

SOLOMON ISLANDS

101 Farmer Fact Sheets



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Alomae & Bobone

Farmer
Fact Sheet

1

What are they?

Alomae (photo, left) and Bobone (photo, middle) are diseases of taro caused by viruses. Viruses are very small, and live inside plants. Insects called plant hoppers (photo, right) suck up the viruses from sick taro as they feed, and then infect healthy plants.

Damage

Most varieties die from Alomae. These are called “male” taro on Malaita - they are the biggest and best. It is very difficult to grow “male” taro on the coast of Malaita, and in some part of the highlands. In recent years, the disease has spread. It is now common on the weather coasts of Guadalcanal and Makira. On Guadalcanal it is called Chuaka. Bobone affects “female” varieties; they do not die, but corms are smaller than on healthy plants.



How do I identify them?

Alomae: first leaves are short, and the leaf blade curled under; the next leaf is shorter and stays rolled. Often the leaves are yellow, but not always. Plants stop growing, rot and die.

Bobone: plants produce small, twisted thickened leaves that often stay green. After 4-6 weeks, healthy leaves appear.

How to manage Alomae & Bobone

CULTURAL CONTROL

- Make new gardens as far away as possible from old ones;
- Check plants for Alomae before using planting material (“tops”) from diseased gardens;
- Visit gardens each week. If you see signs of Alomae: a) fold the leaves slowly with plant hoppers inside, b) shut the stalks together, trapping the plant hoppers, c) pull out the plant, and d) burn it. Or put a rice bag over the diseased plant, pull it out and burn it;
- DO NOT pull out plants and then leave them in the garden, or throw them into the bush – the insects will come back into the garden and infect the healthy plants;
- ALL farmers in a village should carefully remove plants with Alomae as soon as they see them; it is best if EVERYONE does this at the same time;
- DO NOT plant “male” and “female” taro in the same garden.

RESISTANT VARIETIES: “Female” taro are resistant to Alomae; and “male” taro show mild Bobone.

CHEMICAL CONTROL: Insecticides are not recommended for these diseases.

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HT works for MAL; GJ is with TerraCircle Inc.



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Banana Black Sigatoka

Farmer
Fact Sheet

2

What is it?

It is a disease caused by a fungus that infects bananas and plantains. It is called Black Sigatoka after a Fijian town where it was first found. The scientific name is *Mycosphaerella*.

Damage

Leaves die early. Instead of lasting 200 days, they last only 50 days. Bunches are small: a third to a half the normal size, depending on the seriousness of the disease. Fruits ripen early, and the taste is poor. Spores develop in the dead, grey areas on the leaves and are spread by wind and/or rain splash. Cavendish varieties are very susceptible.



How do I identify it?

Look for red-brown and yellow streaks that develop rapidly (photo, right); the leaves dry from the margins back to the mid-rib (photo, left), and they die early.

How to manage banana black Sigatoka

CULTURAL CONTROL

- Allow more air into the plantation to dry the leaves as quickly as possible after rain and dew – remove weeds and trees from within the plantation, and remove trees from the boundary. If leaves are dry, fewer spores form, and fewer healthy leaves are infected;
- Remove leaves or parts of leaves, when they are more than half infected; plant at wide spacings; weed regularly; cut out suckers, leaving 3-4 of different size; remove and burn old infected leaves; use a mulch to improve plant health.

RESISTANT VARIETIES: Many plantains in Solomon Islands have resistance. Test FHIA varieties imported by MAL for Cavendish-like qualities. In Fiji, FHIA 1, 17 and 18 are resistant to Black Sigatoka. See your MAL extension officer for advice.

CHEMICAL CONTROL

Fungicides are only recommended for commercial plantations:

- Protectant fungicides: dithiocarbamates (e.g., mancozeb); or banana misting oil;
- Systemic fungicides: triazoles (e.g., propiconazole and flusilazole); strobilurins (e.g., azoxystrobin). Rotate fungicides in the different groups to prevent build up of resistance. In drier times, use only mancozeb. See your MAL extension officer for advice.

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Cocoa Brown Root Rot

Farmer
Fact Sheet

3

What is it?

It is a disease caused by a fungus that lives in the soil. The fungus produces a bracket producing millions of spores. Many plants are attacked other than cocoa, including coffee, *Cordia* and other forest trees (especially in Vanuatu), oil palm and rubber. The scientific name is *Phellinus*.

Damage

Spores of the fungus infect stumps after the forest has been cut down. The fungus spreads from the infected stumps to the cocoa by root-to-root contact. Leaves turn yellow, wilt and die. The fungus then grows up the trunk as a dark brown to black crust (photo, left); this has a white margin, often with clear drops of liquid. Further spread occurs from diseased to healthy cocoa roots and, in a short time, a large number of trees are killed.



How do I identify it?

Look for the crust that grows up the trunk. Also, look for brackets of the fungus on old stumps of forest trees, as well as on shade trees, for instance, *Leucaena* (photo, right). Note, the bracket has not been seen on cocoa trees in Solomon Islands.

How to manage cocoa brown root rot

CULTURAL CONTROL

- After clearing the forest, look for stumps that have brackets growing from them. The stumps should be dug out, together with all roots larger than 2.5 cm diameter. Check the old stumps for brackets every 3 months;
- If diseased cocoa trees are seen, remove them immediately, taking out as much of the larger roots as possible. Carefully remove soil from around the trees nearby and inspect for the crust at the base of the trunk and on the larger roots. If seen, remove the trees.

CHEMICAL CONTROL: Fungicides are not recommended for control of cocoa brown root rot.

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Butt & Root Rots

Farmer
Fact Sheet

4

What are they?

Butt rots are diseases caused by fungi that live in the soil and feed on the roots of trees. Only the bracket is seen; brackets produce millions of spores that are spread by wind.

Butt rot fungi attack many trees. They attack orange and other citrus, and also oil palms. The scientific names are *Ganoderma* (photo, left & top right) and *Trametes* (photo, below right).

Damage

Spores from the brackets spread the fungi. The spores germinate and enter through wounds. As the fungi grow, white rots develop inside the trunk and in the roots. Leaves turn yellow and fall, fruit production stops, and branches die back slowly. Brackets appear at the base of the trunk, but death takes several years. The fungi also spread by contact between diseased and healthy roots.



How do I identify them?

If branches start to dieback, it is possible that the roots have butt rots. There is no way to be sure until the brackets develop. Look for brackets at the base of the dying trees, as well as those nearby, and on any stumps that are present.

How to manage butt & root rots

CULTURAL CONTROL:

- Dig out trees with brackets, along with all the main roots;
- Do not damage the bark of trees. Spores of the fungus can enter the trunk through wounds. Stop people cutting the bark with bush knives!

CHEMICAL CONTROL: Fungicides are not recommended for butt rot diseases.

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Chilli Viruses

Farmer
Fact Sheet

5

What are they?

