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THE SWEET POTATO WEEVIL

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INTRODUCTION

Sweet potato (kaukau) is the most common and the most important food crop grown in Papua New Guinea. Traditionally, sweet potato has been planted in village gardens as a subsistence crop. However sweet potato is now being grown more intensively, as a cash crop, to supply the food requirements of the growing urban (town and city dwelling) population. This more intensive cultivation may lead to different insect pest problems in this crop.

At present, the most damaging insect pest of sweet potato is the sweet potato weevil *Cylas formicarius*. In extreme cases this insect can ruin a crop for consumption by man or even pigs.

DESCRIPTION

The adult sweet potato weevil is about 6 mm long and 1.5 mm wide. It looks very like an ant but it is a true weevil. The head and abdomen are shiny dark blue-black; the thorax and legs are red-brown. If disturbed it drops to the ground and pretends to be dead. The adult is shown in the diagram of the life cycle on page 29.

BIOLOGY

The eggs are creamy white and measure about 0.6 mm x 0.4 mm. They are laid singly into holes chewed by the female in either the tubers or the thicker vines. After 4 to 7 days small white larvae (grubs) with brown heads hatch out. The larvae are legless and feed inside the vines or tubers.

The larva is fully grown after about 16 days of feeding. It then enters the pupal (resting) stage. No feeding occurs during this stage and the adult weevil develops, finally emerging about 7 days later. The newly emerged adult remains inside the tuber or vine for approximately 5 more days until its skin hardens and its colours darken. The adults sometimes fly at dusk or in the early evening. The whole life cycle takes 30 days or longer. In the warmer lowlands it is shorter than in the cold highlands. Investigations into the life cycle are continuing.

If the egg is laid in the vine the insect completes its whole life cycle there and does not tunnel into the tubers. Similarly if an egg is laid in a tuber, the life cycle is completed in the tuber.

ECONOMIC IMPORTANCE

The larvae feeding in the tubers cause most damage to the crop. They bore tunnels in the tubers leaving their frass (droppings) in the space behind them. They spoil the flavour of the sweet potato. Even though the weight of the tuber may not be reduced the amount of tuber that can be eaten or sold is reduced. When tubers are infested by many larvae they can taste so bad that not even pigs will eat them.

Severely attacked tubers may rot in the ground because plant diseases can enter them through the many weevil tunnels.

Larvae living and feeding in the vines do not appear to reduce tuber production. If many are observed in the vines this usually

