sand mixture gives some measure of protection against the dreaded pest. The infestation could be cured by injecting 1 per cent Pyrocon E/ Carbaryl or 0.2 per cent trichlorphon. We can also exploit the natural biological control agents like the indigenous earwing predator *Chelisoches moris* and the reduvid bug *Platymeris laevicollis*, a native of Zanzibar, introduced into coconut plantation for control of *Oryctes*.

The root-damaging Cockchafers particularly *Leucopholis coneophora* is a pest of coconut and other crops raised in coconut plantations in sandy and sandy loam tracts in India. The following would essentially be the different constituents to be integrated for the effective control 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 useful. Treatment of the soil with 5 per cent BHC or Aldrin or Chlordane at 120 kg/ha twice a year in April and August is effective in combating the pest. The adults could be attracted to light or to branches of neem trees planted in the coconut gardens, on days when mass emergence of adults are expected after premonsoon showers, collected and killed. Exploitation of the biological control agents like *Campsomeriella collaris* (Scoliidae), DD-136 (Nematode-cum bacterium culture) and pathogens (indigenous or exotic) can also be done, which will definitely enhance the scope of integrated control.

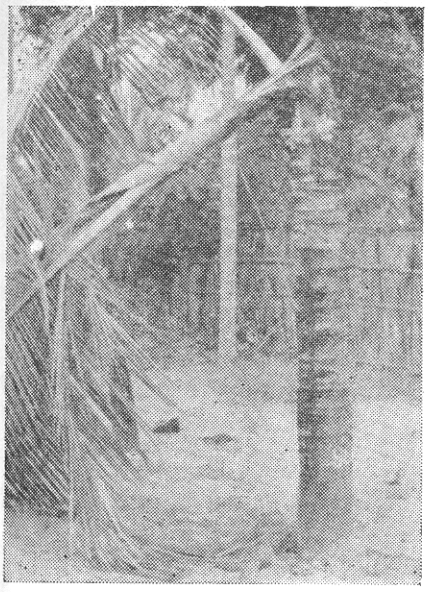


Trichospilus pupivora

Grub of red weevil

In the case of the slug caterpillar *Contheyla rotunda* cutting and burning badly infested leaves checks further spread of the pest to the surrounding pest-free garden and 0.1 per cent BHC spray at monthly intervals controls sporadic out break of the pest. Field control of termities infesting germinating seed coconuts in nurseries could be obtained with aldrin and heptachlor 50g/100 sqm. and chlordane 60g/100 sqm. Very low concentrations of carbaryl and dichlorvos give high mortality of *Stephanitis typicus*.

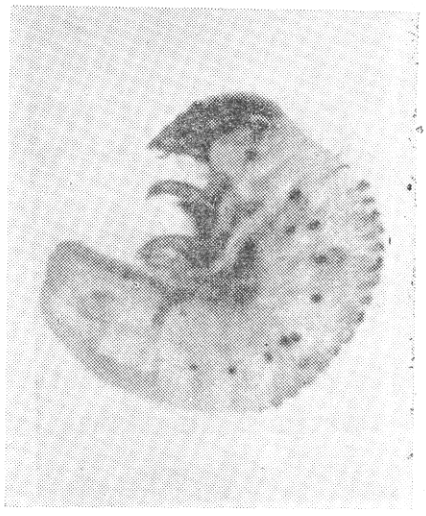
General cleanliness and sanitation are essential prerequisites for rat control. Trapping could be resorted to in dwellings and field as well, making use of box and guillotine traps. Against the burrowing rat *Bandicota bengalensis* bamboo snap back cum noose trap could be effectively used, while plank trap or death



Weevil damaged palm

fall trap has proved to be the best against *Bandicota indica*. Among the chemical methods, use of baits containing single dose poisons, barium carbonate or zinc phosphide or Norbormide is suggested. Anticoagulants such as Fumarin, Warfarin, Coumachlor, etc., are also found to be effective. Fumigants, chemosterilants and repellents are some of the other means available for rat control. Encouragement of predators will also help in bringing down rodent population.

In order to ensure that our coconut production drive does not fail due to failure on protection front the strategy for pest management should be as bold as the new strategy for crop production. The personnel engaged in this work would have to be keenly aware and perceptive of the integrated control approach and capable of conducting research on population dynamics of pests and interrelationships with the different organisms in the environment. Besides, the plant protection worker should be vigilant with regard to the changes that are constantly being introduced by the cultivator in the agroecosystem and watch for any eruption in the pest and disease complex. Surveillance for any newly introduced pest is also essential. This would also require educating the coconut growers. It is to be emphasised that a knowledge of the economic level of population of pests, their estimation and prediction, is the baseline for any consideration of integrated pest management.



Cockchafer grub