There are two or more viruses in chillies in Solomon Islands. The same viruses probably occur in other crops too. The viruses known to be present are:

- *Cucumber mosaic virus*; this infects many members of the cucumber family as well as banana, tobacco, tomato and legumes. It is spread by aphids, also known as green flies.
- *Tomato mosaic virus*; this infects tobacco, tomato and many weeds. It is spread:
 - On the outside of seed;
 - By contact with old crops of chilli, tobacco, tomato and weeds;
 - By contact with undecomposed plants in the soil;
 - On hands of people touching the plants, seedlings in particular;

Damage

Leaves show yellow spots and blotches, curls and crinkles. Usually, these viruses do not cause severe disease and plants continue to produce fruit. However, some plants near Auki, Malaita, show severe symptoms with yellow, distorted, bunched leaves (photo). Fruit production on these plants is low. They may have more than the two viruses named above, or different ones.



How do I identify them?

Look for yellow and green patterns on the leaf; they may also be misshapen and sometimes curled. Plants with severe symptoms (photo) have very yellow, small, pointed, leaves. [It is difficult to identify viruses by symptoms. Many viruses cause similar symptoms.]

How to manage chilli viruses

CULTURAL CONTROL

- Do not plant new plots of chilli next to old ones; this is very important;
- Pull out and burn all plants before planting a new plot with healthy plants;
- Avoid touching the leaves of seedlings, especially after handling older plants.

RESISTANT VARIETIES: There is no information on the resistance of chilli varieties to these viruses.

CHEMICAL CONTROL: This is not an option for these diseases.

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Cocoa Black Pod & Canker

Farmer
Fact Sheet

6

What are they?

Black pod is a disease of young and mature cocoa fruit; canker is a disease of cocoa branches and trunks. Leaves are also attacked (photo, far right). Black pod and canker are caused by a water mould, once thought to be a fungus. This water mould also infects betel nuts, breadfruit, coconuts, papaya, pepper, and many more. The scientific name is *Phytophthora*.

Damage

The water mould produces spores on the fruits – in the white areas. Wind and rain, insects and pruning tools spread the spores. Pods rot in 7-10 days. About 4 of every 10 pods are destroyed by black pod (photo, far left), depending on rainfall, variety and management. Pod rot leads to cankers in branches and trunks (photo, second from left).



How do I identify them?

Look for brown spots on pods that grow rapidly (photo, second from right). Cankers are less obvious. Scrape away the bark near black pods and look for red wood beneath (photo, second from left). Look for sunken areas with splits between dead and healthy bark.

How to manage cocoa black pod & canker

CULTURAL CONTROL

- Create a light shade (about 600 trees/hectare if planted); plant cocoa not less than 3 metres apart; prune to create an open canopy - 3-5 branches coming from the fork (jorquette); cut out branches near or touching the ground; remove water shoots;
- Remove diseased pods as often as possible, at least every month, preferably every 2 weeks during the main crop. Take pods out of the plantation and bury them.

RESISTANT VARIETIES

Amelonado is the most resistant variety grown in Solomon Islands.

CHEMICAL CONTROL

Copper sprays are useful, if applied regularly (every 2 weeks) to the pods. Trunk injections using phosphorous acid are also effective, applied once or twice a year, depending if black pod losses are low or high. See your MAL extension officer for advice.

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Gummy Stem Blight

Farmer
Fact Sheet

7

What is it?

It is a disease caused by a fungus. The fungus attacks cantaloupe melon, cucumber and watermelon. The scientific name is *Didymella*.

Damage

The fungus produces small, black, round structures, like baskets, inside the leaf spots; these can just be seen with the eye. They contain millions of tiny spores (like seeds). Spores are spread in wind and rain. Spots develop and grow rapidly (photo, left) causing leaves to blacken, shrivel and die. It happens so quickly that it is called “blight”. The loss of leaves means that the fruits are starved of food, and do not develop properly.



How do I identify it?

Look for brown spots on the leaves (photo, right) of nursery plants. In the field, look for the rapid growth of black spots and blotches, especially during wet weather.

How to manage gummy stem blight

CULTURAL CONTROL

- **Nursery:** a) take soil where watermelon has not been grown before; b) build the nursery far away from watermelon gardens; c) do not make the nursery downwind from watermelon gardens; d) check plants every 2 days, and remove any plants with leaf spots;
- **Field:** do not plant watermelons on the same land as the last crop. Leave a 3-year gap;
- Do not plant watermelons down wind from older crops with gummy stem blight;
- After the watermelons have been harvested, collect the vines and burn them.

CHEMICAL CONTROL

Use one of the following fungicides: Bravo (chlorothalonil), Dithane M-45 (mancozeb) or copper oxychloride. Spray every 7 to 10 days. See leaflet: Gummy Stem Blight published by MAL or contact your MAL extension officer for advice.

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Yam & Banana Nematode

Farmer
Fact Sheet

8

What are they?

They are worm-like animals that live in roots of yam and banana, and other plants. You need a microscope to see them. Eggs are laid in roots, or in soil close by; they hatch, and the young nematodes moult several times before becoming adult. The scientific name is *Pratylenchus*.

Damage

The mouth has a “spear” (photo, arrow below left) used to enter roots (photo, lower right) and tubers, and for feeding. On **banana**, the nematodes cause spots on the roots growing into red and/or black patches (photo, top right). The roots die, and plant growth is poor; sometimes they fall over. On **yam**, tubers show shallow, brown, dry rots, which spread during storage (photo, top left); these rots destroy the planting material for the next crop.



How do I identify them?

Often, it is not obvious that yams are infected until harvest, when symptoms are seen on the tubers. On banana, plants may fall over in the wind, a characteristic of the disease.

How to manage yam & banana nematode

CULTURAL CONTROL

- Inspect each yam piece or banana sucker before planting. If dry rot is seen, cut out the diseased parts. Wipe the knife with bleach before cutting the next tuber or sucker;
- If dry rot occurs, do not grow crops on the land for 3 years. Plant cover crops, e.g., Guinea grass (*Panicum*) and siratro (*Macroptilium*), to reduce nematode populations;
- Use local knowledge, and plant on land where crops have grown well in the past;
- DO NOT store yams with dry rot. Inspect yams regularly and remove any with dry rot;
- In banana plantations, add organic matter to the soil and use a mulch.

CHEMICAL CONTROL

Treat yams with hot water (51°C for 10 minutes) and banana suckers (53°C for 20 minutes) before planting. Seek help from your MAL extension officer before using hot water.

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Mango Spots & Dieback

Farmer
Fact Sheet

9

What are they?

The spots and dieback are caused by fungus. The fungus attacks mango and many other plants, including avocado, coffee, eggplant, papaya, sweet pepper, tomato and yam (see Fact Sheet 16). A common name for the disease is Anthracnose. The scientific name is *Glomerella*.

Damage

Large numbers of spores are produced in tiny dish-like structures in the leaf spots (photo, left), and they are splashed by rain onto other leaves, flowers and shoots.

The disease is worse in wet weather. There are several symptoms: a blight of flowers, so that they die without producing fruit; black spots on young fruit, which shrivel and fall; shoot blight, which causes dieback; and pin-point infection of mature fruit, which expand after harvest as the fruits ripen, and cause losses in storage (photo, right).



How do I identify them?

Look for flower blight in wet weather, and the black spots on young leaves and fruits.

How to manage mango spots & dieback

CULTURAL CONTROL

It is important to prune trees so that they are not more than 4 metres tall. Disease twigs should be removed and burnt along with fallen leaves.

