ENTOMOLOGICAL NOTES

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THE CUCURBIT FRUIT-FLY

(*DACUS CUCURBITAE* COQ.)

THIS is the common fruit-fly attacking various cucurbit gourds, such as cucumber, pumpkin, snake gourd, bitter gourd, luffa, chocho (*Sechium edule*), etc., and so far as is known in Ceylon it confines its attacks to plants of this order, both wild and cultivated. The damage is usually done to the fruit by the larvae or maggots, but there is a possibility that the stems and other parts of the plant may be bored by the larvae, although there is no definite evidence of this in Ceylon at present.

The flies are about twice the size of an ordinary house-fly, with dark-brown bodies, pale-yellow markings on the thorax and a black band across the middle of the abdomen. The female, by means of her extensible ovipositor, lays her eggs in small clusters at intervals of a few days just under the skin of the fruit. These eggs hatch within 1½ to 2 days and the maggots tunnel inside the fruit on which they feed, causing the attacked portions to decay rapidly. When full-grown in about 4 to 5 days, they leave the fruit and pupate in the soil, usually near the surface. The pupal period is about 8 to 10 days, after which the flies emerge and start feeding. Under tropical conditions the life-cycle from egg to adult is about 14 days, but under cooler conditions it may last a few days longer.

The male and female flies do not become sexually mature until about 3 weeks after emergence and the females do not begin egg-laying for about another week, that is, until about one month after emergence. The flies have been kept alive here in the laboratory for several weeks with food, and in other countries it has been found that the females can continue to

lay eggs up to six months after emergence. Under natural conditions in the field, this pest can probably survive from one crop season to another in the adult condition.

Control.—Collect and destroy at frequent intervals all damaged fruit by burning or burying deeply. Destroy all crop refuse at the end of the season. These measures are seldom carried out by cultivators and the flies are able to breed in large numbers throughout each season. Poisoned baits and lures are under experiment and results will be available later.

Natural enemies.—Braconid parasites (*Opius* sp.) have been bred from the larvae of this fruit-fly, but they do not appear to be sufficiently common to have much effect in controlling this pest under natural conditions. Two species of imported pupal parasites are being bred and liberated periodically in village areas.

THE PADDLE-LEGGED BUG

(*LEPTOGLOSSUS MEMBRANACEUS* F.)

During May, 1936, sudden invasions of vast swarms of a large plant-sucking bug were reported from some bungalow gardens in the Talawakele and Badulla districts and from village gardens in Dumbara and Matale. This proved to be the " paddle-legged bug " and at that time the bugs were all in the active winged stage. In the up-country areas serious damage was caused to the fruits of tree tomato (*Cyphomandra betacea*) and of various species of citrus, mainly oranges, resulting in a heavy fall of fruit. At mid-country elevations the bugs, apart from feeding on oranges, swarmed into vegetable areas which were severely injured. They then started breeding on bitter gourd (*Momordica Charantia*) and snake gourd (*Trichosanthes anguina*).

Under normal conditions these bugs are comparatively rare and probably breed in small numbers on wild cucurbits related to bitter gourd. The only other recorded instance of similar vast swarms of this particular bug was in May, 1912, when they appeared almost simultaneously in various parts of the Island, such as Ambawela, Haputale, Maskeliya, Panadure and Galle at elevations ranging from over 5,000 feet to almost sea level. Green (1) mentions that a number of fruits and

vegetables were attacked by these bugs, including oranges, tree tomato, passion fruit, peach, plum, Cape gooseberry (*Physalis peruviana*), beans, peas and vegetable marrow. These bugs are not known to breed on any of the above fruits and vegetables with the possible exception of marrow, and, as in the case of the recent invasions, the attacks on fruits and vegetables seem to have been made only for feeding as a preliminary to subsequent egg-laying and breeding on cucurbits.