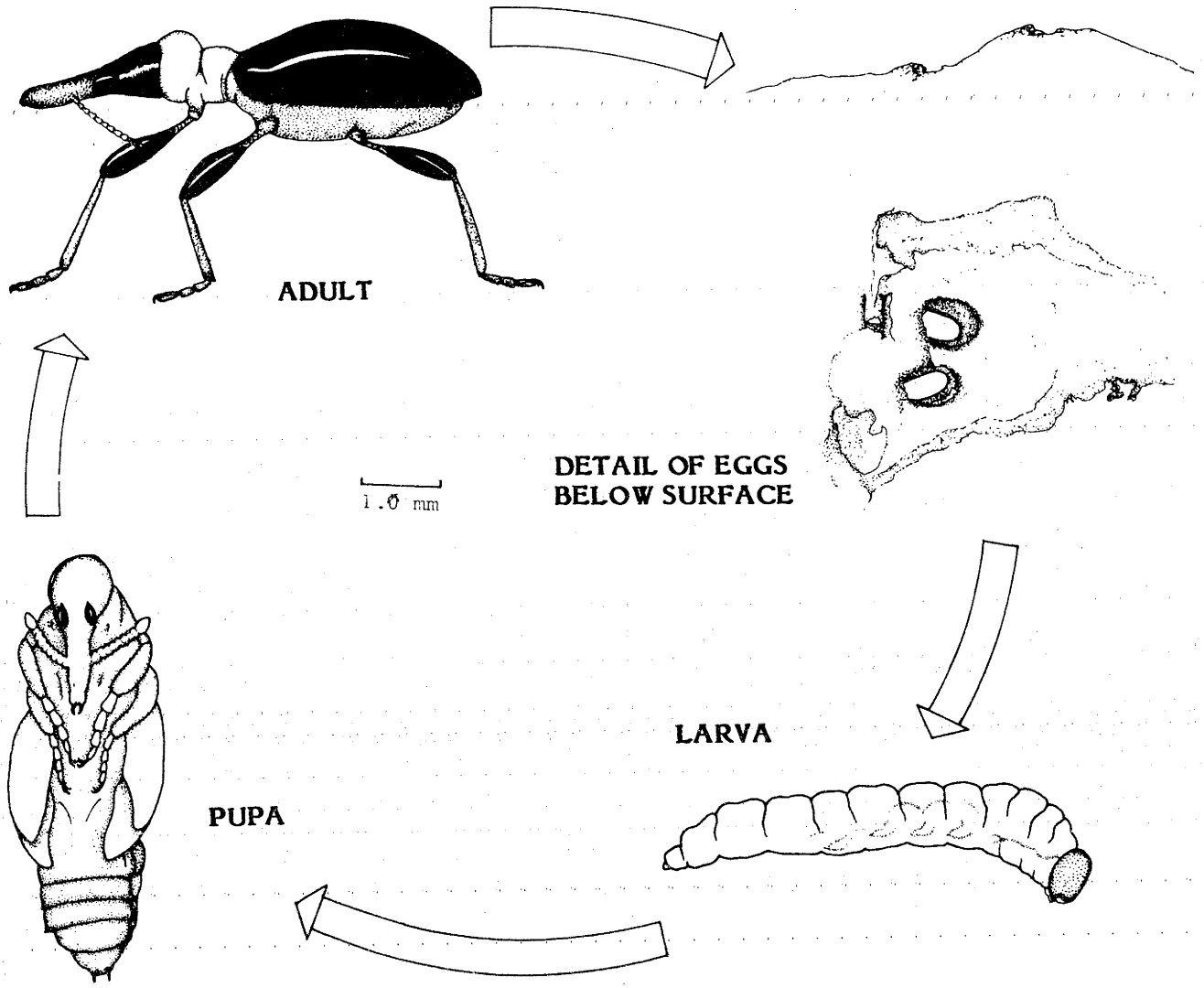

Diagram of the life cycle of the sweet potato weevil

means that there will also be many larvae in the tubers. It is usually possible to see if there are larvae feeding inside the vines because they become much thicker at the point where they enter the ground. If they are split open, tunnels and very often larvae, pupae and young adult weevils can be found. The adults also leave small holes as they emerge from the vines.

Adult weevil damage to the vine is limited to small chewed patches on the leaf stalks, the vine and on the undersides of the leaves. The damage caused by adult weevils to tubers can be seen as small holes, about the size of a pinhead in the surface normally near the top of the tuber.

The adult weevil gets to the tuber when it becomes exposed. This can happen when heavy rain washes the soil off the tops of mounds or ridges. Also, several days without rain can cause the soil surface where the vine enters the ground to shrink back. This allows the female to crawl down to the tuber to lay eggs. Only a small part of the tuber needs to be exposed for this to happen.

Sweet potato weevil damage is reported to be most serious in areas with a marked dry season or in the drier parts of the highlands such as the Benabena and Henganofi areas of the Eastern Highlands Province.

CONTROL

These recommendations are intended mainly for growers producing sweet potato crops for sale, but they may also be used by subsistence farmers.

Cultural control

To control sweet potato weevils the following cultural control methods can be carried out. They are of equal importance and are not given in any particular order. However, if one or more is not carried out then weevils may become a problem.

1. Do not plant a second crop of sweet potato on land immediately after you have harvested the first. Plant a different crop (crop rotation) before you use the land for sweet potato again, or leave it fallow for several months. This type of crop rotation helps to prevent the build up of weevil numbers. Advice on crop rotation can be obtained from your nearest didiman.

2. Use vine tips for planting material. When possible take those from fields which are not infested by sweet potato weevil.

3. If tubers become exposed, by heavy rain washing away the soil, cover them with fresh earth.

4. Use varieties which form tubers deep underground because these are less likely to be attacked by the weevils. Advice on sweet potato varieties can be obtained from D.P.I. entomologists and agronomists.

5. Keep the gardens as clean as possible by burning old vines and tubers after the harvest. Even when other crops are grown these old vines and tubers can support weevil populations which can attack the next sweet potato crop when it is planted.

6. Some plants which are related to sweet potato can support the weevil as well. The most common of these plants is the 'morning glory', *Ipomoea congesta*, which has hairy vines and leaves and long pale blue trumpet-shaped flowers. Both the leaves and flowers are similar to those of sweet potato. It grows and climbs over trees, bushes and fences.

Chemical control

The chemicals recommended for chemical control of sweet potato weevil are fenthion or formothion. Fenthion is considered more effective.

Always use chemicals carefully and take the necessary precautions (see Rural Development Series Handbook No. 18, D.P.I.). The recommendations are divided into 3 types of application:

1. Using non motorized sprayers - for subsistence and small scale farmers.

2. Using motorized mistblower sprayers - for small farmers with a larger crop area.

3. Using tractor-sprayers - for very large farms.

1. Using non-motorised sprayers - the leaves of the sweet potato should be sprayed until they are wet and the spray is just beginning to run off them. Always use a filter when filling the sprayer tank to prevent blockages of the nozzle. The spray should be applied every 14 days from a crop age of 14 days. For use in non-motorised sprayer, 0.1% fenthion or 0.2% formothion are recommended. Mix the chemicals as follows. The letter V represents the exact volume of the spray being used.