RESISTANT VARIETIES

Indo-Chinese/Philippine varieties are said to have resistance and need to be tested in Solomon Islands. They have good flavour, and low fibre. See your MAL extension officers for advice.

CHEMICAL CONTROL

- Use copper oxychloride or mancozeb. Spray pruned trees when flowers first appear, continuing at recommended intervals until the pre-harvest waiting period;
- Dip fruit after harvest in fungicides (carbendazim)/hot water (5 minutes at 52°C) to control fruit infections that develop in storage. See your MAL extension officers for advice.

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Taro Mitimiti

Farmer
Fact Sheet

10

What is it?

It is a disease of taro caused by nematodes - tiny worm-like animals that feed and live in the roots and corms of taro, too small to be seen with the eye. Mitimiti is known only from taro in Choiseul, Kolombangara, Ontong Java and Rennell. The scientific name is *Hirschmanniella*.



Damage

The nematode (photo, right) has a mouth with a “spear” inside (See **Fact Sheet 10**); it uses it to enter the roots, and to break the cells and feed on the contents. The nematodes also enter the corms, and slowly make their way upwards, causing a dry brown rot as they go. At first, these rots are in bands, 1-10 mm wide (photo, below right) with red margins. They make the corms look like uncooked fatty meat – *mitimiti*. Later, the rots join together. The decay to roots and corm causes plants to wilt and stay small (photo, left). Harvests are poor.



How do I identify it?

Look for wilting plants; then cut the corms and look for reddening and brown dry rots.

How to manage taro mitimiti

CULTURAL CONTROL

- Prepare “tops” carefully: remove outer leaves, trim the corm, remove the roots;
- DO NOT plant suckers with whole corms attached; cut and check for rot;
- On hillsides, DO NOT plant below gardens where the disease was present before.

RESISTANT VARIETIES: Tiko, a semi-wild variety on Malaita was resistant when planted in a swamp on Ontong Java. There is no information on the resistance of other varieties.

CHEMICAL CONTROL

Treat “tops” at 51°C for 10 minutes before planting. Make sure the “tops” have more than 1 cm of corm. This method should only be used to establish a source of nematode-free planting material. See your MAL extension officer for advice.

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Athelia Wilt

Farmer
Fact Sheet

11

What is it?

The disease is caused by a fungus that lives in the soil and attacks plants at soil level. It attacks beans, carrot, cucurbits, peanut, pepper, sweet potato, taro and tomato. It is also known as Southern blight. The scientific name is *Athelia*.

Damage

Plants can be infected at any stage, from planting onwards. On peanut (photo, right), the fungus infects the roots and lower stems, and causes plants to wilt. It can spread rapidly from plant to plant. Sweet potatoes are often killed soon after planting.



How do I identify it?

Look for plants that are wilting. Then look for thick, white, cottony growth (photo, left) and tiny, light brown, round balls (photo, arrowed right) on stems and leaves - called **sclerotia**.

How to manage Athelia wilt

The fungus lives for many years in the soil as cottony growth or as sclerotia, so control is difficult. The sclerotia germinate when the roots of plants grow near them.

CULTURAL CONTROL

- Avoid land where the disease occurred in the last crop. If possible, let the land “go bush”, that is, do not plant anything there for at least 3 years;
- Remove old crops or bury them by digging the soil deeply before planting - sclerotia do not survive for more than 45 days if buried 20-30 cm;
- If plants are raised in a nursery, check that they are free of the disease;
- Remove infected plants as soon as they start to wilt, taking soil from around the stems and roots, but being careful not to spread the sclerotia onto other plants. Burn the plants.

CHEMICAL CONTROL: Fungicides are not recommended for the control of this disease.

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Cocoa Pink Disease

Farmer
Fact Sheet

12

What is it?

It is a disease caused by a fungus. It infects cocoa and other trees - *Agathis*, *Citrus*, *Cordia*, *Hibiscus*, mango and rubber. The scientific name is *Phanerochaete* (also known as *Corticium*).

Damage

White threads of the fungus spread over the bark – the threads look like cobwebs. Later, white pustules appear through cracks and through the natural openings in the bark. Later still, a pink crust develops which produces spores. Spores of the fungus are spread by rain splash.

Branch dieback occurs and, occasionally, death of the tree if infections occur at the fork or jorquette. If management is poor, and there is a lot of shade, losses can be high, but usually the disease is not important. The disease is worse on trees between 2 and 6 years' old.



How do I identify it?

Look for the sudden death of a branch, with the brown leaves remaining attached (photo, left). Look closely to see white threads of the fungus and the pink crust on the stems and trunk (photo, right). Regular surveys to detect infections are very important.

How to manage cocoa pink disease

CULTURAL CONTROL: Prune out the infected branches as soon as the fungus is seen. If the fungus has infected the fork or jorquette, then consider a chemical treatment (see below);

- DO NOT leave the cut branches in the plantation; take them out and burn them;
- Prune only in dry weather. Cut at least 30 cm below any sign of the disease;
- DO NOT plant trees too close or under heavy shade.

CHEMICAL CONTROL: Copper fungicides are useful if applied as a paste in a little water. Prune the branches and apply the paste to the cut ends and along the remaining parts.

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Sweet Potato Scab

Farmer
Fact Sheet

13

What is it?

It is a disease caused by a fungus that attacks the shoots of sweet potato. It is not found on any other plant. The scientific name of the fungus is *Elsinoe*.

Damage

Masses of small spores occur in the scabby areas. They are spread by rain-splash from plant to plant. Spread to new gardens is on diseased cuttings. Young leaves are infected along the veins and leaf stalks (photo, right). As leaves grow, they twist, curl and tear. Old leaves have pin size spots between the veins. Severe infection reduces plant yields.



How do I identify it?

Look for brown scabby marks on leaf veins, stalks and stems. Look for torn, curled leaves and twisted stems. Often the backs of the leaves are turned upwards (photo, left).

How to manage sweet potato scab

CULTURAL CONTROL

If you want to grow susceptible varieties, because of their taste and/or they sell well in the market, then use disease-free planting material. Good early growth is important and will reduce disease impact. Do the following:

- Make a nursery, plant washed storage roots; leave a space of 1-2 cm between each;
- When shoots grow, cut 30 cm long vines; check each one is free from scab;
- Plant in a new garden, where sweet potato has not been grown for 1-2 years.

RESISTANT VARIETIES: Many varieties are resistant to scab: grow these. See your MAL extension officer for advice.

CHEMICAL CONTROL

Best control is by using resistant varieties, but if you need to spray, do the following:

- Dip the cuttings for 15 min in mancozeb before planting;
- Spray with mancozeb at the first appearance of symptoms;
- Repeat at 14-day intervals, until 1-2 months before harvest.

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Taro Leaf Blight

Farmer
Fact Sheet

14

What is it?

It is a disease caused by a water mould. It attacks leaves, stalks and corms of taro and edu (giant taro). The scientific name is *Phytophthora*.

Damage

Spores of the water mould - it is not a fungus - form in a ring around the leaf spots (photo, left); the spores are spread in wind and rain to plants nearby, and to new gardens. The spots grow rapidly, and the leaves die early, so plants have fewer leaves than normal. Because of this, corm yields at harvest are about half those of healthy plants. A firm, brown corm rot occurs after harvest.



How do I identify it?