Numerous species of larger plant-bugs are usually avoided by birds, lizards and toads, probably owing to their rather hard bodies and objectionable odour, but are partially controlled by parasitic and predaceous insects and possibly by parasitic fungi, some more effectively so than others. It would appear that under normal conditions *Leptoglossus* must be controlled by some very effective natural check or combination of checks, but what this can be is not known at present. This natural control seems to have been considerably upset by the long drought of 1934 and the first half of 1935, since many comparatively rare insects, including *Leptoglossus*, have suddenly assumed the status of pests, while others which have been chronic pests for years have faded away into comparative insignificance.

Stages and life-cycle of Leptoglossus.—The full-grown winged bugs are about 15 to 20 m.m. long, the males being usually smaller than the females. They are dark-brown to blackish above, with an orange coloured band across the shoulders which terminate in a spine on each side. There is also a small yellowish spot in the middle of each wing cover and a row of small reddish spots along the lateral edges of the abdomen. The whole of the underside of the body is mottled with orange red spots and the antennae are alternately barred with black and orange. The adult bugs are distinguished from any of their relatives by the paddle-like tibial extensions on their hind legs which have given them their popular name. This name does not imply any aquatic habits on the part of the bugs, the extensions being merely ornamental.

The pale-brown cylindrical eggs are usually laid end to end in a line on the stems, leaf-stalks and fruit of various cucurbits, preferably bitter gourd and snake gourd and related wild plants. These eggs hatch in about 9 days, the young nymphs emerging

through a circular cap or trap-door in the upper surface of each egg. The young bugs pass through five instars, or periods of feeding and growth between moults. During the first four stages the nymph has a bright red head and abdomen and a black thorax, while the fifth stage is usually brownish black with reddish areas on the three parts of the body ; a paler brown variety without reddish markings is occasionally found. The tibial extensions first appear during the second instar and increase in size with each succeeding moult, attaining their full size in the adult. The nymphal period lasts about 4 to 6 weeks, the bugs entering the adult winged stage with the last moult. The adults do not become sexually mature until about 2 or 3 weeks later and can be kept alive with food for several weeks, during which period the females lay small batches of eggs at intervals. It is not known at present how many eggs a female can lay, but the occurrence of these bugs in such vast swarms as have appeared this year indicates that under favourable conditions they can be prolific breeders.

Remedial measures.—The sudden invasion of a fruit orchard or a vegetable garden by myriads of these winged bugs may result in a serious loss of crops unless the invaders can be killed off or driven away speedily. The usual remedy for plant-sucking bugs of this type, apart from collection and destruction, is the application of contact sprays, such as kerosene emulsion, fish-oil soap or tobacco wash, and these would be quite effective at the ordinary strengths against the younger stages of *Leptoglossus* with their softer bodies and in their wingless, comparatively inactive condition. Therefore if any spraying is undertaken it should be applied to the younger bugs on their breeding plants in vegetable gardens and the spray should be so directed as to wet the bugs thoroughly. The use of these insecticides against the adult winged bugs was found to be impracticable, since most of them escape in flight before they can be thoroughly wet, while those caught unawares by the spray are usually resistant to these sprays used at the ordinary strengths. Stronger applications are inadvisable, as they would be liable to injure the tender foliage and young shoots.

As indicated above, the invasion of a fruit or vegetable garden by vast swarms of the winged *Leptoglossus* comes so suddenly that much damage may be done before their presence

is detected and any action taken to destroy them. Since spraying is impracticable at this stage, the only possible remedy is to collect and destroy as many of the adults as possible by any available method. This should be done in the early morning or late afternoon when the bugs are somewhat sluggish, especially in the cooler temperatures at higher elevations. The invaders can be beaten down on to sheets spread on the ground and then collected into tins of kerosene and water or crushed and buried. Many can be caught in hand nets and similarly treated, while in village areas paddy winnows smeared with sticky juices would be of value in catching the bugs, as in the case of the "paddy fly." Any campaign of this nature should be carried out speedily and systematically.

