

SOUTH PACIFIC COMMISSION

SWEET POTATO WEEVIL



Above: Adult male Cylas formicarius (x3).



Left: Larval damage to tubers (note newly hatched adult at top of picture).



Right: Tuber surface holed during egg-laying and adult feeding.

SWEET POTATO WEEVIL (*Cylas formicarius*) is the most important pest of sweet potato. It is widely distributed throughout the world occurring in Africa, Asia, the Caribbean, in parts of North and South America and the Pacific. Within the SPC region it is present in all countries except Nauru, Pitcairn, Tokelau and Vanuatu. The weevil also occurs in northern and eastern Australia. Severe infestations are common in areas with low rainfall or where there is a dry season.

BIOLOGY

Superficially, adults look very much like ants but their long 'nose' clearly distinguishes them as weevils (front cover, above). They are 6-7 mm long, the head and wing covers are blue-black, and the legs, thorax and antennae are reddish-brown. Adults feed on the outside of the stems, petioles, leaves and tubers. They are most active just after sunset and again just before sunrise. If disturbed they drop from the vines and appear to be dead. The weevils can fly considerable distances. The main method of dispersal is the movement of infested vines and tubers by man.

Depending on the temperature the life cycle takes 4-6 weeks, and ten generations a year are possible. The preferred host is sweet potato but several other species of *Ipomoea* and a few close relatives are alternate hosts. The common wild hosts that occur in the region are *I. aquatica*, *I. indica* (*I. congesta*) and the beach morning glory, *I. pes-caprae*, present along the coasts in many countries of the region. Weevils readily move from these to sweet potatoes grown nearby.

Eggs are laid singly in small holes chewed by the female at the base of the vines or in the tubers (front cover, below right). These holes are then plugged with a faecal pellet to prevent the eggs from drying out and to protect them from predators. After 5-8

days, the white, legless larvae hatch and begin to feed inside the vines (Fig.1) or tubers (front cover, below left). The larval stages last 15-20 days, then the larvae pupate. About one week later the adults hatch. They remain within the plant for 6-9 days while their true colour develops, after which they emerge and start to feed. Shortly afterwards mating occurs. Egg-laying begins 2-3 days later and continues throughout most of the 70-90 days of adult life.

DAMAGE

The adult weevils cause only minor damage. They scrape off the surface layers of the leaves, petioles and stems, making small, oval patches as they feed. Leaves may wilt and die when weevil numbers are high, but this is rare and unlikely to effect tuber yield. Small, round feeding punctures are also made on the surface of the tubers. However, the real cause for concern is the damage done to the tubers and vines by the larvae as they tunnel through them.

Total yields are not usually affected by weevil attack on the tubers, but the long, twisting, frass-filled tunnels of the larvae reduce the amount that can be eaten. Even

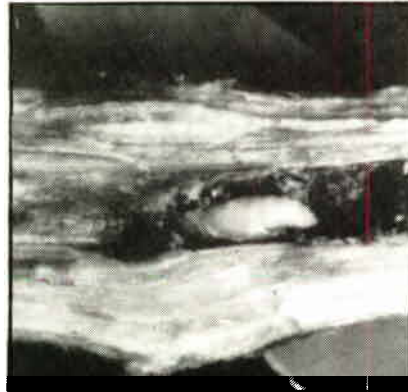


Fig. 1: Weevil pupa in a sweet potato vine (x3).

the undamaged part of the tuber is spoilt because of the presence of chemicals known as terpenes produced in response to attack. These turn the flesh brown when the tubers are cut and give them a sour taste so that even pigs will not eat them. Weevil damage increases the longer the tubers are left in the ground and if harvest is delayed the entire crop may be lost.

When vines are attacked by large numbers of larvae they become thickened and cracked and this may lead to loss of plant vigour and reduced tuber yield. This damage is less obvious than that done to the tubers and may be overlooked.

Weevils either gain access to tubers when they become exposed at the soil surface or reach them by tunnelling through loose earth or via soil cracks. This is why tuber damage is greater when rainfall is low and in soils that crack when dry.

CONTROL

Choice of varieties

Varietal resistance has been sought in most countries where the weevil is a problem, but so far without success. Those varieties released from the International Institute of Tropical Agriculture, Nigeria (TIS 2532, TIS 3017 and TIS 3030) with resistance to the African sweet potato weevil, *Cylas puncticollis*, are not resistant to *C. formicarius*.

Varieties should be selected which form tubers deep in the ground so that it is more difficult for weevils to find them.

The use of early maturing varieties is another important way of avoiding damage. Studies in the Port Moresby area of Papua New Guinea, for example, have sought varieties which give acceptable yields at 3 months and can be harvested before the weevil population has had the chance to damage the crop.