- Spots grow rapidly, and leaves die early;
- Plants have 3 to 4 leaves instead of 6 to 7;
- As the spores form, smaller spots develop in a row below larger spots;
- White rings of spores occur around the spots, seen most clearly in the early morning;
- Black pellets develop on the underside of the spots (photo, right).

How to manage taro leaf blight

CULTURAL CONTROL

- Make new gardens as far away as possible from old ones;
- Cut off infected leaves, or parts of leaves, as soon as the disease is seen;
- DO NOT plant suckers with leaves;
- Prepare planting material when dry, otherwise leaf stalks may be infected at cut ends;
- If possible, grow taro in the highlands, where the disease is less.

RESISTANT VARIETIES: Plant taro with resistance. See your MAL extension officer for advice.

CHEMICAL CONTROL

- Use copper (copper oxychloride) or dithiocarbamates (mancozeb);
- For better control, use metalaxyl (Ridomil) plus copper;
- Use phosphoric acid, alternating with mancozeb;
- Prevent storage rots: wash the soil from the corms, cut off the leaf stalks and put the corms in plastic bags, seal and store in a cool place. Store for up to 4 weeks.

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Cocoa White Thread

Farmer
Fact Sheet

15

What is it?

It is a fungus that attacks cocoa and shade trees. It also attacks mango. The scientific name is *Marasmiellus*.

Damage

White threads of the fungus grow over leaves and branches. Leaves turn brown and die, but remain in place, held by fungal threads (photos, left & right). The fungus produces toadstools, and these produce spores.

The disease is worse if management is poor. Large number of leaves can be destroyed, but the impact on yield is not known in Solomon Islands. Probably, with proper maintenance, the disease is not important.



How do I identify it?

Look for patches of dead leaves held in place by white threads. The fungus is better seen growing over the leaves when they are wet (photos, above left).

How to manage cocoa white thread

CULTURAL CONTROL: Prune infected leaves and branches, and burn them. It is very important to inspect plantations for this disease (and others) at least once a month.

CHEMICAL CONTROL: Fungicides are not recommended for the control of cocoa white thread.



Note, Horsehair blight is caused by a similar fungus (photos, above, right & left). The fungal threads are brown. They do not infect the leaves, but grows over them. When the leaves fall naturally, they are kept in place by the fungus. It looks as if the fungus has killed them.

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Yam Leaf Spots & Dieback

Farmer
Fact Sheet

16

What is it?

Leaf spots and dieback of yam is caused by a fungus. The fungus attacks many other plants, including avocado, coffee, eggplant, mango, papaya, sweet pepper and tomato. Another name for this fungus is Anthracnose. The scientific name is *Colletotrichum*.

Damage

Damage is worse in wet weather. Large numbers of spores develop in tiny dish-like structures in the spots, and the spores are splashed in rain onto other leaves and shoots.

Leaves turn black so quickly that people say the plants have been struck by lightning. Shoots and stems blacken and die. New shoots grow from the planting piece, but they too are killed. Plants die without producing tubers, or produce a number of small ones.



How do I identify them?

Look for brown leaf spots, often with a yellow halo (photo, left). Sometimes, the spots join together. Look for leaves that turn black rapidly (photo, lower right) or become boat-shaped with blackened veins (photo, top right).

How to manage yam leaf spots & dieback

CULTURAL CONTROL: Plant early in August and September, so that plants are at the top of their supporting poles before the storm season. This is important: yams are more resistant when a full canopy has formed; therefore, plant early.

RESISTANT VARIETIES: Select varieties with resistance to the disease, e.g., Kinabeyo from the Philippines. See Kastom Gaden Association for advice.

CHEMICAL CONTROL: Many fungicides have been tried, e.g., chlorothalonil, copper, dithiocarbamates (mancozeb), but they can only delay the disease. They cannot control it during long periods of rain.

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Banana Scab Moth

Farmer
Fact Sheet

17

What is it?

It is an insect that damages fruits of banana and plantains when they are very young and still wrapped in leaves. The scientific name is *Nacoleia*.

Damage

The moth lays its eggs near the flower. The caterpillars hatch and then enter the flower (photo, arrowed left).

The caterpillars feed on the skin of the young fruit. A crust or scab forms on the damaged parts (photo, right). If the damage is severe, the fingers are misshapen and stunted. Sometimes, the caterpillars eat through the skin and feed on the flesh of the fruit.



How do I identify it?

Look at the young developing fruit. Look for feeding damage, black scabs on the skin, or caterpillar droppings. The moth (photo, right) is light brown with small black spots on the wings.



How to manage banana scab moth

CULTURAL CONTROL

Inspect the banana plants daily for new flowers. Before the flowers bend horizontally, partly or completely remove the leaves around the flower, then spray the fruit with water or dust them with ashes. This method is not always successful.

CHEMICAL CONTROL

In Australia, farmers inject the flowers with insecticides (acephate, bifenthrin and chlorpyrifos), when it is still upright. Dilute insecticide (20 to 40 ml) is injected a third the way down the fruit. Bt or *Bacillus thuringiensis* var. *kurstaki* is effective as a spray. These methods have not been tried in Solomon Islands. See your MAL extension officer for advice.

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Bean Pod Sucking Bug

Farmer
Fact Sheet

18

What is it?

It is an insect that feeds on beans - long bean, soybean and mung bean. It has a long, needle-like mouth, used to suck juices from stems, pods and seeds. The scientific name is *Riptortus*.

Damage

The adults and young (photos, top left & right; bottom left) – have long thin mouthparts. As they feed, the pods turn brown, dry up and die. Damage can be severe.



How do I identify it?

Look for the adults with their long thin mouthparts and long legs; look under the leaves for the young – they look like large black ants. Look closely for small holes and shrivelled bean pods.

How to manage bean pod sucking bug

CULTURAL CONTROL

Plant long beans near *Bixa* (photo, lower right) as a “trap” crop; a method discovered by a farmer on Malaita. *Bixa* is known as the Lipstick Tree; it has red seeds, used by children to paint their faces. When the fruits open, they attract large numbers of *Riptortus*. The insects are attracted to *Bixa* seeds, leaving the long beans undamaged.

CHEMICAL CONTROL

Insecticides have not been tested against *Riptortus* in Solomon Islands. It is likely that synthetic pyrethroids, such as lambda cyhalothrin or permethrin would be effective. Also, try natural products, neem, chilli, derris and pyrethrum (see Fact Sheet no. 56a-c); and see your MAL extension officer for advice.

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Cassava Shoot Dieback

Farmer
Fact Sheet

19

What is it?

A large insect bug causes the dieback. It has a long, needle-like mouth. It uses this to suck juices from stems and fruits. The scientific name is *Amblypelta*. This insect also causes premature nutfall on coconut, shoot dieback on Eucalyptus, and black spots on cocoa pods.

Damage

As the bug feeds, it injects a poison into the plant. Different plants develop different symptoms:

- On coconuts, the young fruits (or nuts) fall;
- On *Eucalyptus* and cassava, the shoots wilt and die, and dead woody areas called cankers develop on the stems (photo, left);
- On cocoa, the young pods (the cherelles) develop black sunken spots and become misshapen as they grow.



How do I identify it?

