MEASURES FOR CONTROL OF COCO-NUT TREE-HOPPER (SEXAVA SPP.)

By John L. Froggatt, B.Sc., Entomologist.

Measures for the control of any pest must necessarily depend on its mode of living and propagating, and its general habits. In order to make the measures discussed readily understandable, it may be desirable to first give a very brief recapitulation of the life history and habits of the coco-nut tree-hopper (*Sexava spp.*).

The adults and nymphs live in the head of the palm, sheltering on the under-surface of the foliage and feeding principally at night. From about 6.30 p.m. the females crawl down the trunks to the ground (a few may volplane down) to deposit the eggs, which are laid singly just under the surface of the soil. The adults then re-ascend the palm by crawling up the trunk. The eggs take from 49 to 107 days to hatch (average 70 days); the young hoppers (nymphs) emerge mostly at night and ascend the palms within, at most, 24 hours after emergence. These pass through a series of "moults" (six for the male and seven for the female) occupying a period of 78–117 days for the male (average 92.4 days) and 90–124 days for the female (average 100.9 days). The adults mate after about two to three weeks and eggs are deposited about five to seven weeks after reaching the adult stage. Epiphytic growths on the trunks of palms are often favoured sites for egg deposition.

The early-stage nymphs are not the voracious feeders that the fifth to seventh instars and adults are.

In elaborating methods of control, for any insect pest, the economics of each case must of necessity be an all-important guide to measures recommended or undertaken.

During the depression period when copra was barely, if at all, paying expenses, only those lines of attack, requiring the minimum expenditure, warranted special attention. Foremost amongst these was—

Biological Control

or the use of other insects which prey on or pass their developmental stages within the body of some stage of the host.

Minute wasp parasites of the eggs were found on New Hanover in 1930, but failed to breed under laboratory conditions. This was later identified as *Doirania leefmansi.*

In 1933, the egg parasites, *Leefmansia bicolor* (*Encyrtidae*) and *Doirania leefmansi* (*Trichogrammatidae*) were introduced into the Manus District from Amboina. The former bred up freely in captivity, but colonies of the latter got weaker and weaker and finally were liberated on the chance that they might establish themselves in the field.

The egg parasites of *Sexava* known to occur in this Territory have been recorded in the *New Guinea Agricultural Gazette,* Volume 3, No. 2,

Parasite breeding over an extended period has shown that *Leefmansia bicolor var.* is very easily bred in captivity. *Doirania leefmansi* has proved difficult to breed in the field laboratory, yielding comparatively weak colonies. The *Mymarid sp.* although breeding freely in the field has failed to develop through even a single generation in the laboratory.

The results achieved in establishing *Leefmansia bicolor* have varied in different parts of the Territory. Within three months of starting regular liberations from the field laboratory, it has been recovered from the field; in some parts it has maintained the generations very successfully, and in others where this has not been so marked, other procedures are now being adopted to test out the influence of increased ground shade and windbreaks.

Biological control, where successful, although slow in attaining its object, calls for very little expenditure of either money or labour, in most cases.

Tanglefoot Bands.

Bands of tree tanglefoot around the trunks of the palms have been tested out, and with one preparation large numbers of first, and to a lesser extent, second stage nymphs have been "trapped", the bands remaining tacky for about four months. This might have economic possibilities in the early stages of an outbreak in a restricted locality, but is too expensive on a large scale.

Use of Insecticides.

With the greatly increased value of copra and the maintaining of a fair price, other methods warranted detailed study; foremost amongst these was the use of insecticides, which could be applied in either of two ways, spraying or dusting.

Spraying requires a large volume of soft water, and a high-power spraying outfit. In many parts, owing to the coraline nature of the soil, soft water is very difficult to obtain in quantity, quite apart from the cost of cartage of such. Salt water has been tested but has not proved satisfactory.

Dusting on the other hand requires no water, although requiring a power machine, but one much less expensive than a corresponding spray outfit.

During long leave in 1936, extensive inquiries were made by the writer, in England, and information obtained from the United States of America, on the latest types of dusting machines, and finally an English machine was selected, equipped with a four-stroke, six horse-power engine, which was ordered early in 1937.

Meanwhile laboratory cage trials were instituted with a number of insecticides, both arsenical and non-arsenical (derris and pyrethrum) to ascertain those which promised the best results in the field. Cages were made of copra-bed wire about 3 feet high and 2 feet in diameter, in which fresh coco-nut foliage was suspended and a number of *Seseva*, collected at night, was placed. The dust was then applied by means of a hand-dusting machine, and the number of deaths recorded over a period of three days. In each series, one cage was untreated, to act as a control.