In vegetable and food crop areas the adults, after severely damaging crops of all kinds, may remain in the locality to breed on cucurbits, and the young stages should be controlled by spraying or by hand picking and destruction. The nymphs can be brushed off into tins of kerosene and water and then buried. Once these bugs are allowed to become established in a cucurbit area they will continue to breed for several months and spoil the gourds as these are formed.

THE ROOT-EATING ANT

(*DORYLUS ORIENTALIS* WESTW.)

Within the last few years this ant has become a serious pest of all kinds of ornamental and vegetable plants, attacking the underground portions and either riddling the tubers and bulbs or destroying the tender portions of the roots and collars. In 1933 a note on this pest (2) indicated that when once it gets established in a vegetable or flower garden hardly any plants escape its attacks, especially during the dry weather when the ants migrate in to well-watered areas from drier surroundings in search of moisture and succulent plant tissues. The control measures previously recommended were mainly the use of petrol as a soil fumigant to kill the ants and of some carbolic disinfectant as a deterrent. It has been found that, while petrol is effective in killing most of the ants actually in the soil at the time of treatment, the effect of the gas soon wears off and more ants return to the attack. During the last few months experi-

ments with paradichlorobenzene (P.D.B.) have been in progress and have given such promising results that it is now being recommended for more general use against *Dorylus* and other soil insects, especially as a commercial grade of this soil fumigant is now available locally. The crystals of P.D.B. give off a rather heavy gas slowly into the soil when mixed therewith, and this gas not only kills the infesting ants without injury to growing plants, but prevents any new invasions over periods of several weeks during dry weather when these ants are usually a nuisance. This soil fumigant can be applied to garden beds before planting as a preventive at the rate of 1 oz. of the crystals for every square yard of surface soil. In order to obtain a more even distribution in the soil, the P.D.B. can first be thoroughly mixed with soil or sand at the rate of 1 oz. of the fumigant to 2 cigarette tins (roughly 1 lb.) of soil, then sprinkled thinly over the surface of a garden bed and mixed in thoroughly with the top layer of soil. In beds of growing plants the same mixture can be sprinkled along shallow furrows between the rows of plants at the rate of $\frac{1}{4}$ oz. of P.D.B. per linear yard of furrow, the soil being then replaced. For small trees and shrubs the fumigant can be applied at the rate of $\frac{1}{2}$ oz. to 1 oz. per plant in shallow circular furrows with a radius of about 6 to 9 inches from the stem. For convenience of measuring it may be mentioned that one large heaped teaspoonful holds about $\frac{1}{4}$ oz. and one cigarette tin about 8 oz. of the crystals.

In up-country districts which get only one wet season a year the ants are usually troublesome during the dry weather and under such conditions the effect of the fumigant lasts for several weeks, and one thorough application made at the start of the drought is usually sufficient to control these ants throughout the season. During wet periods a second application may be necessary on any return of the pest.

The large black ant which makes its nests around the bases of trees, around plants in garden beds and under the turf in grass lawns can also be controlled by P.D.B. Nests around old trees may take up to 4 oz. of the fumigant thoroughly mixed with the soil with which the cavities have to be filled, while the excavations made by this pest in lawns can be similarly treated with a soil mixture containing from $\frac{1}{4}$ oz. to 1 oz. of

the poison according to the size of the nests. After a wet period the application may have to be renewed.

This fumigant should also prove useful against other soil pests, such as cockchafer grubs, " leather jackets " and possibly cutworms. For garden beds where these are known to be chronic pests a thorough application before planting is worth a trial.

REFERENCES

1. Green, E. E.—The Paddle-legged Bug (*Leptoglossus membranaceus*). *Trop. Agriculturist*, Peradeniya, XXXVIII, No. 6, June, 1912, pp. 529, 530.

2. Hutson, J. C.—Entomological Notes—Pests of Garden Plants. *Trop. Agriculturist*, Peradeniya, LXXX, No. 5, May, 1933, pp. 276-279.