The bug has a pale green body, long legs, and pale brown wings (photo, right). The body is 20 mm long. Look for the very long needle-like mouth, almost as long as its body. The young bugs look like the adults, except they are smaller.

How to manage cassava shoot dieback

NATURAL ENEMIES

Natural control by ants occurs in Solomon Islands. *Wasmannia*, the fire ant from Papua New Guinea, controls the bug in coconuts. *Oecophylla*, the weaver ant, controls the bug in cocoa (and coconuts, if other ants are absent), so plant soursop between the rows of cocoa to attract them. Damage to cassava is usually quite low, so control measures are not worthwhile.

CHEMICAL CONTROL: Insecticides are not recommended for the control of this insect.

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Diamond Back Moth

Farmer
Fact Sheet

20

What is it?

An insect that feeds on plants in the cabbage family - broccoli, cauliflower, Chinese cabbage, head cabbage – but also radish, *Amaranthus* and watercress. The scientific name is *Plutella*.

Damage

Caterpillars do the damage. They eat the leaves, making large holes. As the caterpillars grow, they tunnel into the centre of head cabbage, cauliflower and broccoli.



How do I identify it?

The caterpillars are light brown at first; when mature, they are dark green, and about 10 mm long (photo, right). When disturbed, they wriggle backwards, and drop from the leaf on a silk thread. The pupa is often found stuck to the underside of a leaf. The moth is about 10 mm long with three, white diamond-shaped patterns on its back (photo, left).

How to manage diamond back moth

CULTURAL CONTROL

- Start with healthy, insect-free seedlings; this is VERY important;
- When numbers are low, hand pick the caterpillars;
- Destroy remains of the last crop, and any weeds belonging to the cabbage family;
- Grow one crop at a time to prevent insects moving from older to younger crops;
- If watercress is grown on rafts in the river, sink half the raft for 30 minutes, then the other half for 30 minutes. Sink half at a time so you do not drown the spiders;
- Grow head cabbage from June to November, the cooler time of the year.

CHEMICAL CONTROL

- DO NOT use the same insecticide all the time. If you do, the moth will become resistant to it. Spray with one insecticide one time, and a different one next time;
- Choose home-made plant-derived products, such as chilli, derris or neem (**see Fact Sheets no. 56a-c**);
- Choose commercial products that contain disease-causing organisms, such as spinosad (Success) or Bt - *Bacillus thuringiensis* var. *kurstaki*; or new chemicals, such as indoxacarb (Steward).

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Fruit Flies

Farmer
Fact Sheet

21

What are they?

They are, from left to right, Mango fly, Melon fly, Solomon fly and Breadfruit fly. Each of the fruit flies attacks several plants. Melon fly is newly introduced; it is not yet in Makira, Rennell/Bellona and Temotu Provinces.

Damage

Eggs are laid in the fruit, and maggots do the damage causing the fruit to rot.



How do I identify them?

Look for rotten fruit, and small holes in the skin. Open up fruits and look for maggots. Maggots have to be reared to identify the species. To catch the flies, MAL uses commercial fruit fly traps containing bait and an insecticide.

How to manage fruit flies

NATURAL ENEMIES

Fruit fly maggots are parasitised by tiny wasps, and eaten by spiders and other insects, such as ants, assassin bugs and beetles. Weaver ants (*Oecophylla*) stop fruit flies from laying eggs. Chickens, pigs and flying foxes, reduce fruit fly populations by eating the maggot-infested fruit.

CULTURAL CONTROL

- Collect and destroy fallen, damaged and overripe fruits; harvest crops early to avoid attack; encourage weaver ants by planting soursops near other fruit trees;
- Sew or staple double layers of newspaper around guava, mango and carambola. In Papua New Guinea, whole banana bunches are “bagged” with banana leaves.

CHEMICAL CONTROL

- Spray fruit trees with insecticides, for example, fenthion or dimethoate;
- Protein-bait technique: Protein from brewery yeast waste and an insecticide are spot-sprayed around crops. Young female fruit flies are attracted to the mixture, feed and die;
- Male-annihilation-technique: High-density of baits (special chemical plus insecticide) used to attract and kill males. NOT A METHOD FOR FARMERS;
- See your MAL extension officer for advice on these methods.

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Sliperi Kabis Flea Beetle

Farmer
Fact Sheet

22

What is it?

It is an insect that feeds on the leaves of *sliperi kabis*¹. It also feeds on okra, but not on the garden hibiscus. The beetle came from Papua New Guinea in about 1980.

Damage

Adult beetles feed on the leaves making many small holes. The damage is so severe that throughout Solomon Islands people have stopped growing *sliperi kabis*. Eggs are laid close to the base of the plant; the grubs or larvae feed on the root tips.



How do I identify it?

Look for small holes in the leaves (photo, right), and the black and orange-brown beetles (4 mm long) (photo, left). The beetles hide during the hotter times of the day.

How to manage sliperi kabis flea beetle

QUARANTINE

- DO NOT take *sliperi kabis* leaves or plants to Temotu, and Rennell and Bellona Provinces: they are still free from the beetle.

CULTURAL CONTROL

- Some growers have found less damage if they grow *sliperi kabis*: a) in the shade; b) among clover; or c) if they put a thick mulch around the plants;
- Plant new gardens as far away as possible from old ones where the beetle is present;
- Grow more *sliperi kabis* in the wet season. There are fewer beetles at that time;
- Dig the soil near the base of the stem to expose the eggs.

CHEMICAL CONTROL

- Use synthetic pyrethroids, such as lambda cyhalothrin or permethrin.
- A variety of Derris, brought from Papua New Guinea many years ago, is effective as a spray. Contact MAL or Kastom Gaden Association for plants and methods of preparation (see also Fact Sheet no. 56c). Read the instructions BEFORE you spray.

¹ Information supplied by Maclean Vagalo, MAL Director of Research, Honiara, and Chris Reid, Entomologist, Australian Museum, Sydney.

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Sliperi Kabis Shoot Borer

Farmer
Fact Sheet

23

What is it?

It is an insect that feeds inside shoots of *sliperi kabis*. It also eats cotton, okra and tomato. The scientific name is *Earias*.

Damage

Caterpillars do the damage. Eggs are laid on stems and buds. Caterpillars enter the buds and tunnel down the shoots, or penetrate young stems directly. Shoot tips and leaves wilt and die.



How do I identify it?

Look at the stems and leaves: are they wilting (photo, left) and dying? Look for small holes in the stems. The caterpillars push their waste out of these holes. Break the stem near a hole to find the caterpillar (photo, top right). The adult is a green-white moth (photo, below right).

How to manage sliperi kabis shoot borer

NATURAL ENEMIES: Small wasps attack the eggs, caterpillars and pupae. Lacewings and ladybird beetles eat the eggs. It is important not to kill these natural enemies with insecticides.

CULTURAL CONTROL

- Cut out the wilting shoots as soon as they are seen; this is important;
- If many shoots are attacked, pull out the plants, stop growing cabbage for a few weeks, and then plant the crop in another garden;
- Grow more *sliperi kabis* during the wet season: the damage is less.