The insecticides comprised both proprietary and experimental preparations supplied to the Entomologist by the manufacturers from England, Australia and America, for testing in connexion with this work.

The arsenicals comprised arsenate of lead (several different brands), calcium arsenate and Paris green.

The non-arsenicals comprised various preparations of derris (as pure powder, and total extractives, diluted with an inert filler) and pyrethrum; of this group both proprietary and experimental preparations were used.

The results with the former were very consistent; 5 per cent. of the insecticide (slaked lime being the dilutent) gave an average kill of 80 per cent. with arsenate of lead, 87 per cent. with calcium arsenate, and 90 per cent. with Paris green, deducting a common factor with the controls. On the other hand, the non-arsenicals gave very variable results, even with the same preparation, ranging from 48 per cent. to 59 per cent. under the same conditions.

At the date of writing, the power-dusting machine has not been received, but on receipt, field trials will be instituted with arsenate of lead and calcium arsenate; in these trials data on the quantity of insecticides per acre, time taken to dust a given area, number of treatments for control, &c., will be worked out.

Such a method of control would in no way interfere with the course of biological control, but would rather tend to supplement it.

Without the application of insecticides the following measures will have to be adopted:—

1. Lighting of fires to give a volume of hot smoke between the rows of palms, having a line of boys to collect and destroy the adults and nymphs coming down from the palm heads.

2. Collection of *Sexava* at night; the number of females collected at these times is greatly in excess of that of males, and prevention of deposition of numbers of eggs is thus brought about.

3. Collection of *Sexava* eggs.

4. Turning over the surface soil by hoes, &c.; in this way eggs are exposed to predators and are destroyed partly by dessication and partly by deep burying.

Poison Bait.

Paris green and bran baits have been tried both in the heads of the palms and on the ground. This method, although very successful with the ground-frequenting locusts, was of no value at all with these tree-frequenting species.

Other Suggestions.

These have included the use of flame-throwers, and aeroplanes. The former have proved themselves of great value on the swarms of young locusts on the ground, but the *Sexava* belong to a family that have totally different habits and do not swarm in this way. To use flame-throwers to destroy the eggs would require a considerable heating of the soil and probably result in damage to at least the roots of the palm close to the surface.

Aeroplanes.

Where there are very large compact areas of any one crop, aeroplanes have been reported to be successful for some insects. But again economics come into the question with copra, which is a comparatively small return per acre for any

costly measure of control. Moreover, the *Sexava* shelter on and feed from the lower surface of the foliage and can be reached more readily and cheaply from the ground than from the air.

Moreover, in the dusting trials it has been found that a high percentage of kill was obtained where the "hoppers" had fed on fresh foliage but had crawled over dusted edges and so got a very small amount of the poison on legs and antennae, which were cleaned through the mouth. Thus dusting from the ground will powder the insects as well as the foliage.

WEEVIL PESTS OF COCOA.

By John L. Froggatt, B.Sc., Entomologist.

Two species of weevils, or "snout beetles," have been bred from cocoa trees, one being a pest of economic importance.

Pantorhytes Plutus, Oberth.

The adult beetle is about three-quarters of an inch in length, head, thorax and hind third of elytra (wing covers) and under surface of body and legs, black; one medium green stripe and one lateral green stripe on each side of thorax, and black portion of elytra marked with green stripes or spots. The snout is short and thick.

The point of attack may be anywhere on the stem or branches, a fork in between branches being especially favoured, heavy gumming arising at every site of infestation.

The eggs are laid in the bark, apparently singly, for only one larva is found in each channel. The grubs tunnel along the soft, woody tissue just under the bark, which is ultimately killed over the site of infestation, leaving a ragged opening, and seriously affecting the branch attacked. As a general rule the channel is more or less straight, but especially in cases of attack in a fork the branch may be completely girdled and the centre of the fork bored into.

The adults feed on both the bark and leaves, but more on the former. A trial was made on one plantation of spraying young trees, on which the beetles were very prevalent, with arsenate of lead, and the manager reports that the pest has been very considerably reduced by this means.

A trial was also made with paradichlor-benzene introduced into the channels, but proved a failure in killing the grubs, the mass of gum apparently hindering sublimation of the chemical and preventing penetration of the fumes into the head of the channel.

Pantorhytes plutus, the green cocoa weevil, has been collected in several parts of the Territory, but has only been recorded as a pest on portions of New Britain.

Diplerous larvae are nearly always present in the gum, but are apparently only scavengers.

Orthorrhinus Patruelis, Pasc.

This weevil has been bred from a small green branch of a cocoa tree, but is apparently not numerous. The adult beetle is dark brown in colour, and about half an inch in length; the surface of the elytra is rough and the snout of moderate length.