ATTEMPTS AT THE BIOLOGICAL CONTROL OF RHINOCEROS BEETLE

By

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The coconut palm is subject t the attack of a large number o insect pests. They are mos tly beetles, caterpillars and bug which infest both the living an dead tissues of leaves, trunk crown, roots and flowers of palms The rhinoceros beetle is the mos serious pest of the coconut palm in many of the coconut growing countries of the world. The beetl bores through into the unopened fronds and spaths and causes severe damage (fig. 1). Damage caused by the beetle also paves way for subsequent infestations by other pests like palm weevil.

The rhinoceros beetle breeds in decaying organic debris such as farmyard manure, municipal rubbish heaps, dead coconut logs, etc. Since this beetle is a prolific breeder and the host plant is a perennial crop affording an abundant supply of food throughout the year and also because it can breed in a variety of materials. its control has ever been a baffling problem to plant protection workers.

Mechanical and chemical methods of control have given good results in terms of pest controlled and consequent increase in yield also. But the high cost of insecticides, its toxicity to men and domestic animals, difficulty in detecting some of the hidden sources of breeding materials, are, to some extent, limitations on popularising those methods.

Biological methods of control, on the other hand, besides not having any deleterious effects are economical as well. Hence an attempt is being made at the Regional Station of the Central Plantation Crops Research Institute at Kayangulam, Kerala to find out the natural enemies of this pest and to employ them for its biological control.

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Fig. 1
A heavily infested tree

In nature this insect is found to be attacked by certain pathogenic fungi, bacteria, viruses, mites, nematodes, insect parasites and predators and certain vertebrate predators like the squirrel, mongoose, rat and pig. The green muscardine fungus which is the causative organism of a disease has been under investigation for more than forty years. The fungus affects all stages of the pest except eggs. The practical utility of this parasitic fungus in controlling the pest was studied at this Research Station. Experiments have shown that high humidity and low temperature are favourable for the spread of the disease. Disease is more prevalent during South West Monsoon when there will be high humidity and low temperature and under such conditions it can take the role of a virulent pathogen and cause epidemics particularly in the larval stages. Field trials are being conducted now at Central Plantation Crops Research Institute, Kayangulam. But the organisms responsible for insect diseases while common in the field and occurring sporadically and causing devastating controls, have so far proved to be rather unreliable and generally not very effective when artificially introduced.

In Kerala certain species of nematodes and mites were observed in plenty in the breeding material of the pest during the onset of monsoon. Mites destroy the eggs as well as just hatched grubs, whereas nematodes generally infest the eggs of *Oryctes*. A spe ies of nematode isolated from dead grubs of the rhinoceros beetle, collected from Agathi (Laccadives) was observed to be capable of infesting even final instar grubs of the pest. Studies are now in progress using DD-136 obtained from Commonwealth Institute of Biological Control, Bangalore.

The scolid parasite *Scolia cyanipennis* has been observed to parasitize second instar grubs of *Oryctes*. Consideration has been given in some countries to the control of rhinoceros beetle by employing some of the scolid wasps. One instance of satisfactory biological control of this pest is by the wasp

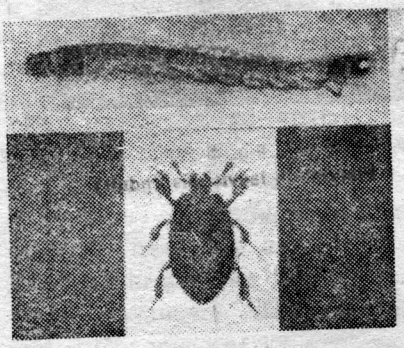

Fig. 2
Santalus parallelus—adult and larva

Scolia oryct phaga introduced into Mauritius for the purpose from Madagascar. It also appears from the observations of H. W. Simmonds and other experts that Scolid wasps may be playing an important role in keeping *Oryctes* under control in Zanzibar and neighbouring parts of East Africa, the native home of both the wasp and the pest. But so far attempts made in introducing these parasites into India have not been successful.

The more common insect enemies of the pest are beetles and bugs. The promising species among the predators recorded so far in

Fig. 3
Agrypnus bifoveatus - larva and adult

India are *Santalus*, *Agrypnus*, *Scarites* and *Harpalus*. Santalus adults (fig. 2) attack and consume eggs and grubs of all ages of *Oryctes* and the larvae (fig. 2) feed on the eggs and early instar grubs of the pest. *Agrypnus* larvae (fig. 3) (adult shown in the illustration is not a predator) attack and kill rhinoceros beetle grubs during its long life. *Scarites* during its larval and adult stages are observed to be predacious on the eggs and early instar grubs of the pest. *Harpalus* which are very common in cattle dung are also predacious on eggs and early stage grubs of the pest. Efficacy of these laboratory bred predators in the field is yet to be ascertained.

A comparative study of the associated fauna in the mainland and Islands in the Indian Ocean has revealed the presence of numerous predacious and parasitic forms in the mainland as compared to those in the Islands. The scarcity of the predatory fauna is evidently the cause of high incidence of the pest in the Islands. Two methods are generally used for the employment of biological control. One is the artificial increase of enemies that already exist in a locality and the other is by the introduction of a new species into the existing biological complex. The latter is done in cases where

effective indigenous parasites or predators are not observed as in the case of this pest. The introduced parasite or predator should not only survive but adapt itself advantageously to the stages of the pests so that there must always be a supply of correct host stage at the appropriate time.

By the introduction of parasitic or predacious fauna in areas where they are absent or less abundant the population of the pest can be brought under check and damage to the crop reduced. With this objective in view the exotic predatory reduviid bug *Platymeris laevicollis* (fig. 4) was considered for trials at the Central Plantation Crops Research Institute, Kayangulam. Culture material for breeding this bug was supplied by the Commonwealth Institute of Biological Control, Bangalore and South Pacific Commission, Western Samoa. This is being bred in the Insectary in large numbers and liberated at two centres, one in Androth, an Island in the Laccadives and another at Pandalam in Kerala. The predators are liberated in crowns of palms at these centres which have been selected taking into consideration heavy infestation by this pest and other conditions congenial for the survival and establishment of this new predator. Regular observations are made of their establishment. The preliminary indications are that they are getting established at least at the mainland centre.

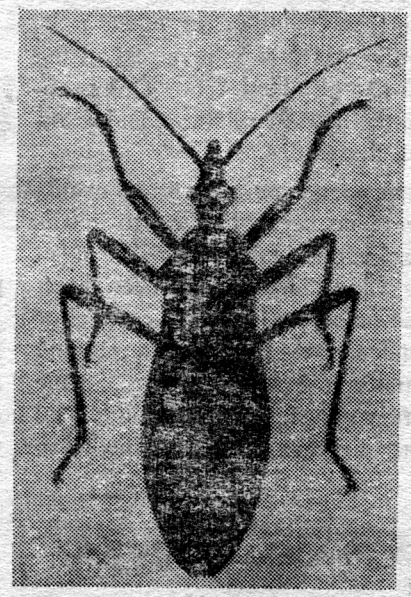

Fig. 4
Platymeris laevicollis (adult)

Biological control is only one aspect of natural control which in a broad sense refers to the fact that no organism multiplies in nature indefinitely in number without limit. A realistic understanding of an insect problem like that of rhinoceros beetle is therefore being based on observations and experiments on the changes of population in nature in relation to its natural enemies. The modern trend in pest control is to use the least amount of insecticides and to keep the pest below the economic injury level by an integrated method of control employing mostly mechanical, sanitational and above all biological control agents.