CHEMICAL CONTROL

- Use plant-derived pesticides, such as neem, chilli, pyrethrum or derris, as they are natural insecticides and do not last long in the environment (**see Fact Sheets no. 56a-c**);
- Use commercial insecticides made from bacteria, e.g., Spinosad, also known as *Success*; or Bt - *Bacillus thuringiensis* var. *kurstaki*. See your MAL extension officer for advice.

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Spider Mites

Farmer
Fact Sheet

24

What are they?

Mites are not insects; they have eight legs and are related to spiders. They feed on many crops, such as beans, cassava, cucumber and relatives, eggplant, potato, *sliperi kabis*, squash, taro and tomato. The scientific name of a common type is *Tetranychus*, the two-spotted mite.

Damage

Spider mites have needle-like mouthparts, and use them to suck the juice from leaves. This kills the cells, and white to pale yellow dots occur (photos, left & top right), often along the main veins. Two-spotted mites make webs (like spiders) on the under surface of leaves. Outbreaks are worse during hot, dry weather. Leaves die early and fall.



How do I identify them?

It is difficult to see mites without a microscope; they are less than a millimetre. Look for white spots on the top of the leaf and webbing beneath, when populations are high. If you think there are mites, place a sheet of white paper under the leaves and tap them sharply.

How to manage spider mites

NATURAL ENEMIES: Predatory mites usually keep populations of spider mites in check, as do ladybird beetles, lacewings, thrips and other insects.

CULTURAL CONTROL

- Make sure the plants have water and the nutrients they need for good growth;
- If leaves become dusty or dirty, this may kill predators, so choose a better site;
- Frequently spray the leaves with water.

CHEMICAL CONTROL

- Use horticultural oil and soaps; test them on a few plants first to see if they cause damage;
- If you use insecticides or miticides, rotate between the different groups to prevent mites becoming resistant to any one of them. Note, eggs are difficult to kill, and so are young, so apply sprays 5-10-days' apart. See your MAL extension officer for advice.

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Spiraling Whitefly

Farmer
Fact Sheet

25

What is it?

It is a small insect that sucks the juice from plants. It looks like a small white butterfly or moth, but it belongs to a different group. And it is not a fly. The whitefly feeds and breeds on many plants, including banana, capsicum, cassava, citrus, custard apple, eggplant, guava, mango, papaya, taro, tomato, ornamentals, shade trees and weeds. The scientific name is *Aleurodicus*.

Damage

The young and adults have long thin mouthparts, and use them to suck the juices from the leaves. Damage occurs in two ways: first, the whiteflies feed on the leaves sucking their juices, and the leaves die early; second, fungi called sooty mould fungi grow on the honeydew - sugary substances that come out of whiteflies as they feed. As a result, the leaves turn black, do not get enough sunlight, and grow poorly.



How do I identify it?

When female whiteflies lay eggs, they make spiraling patterns on the under surface of leaves (photo, left); these patterns give the insect its name. Look for adults on the undersides of leaves (photo, right). They are small, 1-2 mm, white and look like tiny moths. Look for the whiteflies in the morning and evening. They can be seen flying in large circles around their host plants. They can be made to fly by shaking the plant, and then they resetttle quickly.

How to manage spiraling whitefly

NATURAL ENEMIES: A tiny wasp, too small to be seen by your eye, usually controls the whitefly. It lays its eggs inside the young whiteflies, killing them. Lacewings and ladybird beetles attack all stages. Usually, you have to do NOTHING, as natural control is excellent.

CHEMICAL CONTROL: DO NOT use insecticides. If you do, you will kill the tiny wasps and other insects that control the whiteflies, and make the situation worse. Also, if you do use insecticides, you might find that after a while they do not work as the whitefly has become resistant to them.

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Sweet Potato Flea Hopper

Farmer
Fact Sheet

26

What is it?

The flea hopper is an insect that feeds on sweet potato leaves. It also feeds on beans, cabbage, cucumber, pumpkin and watermelon. The scientific name is *Halticus*.

Damage

The adults and young have piercing/sucking mouthparts. They use these to suck juices from the leaves. Small whitish spots appear where they feed. As the number of insects grows, the spots develop into patches and the whole leaf may become grey or silver (photo, left).



How do I identify it?

Look for white dots on the top and bottom of the leaves, and black dots, which are the droppings or faeces. Look for small black insects (1-2 mm) with large back legs and long antennae (photo, right). When disturbed, they move rapidly under the leaf or they jump.

How to manage sweet potato flea hopper

CULTURAL CONTROL

- Do not take vines for gardens where populations of flea hoppers are high. Eggs of the flea hopper are laid in the stems;
- Keep gardens free from weeds, as the flea hopper also breeds on them.

CHEMICAL CONTROL

- Use plant-derived pesticides, such as pyrethrum or derris, as they are natural insecticides and do not last long in the environment (**see Fact Sheets no. 56a-c**);
- Or use synthetic pyrethroids, such as lambda cyhalothrin or permethrin. See your MAL extension staff for advice.

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Sweet Potato Hornworm

Farmer
Fact Sheet

27

What is it?

It is an insect that feeds on sweet potato, but also on capsicum, eggplant, legumes and tomato. The scientific name is *Agrius*.

Damage

The caterpillars do the damage. They eat the young leaves, often down to the leaf stalk. If populations are high, they will eat all the leaves. If severe damage occurs when plants are young, it will affect yield.



How do I identify it?

Look for large holes in the leaves, and caterpillar droppings. The mature caterpillars are up to 95 mm long, with slanting pale yellow lines along the sides, and a horn at the rear (photo, left). The adult moth is grey-brown, with a wingspan of 8-12 cm (photo, top right). The pupae (photo, lower right) are found in the soil under the plants. They are reddish brown with a prominent "trunk", which is curved downward and looks like a cup handle.

How to manage sweet potato hornworm

NATURAL ENEMIES: Populations of the sweet potato hornworm are usually kept in check by a number of minute wasps that parasitise the eggs. Bugs and flies also attack them.

CULTURAL CONTROL

- Handpick the caterpillars if the garden is small;
- Allow chickens into the garden.

CHEMICAL CONTROL

Pesticides are not recommended; they will kill the parasites that attack the eggs and caterpillars. But if used, it is best to choose natural insecticides, such as neem, chilli, pyrethrum, derris (**see Fact Sheets no. 56a-c**) or those containing bacteria, such as spinosad (Success) and Bt – *Bacillus thuringiensis* var. *kurstaki*.

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Sweet Potato Leaf Folder

Farmer
Fact Sheet

28

What is it?

It is an insect that feeds on the leaves of sweet potato. It also feeds on wild relatives of sweet potato, as well as *Mikania*. The scientific name is *Herpetogramma*.

Damage

Caterpillars do the damage. They fold the leaves with webbing. The young caterpillars eat the surface of the leaf; older ones eat through the leaf making small windows (photo, left). There is no information about leaf damage affecting yield.



How do I identify it?

Look for folded leaves, unfold them and look for caterpillars, webbing and their droppings. Look at the leaf surface for small windows between the veins. The adult moth is brown with zig-zag markings on the wings (photo, right).

How to manage sweet potato leaf folder

NATURAL ENEMIES

Tiny wasps provide natural control of the leaf folder. Earwigs and other predators are also important for natural control.

CULTURAL CONTROL

- DO NOT take vines for replanting from plants with folded leaves.