Cultural control

Infestations of sweet potato weevil can be significantly reduced by applying the following cultural practices:

Cuttings for propagation should always be taken from the first 30-50 cm of vines to avoid weevil eggs or larvae.

If tubers become exposed they should be covered again with soil, otherwise they will readily become infested by weevils.

Successive crops of sweet potato should not be grown on the same land. There should be a period of at least 12 months between crops. During this interval the land may be planted to alternate crops or left fallow. New plantings should be 1 km or more from existing crops, although shorter distances may be adequate where plots are surrounded by forest. If a new site is not available it is important that all trash from the previous crop is collected and burnt before the land is replanted.

Alternate hosts

The morning glory, *I. indica* and the beach morning glory, *I. pes-caprae*, should be removed from around sweet potato crops to prevent early weevil infestation. However, where crops are grown continuously on the same land the removal of these alternate hosts is unlikely to be of benefit.

Biological control

Predators and parasites of sweet potato weevils are known, but none have been found to usefully control populations.

Chemical control

1. Pre-planting

Dip vines used for propagation in an insecticide at 0.01 to 0.05 per cent active ingredient for at least 30 minutes. Most organophosphorus or carbamate insecticides, for example, acephate, carbaryl, dimethoate and those listed under post-planting, are

suitable. This treatment of vines is especially important if cuttings other than terminal shoots are used for propagation.

2. Post-planting

Treat plants with fenthion (0.1 per cent active ingredient) or formothion (0.2 per cent active ingredient) applied by hydraulic knapsack sprayer, starting 2 weeks after planting and then at 2-weekly intervals, until 2 weeks from harvest. Leaves should be sprayed until the chemical is just beginning to run off them. When sprays are made by mistblower rates are 0.5 per cent active ingredient fenthion or 1.25 per cent active ingredient formothion with a flow rate of 550 ml per min. For most machines this is obtained by using the smallest restrictor. For both high and low volume sprays a wetting agent (Agral '60' or Citowett) should be used as recommended by the manufacturer.

Integrated control strategies

The methods described above need to be used together to give maximum weevil control; especially important is the use of weevil-free planting material and the removal of *Ipomoea* weeds. In addition, studies at the Asian Vegetable Research and Development Center, Taiwan, have shown that a sex pheromone (chemical attractant) can be used to capture male weevils and so reduce populations. The chemical is placed in traps 10 to 15 m apart soon after the crop is planted. Each trap is sufficient to bait weevils from an area of 100 to 200 m². For more information on this new technique write to The Entomologist, AVRDC, Shanhua, Tainan 74199, Taiwan or to the SPC Plant Protection Service.

Quarantine precautions

In those countries of the region where the sweet potato weevil is not yet present strict quarantine precautions should be taken to avoid its introduction. The movement of sweet potato propagating material between countries should, in any case, be

limited to small quantities for scientific purposes under the supervision of the specialist officers of the agricultural services. Preferably these introductions should be as sterile, pathogen-tested plantlets growing in a tissue culture medium.

The West Indian Sweet Potato Weevil

Euscepes postfasciatus, the West Indian Sweet Potato Weevil, occurs in North, South and Central America, the West Indies and the following countries of the region: Cook Islands, Fiji, French Polynesia, Guam, New Caledonia, Tonga, Vanuatu and Wallis and Futuna. The adult is smaller than the sweet potato weevil and is greyish-brown with a white mark near the rear of the body. The symptoms made by the larvae as they tunnel through the tubers are similar to those caused by *C. formicarius*. Control measures for *E. postfasciatus* are the same as those for sweet potato weevil.

This leaflet was prepared by R. Macfarlane, Plant Protection Officer and G.V.H. Jackson, Plant Health Officer, South Pacific Commission, Plant Protection Service, Suva, Fiji, from whom further information can be obtained. The photographs were taken by R. Macfarlane and B. Thistleton.

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Original text: English.

Printed with financial assistance from the New Zealand Government.

Published by the South Pacific Commission and printed by Oceania Printers Ltd., Suva, Fiji. Further copies of this leaflet may be obtained from the South Pacific Commission, Plant Protection Service, Private Mail Bag, Suva, Fiji; or from South Pacific Commission, BP D5, Noumea Cedex, New Caledonia.

South Pacific Commission Cataloguing-in-publication data

Macfarlane, R.

Sweet potato weevil / by R. Macfarlane and G.V.H. Jackson.

1. Sweet potatoes—Diseases and pests—Oceania 2. *Cylas formicarius* I. Title II. Series III. Jackson, G.V.H.

635.229768
ISBN 982-203-045-2

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