

Widespread Damage by Insect Pests in Highlands Sweet Potato Gardens

A. J. KIMBER, Agronomist

Highlands Agricultural Experiment Station, Aiyura

Because of frost and drought, 1972 has been a very bad year for sweet potato (*Ipomoea batatas*), particularly in the Highlands. This is very serious as sweet potato (*kaukau*) is the major food item of subsistence farmers in most parts of Papua New Guinea. In many areas, the situation has been made worse by damage caused by two insect pests, the sweet potato weevil, and the sweet potato leaf miner. This article describes the damage done by these two insects, and outlines DASF's recommendations for their control.

I. SWEET POTATO WEEVIL

(*Cylas formicarius*)

This pest is sometimes called the ant weevil, because the adult, which is a weevil, also looks like an ant. The adult is about 5 to 6 mm ($\frac{1}{2}$ in) long, the body a dark metallic blue colour, and the thorax and legs reddish brown (*Plate I*). Although when seen it seems to



Plate I.—The adult sweet potato weevil is about $\frac{1}{2}$ inch long

(Photo: D.I.E.S.)

spend most of its time walking, it is, in fact, also able to fly. The adult will feed on leaves, vines, roots and tubers of the sweet potato, and it is able to reach the tubers through cracks in the soil. This is why the weevil can be a very bad problem in dry weather, when cracks appear in the soil. The adult does not do much

damage to the leaves and stems of the sweet potato plant, but when it reaches a tuber it chews small feeding holes on the surface of the tuber, and in these holes it lays its eggs (*Plate II*). The eggs of course, hatch into larvae (grubs) and it is the larvae which cause by far the most damage. They make tunnels in the tuber, eating as they go. The larvae are white in colour, about 7 to 8 mm (just over $\frac{1}{2}$ in) long, and take about 3 weeks to reach full size. If an infested tuber is broken open, the larvae will be seen inside (*Plate III*). After the full size is reached, each larva eats out a small hole at the end of its tunnel and here it pupates (changes into the adult form of the weevil). The adult can live for several months and it is possible to get as many as eight generations in a year.

Damage by this pest can be so bad that it causes a complete loss of the crop. Over the years there have been a number of outbreaks reported at various places, including Wau, Bulolo, Kainantu, Henganofi, Goroka and Kundiawa. No doubt there have been many unrecorded outbreaks also. In fact, outbreaks occur regularly every year in some of the drier areas. Somehow the people are able to grow enough sweet potato for themselves and the weevils as well.

METHODS OF CONTROL

What can be done to control the sweet potato weevil? It is difficult to kill the weevil once it has got into a garden, so control methods are largely concerned with trying to keep the weevil out of the garden altogether. In some areas it may not be possible to prevent outbreaks occurring every year, but by simple common-sense measures, the amount of damage can be greatly reduced. The control measures recommended are the same, not only for the whole of Papua New Guinea, but also for the whole South Pacific region.