CHEMICAL CONTROL

Pesticides are rarely needed; if they are, use the following:

- Use plant-derived pesticides, for example, neem, chilli, pyrethrum or derris (**see Fact Sheets no. 56a-c**), as they are natural insecticides and do not last long in the environment;
- Use insecticides made from bacteria, for example: Spinosad, also known as *Success*; or Bt - *Bacillus thuringiensis* var. *kurstaki*.

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Sweet Potato Weevil

Farmer
Fact Sheet

29

What is it?

It is an insect that feeds on sweet potato storage roots and vines. The scientific name is *Cylas*.

Damage

Adults (photo, left) feed on the buds, leaves, vines, but damage is small. The grubs or larvae do most damage feeding on the storage roots (photo, right). The females crawl through cracks in the soil to lay their eggs in the storage roots. They also lay their eggs in the base of the vines.



How do I identify it?

Look at the base of the plant for damage to the stem. Break the stem open to see if there are tunnels, rots and grubs. Dig up a storage root and look for damage to the skin; cut the root and check if there are grubs and feeding tunnels. Adult beetles are most active at night, but can sometimes be seen on plants during the day.

How to manage sweet potato weevil

NATURAL ENEMIES: Ants, beetles, earwigs and spiders eat the weevils, but do not give control.

CULTURAL CONTROL

- Grow sweet potatoes on the same land only once every 3-4 years; plant far away from other sweet potato crops;
- Select tip cuttings (25-30 cm long) from young vines. NEVER use old parts of the vine that may have weevil eggs and grubs in them;
- Plant cuttings deep in the soil and use deep-rooted varieties;
- Hill-up the soil around the plants, especially if the soil cracks;
- Spread mulch (grass and dried weeds) to keep the soil moist;
- Harvest the crop as soon as it has developed sizeable roots;
- Destroy any crop remains left in the field after harvest – THIS IS IMPORTANT.

CHEMICAL CONTROL

Commercial growers who need to use insecticides should see their MAL extension officer for advice. Note, the insecticides bifenthrin and chlorpyrifos are widely used in other countries.

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Taro Beetles

Farmer
Fact Sheet

30

What are they?

They are large insects that live in the soil and feed on taro. They also feed on other plants, including banana, coconuts, forest ferns, giant taro, giant swamp taro, *Pandanus*, sugarcane and young oil palms. The scientific name is *Papuana*. There are many different kinds.

Damage

The adult beetles do the damage. They burrow into the corms of taro, killing plants if they eat their way to the growing point. Those that survive grow poorly. Holes bored in the corms make them unfit for export, local markets and even home use (photo, left).



How do I identify it?

The adult is a shiny black beetle, 15-25 mm long, with horns on the head (photo, right). The number and size of the horns differ among the different kinds. Breeding sites are under rotten logs and stumps, manure, sawdust, along riverbanks, and in the fibrous roots of grasses. Grubs are white and “C” shaped at rest. When mature, they are 25-40 mm long. Look for young plants that are wilting; pull them up and check for beetles.

How to manage taro beetles

NATURAL ENEMIES: Several natural enemies have been found, including a fungus, a fly and the cane toad, but none give good control. *Papuana* beetles are very difficult to control.

CULTURAL CONTROL

- Crop rotation: leave several years between crops of taro;
- Check that planting “tops” are free of soil, grubs and beetles;
- Destroy breeding sites at the sides of taro gardens. In particular, rotting logs that might become breeding sites.

BIOLOGICAL CONTROL: The fungus, *Metarhizium*, works under experimental conditions, but as yet there is no recommendation for farmers. A virus has been tried without success.

CHEMICAL CONTROL

The chemical imidachloprid (Confidor) and cypermethrin (Mustang) have controlled *Papuana* beetles in Fiji, and also in Solomon Islands. See your MAL extension officer for advice.

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Taro Cluster Caterpillar

Farmer
Fact Sheet

31

What is it?

It is an insect that feeds taro and many other crops: cabbages, chilli, corn, eggplant, okra, rice, tomatoes and watercress. The scientific name is *Spodoptera*.

Damage

The caterpillars do the damage. After hatching, they stay together (photo, lower left), stripping the leaf surface as they spread out (photo, top left). Later, they live alone (photo, top right), eating all parts of the leaf, including the leaf stalks. Mostly, the caterpillars feed at night. Normally, natural enemies control the caterpillars. But outbreaks do occur, especially after cyclones, when natural enemies are destroyed. These outbreaks can be severe.



How do I identify it?

Look for the egg masses: they are white and easily seen. Look for “scratch” marks on the leaf surface left by the newly hatched caterpillars. Look for the older caterpillars at night. They chew large areas of the leaf and, when numerous, they can destroy the whole plant. Adult moth has a wingspan of 30-40 mm (photo, lower right).

How to manage taro cluster caterpillar

CULTURAL CONTROL: Small wasps normally control the caterpillars.

CULTURAL CONTROL: Destroy egg masses and young caterpillars by rubbing them with your hand or another leaf. If there are many caterpillars, and damage looks likely, allow chickens into the garden. Plant flowers, such as *Coleas*, to give food to the natural enemies.

CHEMICAL CONTROL: Pesticides are not recommended, as they will kill natural enemies. If needed, use chilli, derris, neem, pyrethrum (**see Fact Sheets no. 56a-c**), or commercial products containing bacteria, e.g., spinosad (Success) and Bt – *Bacillus thuringiensis* var. *kurstaki*.

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Taro Hornworm

Farmer
Fact Sheet

32

What is it?

It is an insect that feeds on the leaves of taro. It also eats the leaves of sweet potato and noni. The scientific name is *Hippotion*.

Damage

The caterpillars do the damage. Usually, they eat all the leaf except the main veins (photo, left), but sometimes only the leaf stalks are left. Outbreaks are not common as natural enemies give good control.



How do I identify it?

Look for leaves eaten between the veins (photo, left). The caterpillars can be found on leaves during the day. They are large (80-90 mm) with eyespots at the front, a line along the sides, and a horn at the rear (photos, above left & right). They become darker nearer the time when they pupate. Adults have wingspans of 40-90 mm; they are streamline, with a large head and eyes (photo, right).



How to manage taro hornworm

NATURAL ENEMIES: Small wasps and flies usually give good control.

CULTURAL CONTROL

- Handpick the caterpillars, if the garden is small;
- Allow chickens into the garden.

CHEMICAL CONTROL

Pesticides are not recommended, as they will kill the natural enemies of the eggs and caterpillars. If they are needed, it is best to use natural products, such as neem, chilli, derris, pyrethrum (see **Fact Sheets no. 56a-c**). Commercial products containing bacteria, such as spinosad (Success) and Bt – *Bacillus thuringiensis* var. *kurstaki* - are recommended.

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Cucumber moth

Farmer
Fact Sheet

33

What is it?

It is an insect that feeds on the leaves of cucumber, melon, pumpkin, snake gourd and watermelon. It is a common pest of watermelon. The scientific name is *Diaphania*.

Damage

The caterpillars do the damage. After hatching, they roll the leaves with silken threads and eat the parts between the veins. They also attack the flowers and young fruits. The caterpillars damage the skin of fruits and cause them to rot.



How do I identify it?