For 1 litre of 0.1% fenthion mix together:-

2.0 ml Lebaycid 55% EC 1 litre of water

For larger quantities of 0.1% fenthion, e.g. V litres, mix together:

2.0 x V ml Lebaycid 55% EC V litres of water

In both cases add a wetting agent as recommended on the label

For 1 litre of 0.2% formothion, mix together:

EITHER

6.0 ml Anthio 33% EC 1 litre of water

OR

8.0 ml Anthio 25% EC 1 litre of water

In both cases add a wetting agent as recommended on the label.

For larger quantities of 0.2% formothion, e.g. V litres, mix together:

EITHER

6.0 x V ml Anthio 33% EC V litres of water

OR

8.0 x V ml Anthio 25% EC V litres of water

In both cases add a wetting agent as recommended on the label.

REMEMBER: Wait 14 days from the last spray until the crop is harvested.

2. Using motorised mistblower sprayers - for a larger area of sweet potato a mistblower sprayer is a good idea. Using mistblowers, choose the restrictor setting on the nozzle which gives a flow rate close to 550 ml/min. For most machines this will be the smallest restrictor (e.g. on 'Solo' mistblowers it is restrictor number 4). Walk at a steady speed when spraying, approximately 1 metre every 2 seconds, or 30 metres a minute. Practice this before spraying. Using a mistblower it is not necessary to completely wet the leaves. For the first 3 sprays, spray over 2 rows onto 3 rows. For remaining sprays, spray over 1 row onto 2 rows. Start spraying when the crop is 14 days old and spray every 14 days.

For 1 litre of fenthion to be used in a mistblower sprayer to control sweet potato weevil, mix together:

10 ml Lebaycid 55% EC 1 litre of water

For larger quantities of fenthion to be used in a mistblower, e.g. V litres, mix together:

10.0 x V ml Lebaycid 55% EC V litres of water

In both cases add a wetting agent as recommended on the label.

For 1 litre of formothion to be used in a mistblower sprayer to control sweet potato weevil, mix together:

EITHER

40 ml Anthio 33% EC 1 litre of water

OR

50 ml Anthio 25% EC 1 litre of water

In both cases add a wetting agent as recommended on the label.

For larger quantities of formothion to be used in a mistblower, e.g. V litres, mix together:

EITHER

40.0 x V ml Anthio 33% EC V litres of water

OR

50.0 x V ml Anthio 25% EC V litres of water

In both cases add a wetting agent as recommended on the label.

REMEMBER: Wait 14 days from the last spray until the crop is harvested.

3. Using a tractor sprayer - If a tractor sprayer is being used, it is important to know how much spray is being put onto a given area. The sprayer must be calibrated in litres/hectare. Start spraying when the crop is 14 days old and spray every 14 days.

REMEMBER: Wait 14 days from the last spray until the crop is harvested.

The amount of chemical needed for spraying 1 hectare is given in the table below. E represents the recommended dosage for the crop being sprayed. If the sprayer is applying E litres/hectare of mixed spray and the tank of the sprayer holds V litres, the amount of chemical to mix in one tank load can also be calculated from the table:

TABLE 1. USING A TRACTOR SPRAYER - AMOUNT OF CHEMICALS TO MIX FOR V LITRES OF SPRAY

Chemical	Amount to apply/hectare each spray (litres)	Amount to mix (ml) in 1 tank load of V litres*
LEBAYCID 55% EC (fenthion)	0.910	$\frac{910}{E} \times V$
ANTHIO 33% EC (formothion)	3.030	$\frac{3030}{E} \times V$
ANTHIO 25% EC (formothion)	4.000	$\frac{4000}{E} \times V$

* *V is the volume, in litres, of the sprayer tank*
E is the volume, in litres per hectare, of mixed spray which the machine is spraying.

NOTE: These sprays will also control leaf-eating insects on sweet potato.

FURTHER READING

Jamieson, G.I. (1968). Observations on time of maturity of sweet potato (*Ipomoea batatas* Lam.). *Papua New Guinea Agricultural Journal* 20 (1&2): 15-24.

Kimber, A.J. (1972). Widespread damage by insect pests in highland sweet potato gardens. *Harvest* 2 (4): 117-121.

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Purseglove, J.W. (1968). *Tropical Crops. Dicotyledons.* Longmans, London, 719 pp.

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FURTHER INFORMATION

Further information on sweet potato weevil and other insect pests of sweet potato can be obtained by contacting your nearest D.P.I. entomologist or didiman. Entomologist are based at:

PORT MORESBY
D.P.I., P.O. Box 417, KONEDOBU
Tel: 214699 Ext 256

LAE
Bubia Agriculture Research Centre
P.O. Box 73, LAE
Tel: 424933

MOUNT HAGEN
Kuk Agricultural Research Station,
P.O. Box 339, MOUNT HAGEN
Tel: 551377

KIMBE
P.N.G. Oil Palm Research Station,
P.O. Box 165, KIMBE
Tel: 935194

RABAUL
Lowlands Agricultural Experiment Station,
P.O. Keravat, E.N.B.P.
Tel: 926251

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(Illustrations: R.E. Sutherland)