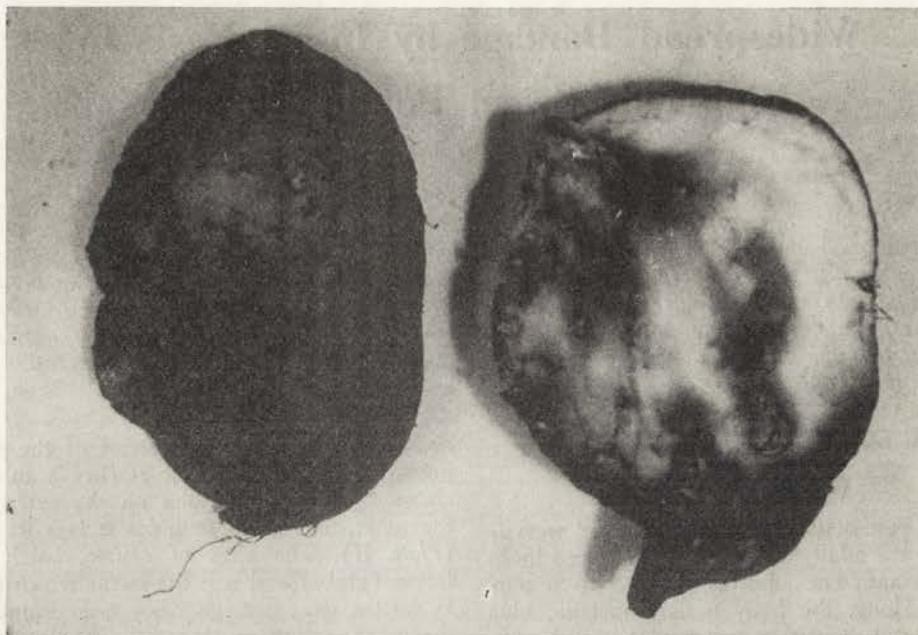


Photo (D.I.E.S.)

Plate II.—Feeding holes can be seen on the surface of the tuber. The eggs laid in these holes develop into larvae

Preventive Methods

(1) Build-up of the pest can be prevented by crop rotation, that is by planting some other crop, not sweet potato, on the land. Once land has become infested with weevils, sweet potato should not be planted on that land again for at least a year. Since the weevils can only live on sweet potato or other very similar plants, they will all die or go somewhere else in 12 months. It is important, however, that all sweet potato and other plants that look like sweet potato should be dug out. Even a few tubers left in the soil by accident would provide food for new generations of weevils. One common plant which can provide a home for the weevils is "Morning Glory" (a creeping vine with trumpet-shaped flowers). This must be dug out also, and destroyed.

(2) When a new sweet potato garden is being planted, cuttings should only be taken from a garden which is known to have no weevils in it. If a garden has the weevil, then the pest can be transported to a new garden very easily, because the adults often feed on the vines.

(3) To make doubly sure that no weevils are carried over into a new garden, cuttings can be dipped in an insecticide mixture before being planted. The dip mixture should contain

284 cc ($\frac{1}{2}$ pint) of 25 per cent DDT liquid concentrate in 18 litres (4 gallons) of water. Cuttings should be completely dipped, allowed to drain over the dip, and planted as soon as possible afterwards. A steel or plastic container is suitable for holding the dip mixture. The mixture will last up to 3 days. After that it will lose its strength and a new mixture should be made up. Old dip mixture must not be emptied into or near drains, creeks or ponds. People dipping cuttings or planting them must wash thoroughly when work is finished for the day, and before eating, drinking or smoking.

(4) New sweet potato gardens should be planted as far away as possible from the old gardens to make it hard for adult weevils to reach the new garden.

(5) It has been explained above that the most serious damage is done when an adult weevil gets into a tuber. It is not easy for a weevil to dig through the soil, so the deeper the tuber is in the soil, the less chance there is of damage by weevils. Vines should therefore be planted as deep as possible.

(6) One final method of control is to use soils which do not develop cracks in dry weather. Of course, this is not always possible, but if soils which do crack open have to be



Photo (D.I.E.S.)

Plate III.—An enlargement of *Plate II*, showing the larvae in the tuber. A larva is about $\frac{1}{4}$ inch long used, then it is a good idea to put a layer of grass about 5 to 8 cm (2 to 3 in) thick on the top of the soil, and so stop it from drying out too much.

Eradication Methods

What can one do if the weevil is already in a garden and it is likely to result in a serious loss of the crop? Certain products are available which are known to kill the weevil, but there are a number of reasons why it is

better not to use them. Firstly, they are very poisonous chemicals, and as well as killing the weevils, they may remain in the tuber, and do some harm to the person who eats the tuber. Secondly, to be really effective, they must be applied to the soil as well as the leaves, and this is very difficult to do in a sweet potato crop where the leaves cover the ground. Probably the most sensible idea would be to harvest the crop as soon as possible, rather than leave it to be damaged any more by the weevils.

II. SWEET-POTATO LEAF-MINER

(Bedellia somnulentella)

This pest is not nearly as serious as the sweet potato weevil, but outbreaks have been recorded this year in a number of locations in the Highlands. Outbreaks of the leaf-miner do not usually cause a complete loss of the crop, but yields can be reduced very much and there is usually a delay before tubers can be harvested.

The adult is a very small moth, usually grey in colour, and only about 3 mm (just over $\frac{1}{8}$ inch) long. When it is flying with its wings

spread out, it is about 8 mm (1/3rd of an inch) across. The moths lay their very small eggs on the surface of a leaf and when the larvae hatch out, they go inside the leaf and move about in there, eating as they go. This is the reason for the name "leaf-miner". The remains of the leaf turn brown and often go hard and brittle in the sun. The larvae then come out of the leaf and start spinning threads among the leaves, as a spider does. These threads can be easily seen, especially early in the morning when the plants are still wet and the sun is low in the sky. At this stage the larvae



(Photo: T. L. Fennel)

Plate IV.—The sweet potato leaf-miner causes much damage to a crop. The larval threads and pupae are seen on the right of the photo. The leaves at the tip of each stem seem to be unaffected, but those farther down the stem are brown and withered.

are about 5 to 6 mm ($\frac{1}{4}$ in) long and can be seen moving about the threads and leaves in a looping fashion. The larvae become pupae, hanging in the threads, and these can be seen as small, dark cigar-shaped objects about 5 to 6 mm ($\frac{1}{4}$ in) long (see *Plate IV*). The adult moths hatch from the pupae and soon start laying eggs again. The time from egg-laying to adult is only 3 to 4 weeks, so a build-up of this pest can be very rapid.

Methods of Control

Although the threads and dead leaves in an infested sweet potato garden can look very bad, the pest does not usually spread very far. It is often kept under control by other insects, which eat it. However, it does cause many people a lot of worry, because it can reduce yields very much.

Apart from natural control by other insects, there are two useful chemicals which can be used, but they are toxic and must be used with great care, if possible by people especially trained for the job. One of these chemicals is marketed as "Septene liquid". For control, mix 28 cc of the product, plus 15 cc of a cheap wetting agent such as teepol or a detergent, in a 14-litre (3-gallon) knapsack, and spray over the sweet potato plants. This should be done again 7 to 10 days later. The first spraying will kill any moths and larvae which are present, but it will not kill the eggs. Ten days later the eggs which survived the first spraying will have hatched into larvae. The second spraying

will kill these larvae. The other product is "Malathion", which is cheaper than "Septene liquid". If 20 cc of the product, plus 15 cc of a cheap wetting agent are mixed in a 14-litre (3-gallon) knapsack, it will again give control in two applications, 7 to 10 days apart.

Chemical control has been successful at Aiyura, and has also been done successfully by Mr D. Birmingham in subsistence gardens in the Goroka area. In this case, the sweet potato gardens were sprayed by two trained operators and the owners were charged a fee. This would certainly be the best method of control for most subsistence gardens.

Further Reading

Entomology Section, DASF (1969). "Insect Pest Survey for the Year Ending 30th June 1967". *Papua New Guin. agric. J.*, 21:66.

O'Connor, B. A. (1969). "Exotic Plant Pests and Diseases". A handbook of plant pests and diseases within the area of the South Pacific Commission. S.P.C. Noumea.

Sherman, M. and Tamashiro, N. "The sweet potato weevils in Hawaii: their biology and control". *Hawaii agric. Expt. Stn. Tech. Bull.* No. 23.

Smee, Lance (1965). "Insect pests of sweet potato and taro in the Territory of Papua and New Guinea: their habits and control". *Papua New Guin. agric. J.*, 17:99.

Stapley, J. H. (1972). "Principal pests of crops in the Solomon Islands". *Pans*, 18:192.