Look for young leaves with eaten parts between the veins, and young fruits with rots. Look for caterpillars with two white lines along the back, up to 20 mm when mature (photo, left). Adult moths have white wings with wide brown borders (photo, right). They are quite easy to identify.

How to manage cucumber moth

NATURAL ENEMIES: Probably small wasps attack the caterpillars, and lacewings eat the eggs, but no one has studied this in Solomon Islands.

CULTURAL CONTROL

- Inspect watermelon crops at least once a week. Check for young leaves that are stuck together, look for caterpillars and for their droppings;
- Hand pick the rolled leaves, or squeeze the caterpillar inside.

CHEMICAL CONTROL

- Only use insecticides if damage to leaves, flowers or fruits is severe;
- Use neem, chilli or derris - natural insecticides that break down quickly (**see Fact Sheets no. 56a-c**);
- Use commercial insecticides made from bacteria, such as spinosad (*Success*) and Bt - *Bacillus thuringiensis* var. *kurstaki*.

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Peanut Rust

Farmer
Fact Sheet

34

What is it?

It is a disease caused by a fungus. Peanuts are the only crop infected. The scientific name is *Puccinia*.

Damage

Infection causes leaves to turn yellow (photo, left), dry, curl and drop. Crop losses can be as much as 50%. This means that without the disease, the weight of peanuts would be up to a half as much again. Infected plants mature 2-3 weeks early. The fungus is spread by the wind.



How do I identify it?

Look for spots on the leaves, stems and pegs. At first, they are yellow, later red-brown. Most spores occur on the underside of leaves (photo, right); if touched a dark brown powder is left on your fingers. These are the spores of the rust: there are millions of them!

How to manage peanut rust

CULTURAL CONTROL

- Remove any self-grown plants from the last crop;
- Plant new crops as far away as possible from those with rust infections;
- If it is not possible to avoid old crops, do not plant downwind from them;
- Rotate peanuts with other crops.

CHEMICAL CONTROL

- Look at the plants at least once a week. Begin to spray as soon as rust spots are seen. Spray at regular intervals: 10-14 days until 14 days before harvest;
- Spray more often if the first treatment is late and there are many plants with rust spots. In most cases, spraying should begin no later than 30-35 days after planting;
- Use chlorothalonil (the trade name is Bravo). It is good against rust and also leaf spot diseases (**see Fact Sheet no. 36**). See your MAL extension officer for advice.

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Rats

Farmer
Fact Sheet

35

What are they?

Three rats: Polynesian rat, Ship rat and Brown rat. All are introduced to Solomon Islands.

Damage

They damage crops - cocoa, coconut, maize, peanuts, pineapple, rice, root crops, and sugarcane, as well as household items. They eat stored foods, spoiling them with urine and faeces. Rats also eat insects, reptiles and young birds. Fleas on rats transmit human diseases.



How do I identify them?

Polynesian: Body, up to 15 cm, pointed nose, large ears, red-brown back, white under, scaly tail, female with 8 nipples; does not burrow. **Ship:** Body, up to 20 cm, large hairless ears, grey-brown back, white under, tail one colour and longer than body, female 10 nipples; often nests in trees. **Brown:** Body, up to 40 cm, small ears, brown on back, pale grey under, tail shorter than body, female with 12 nipples; nests underground.

How to manage rats

CULTURAL CONTROL

- Keep cats;
- Put aluminium bands (30 cm wide, 2.5 m from the ground) on coconut trunks;
- DO NOT leave household waste for rats to eat; good hygiene is very important.

TRAPPING: Use snap-traps; when first used, leave without bait for a few days, so rats get used to them. Frequently change their position, and put them out of reach of children and pets.

CHEMICAL CONTROL

- Use warfarin (0.025-0.05%) in paraffin wax blocks tied to trees, 25-30 per ha;
- Use brodifacoum (0.005%) as ready-made pellets. See your MAL extension officer for further advice;
- Use *Gliricidia* (the shade tree). Pound young leaves and mix with cooked rice, maize or other bait (see **Fact Sheet no. 56c**). Bacteria convert chemicals in the leaves to substances similar to brodifacoum. It is less toxic than brodifacoum, so larger amounts must be eaten. Try using the bark. Change the bait daily, and protect from pets. This has not been tested in Solomon Islands.

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Peanut Leaf Spots

Farmer
Fact Sheet

36

What are they?

The leaf spots are caused by two fungi. One is called **Early leaf spot**, the other **Late leaf spot**. The scientific name is *Mycosphaerella*. Peanuts are the only crop infected.

Damage

Infection causes early death of leaves. In severe cases, crop losses are 50% or more. Masses of spores are produced on the spots, and these are spread by wind and rain splash.



How do I identify them?

Look for spots (round, up to 10 mm) on the older leaves at first (photo, left); the spots spread rapidly to leaves and leaf stalks of all ages. **Early leaf spot**: look for yellow margins around brown spots. **Late leaf spots**: look for black rather than brown spots on the underside of the leaf (photo, right). BUT differences are not always easy to see!

How to manage peanut leaf spots

CULTURAL CONTROL

- If possible, avoid planting peanuts in high rainfall areas, or plant at drier times of the year;
- Leave at least 1 year between crops planted on the same land;
- Plant new crops as far away as possible from older crops;
- Remove and burn or bury the remains of the crop immediately after harvest.

CHEMICAL CONTROL

- Inspect the plants at least once a week. Spray as soon as spots are seen, and no later than 30-35 days after planting. Spray at 10-14 day intervals; stop 14 days before harvest;
- Use chlorothalonil (trade name is Bravo). It controls leaf spots and rust disease (**see Fact Sheet no. 34**). Copper fungicides can also be used. See your MAL extension officer for advice.

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Bean Pod Borer

Farmer
Fact Sheet

37

What is it?

It is an insect that feeds on the pods of many types of beans. The scientific name is *Maruca*.

Damage

The caterpillars do the damage. The eggs are laid on flowers, and the caterpillars feed on buds, flowers and pods. They bore into the pods and eat the seeds.



How do I identify it?

Look for flowers and pods tied together by webs made by the caterpillars. Look for chewed remains of the pods around entry holes. Look for caterpillars inside the damaged pods: they are pale with two rows of black markings on their backs (photo, left). The moth is brown with a white patch on the front wings (photo, right).

How to manage bean pod borer

It is difficult to control. Pesticides are not recommended. Pesticides are: a) likely to kill natural enemies; b) not very effective as the caterpillars are inside the pods; c) expensive, and have to be used repeatedly; d) a danger to you and the environment.

CULTURAL CONTROL

- Inspect daily and hand pick the eggs and young caterpillars on the flowers.

CHEMICAL CONTROL

If pesticides are required:

- Use insecticides made from bacteria, for example: Spinosad, also known as *Success*; or Bt - *Bacillus thuringiensis* var. *kurstaki*;
- Use neem, chilli or derris - natural insecticides that break down quickly (**see Fact Sheet no. 56a-c**); see KGA and MAL extension officers for information on plants and how to use them.

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Aphids

Farmer
Fact Sheet

38

What are they?

Aphids are insects, often called green fly. They have needle-like mouthparts and suck the juices from leaves and stems. Many kinds of aphids occur on many different plants; here is the Cotton or Melon aphid, also common on taro and cucumbers.

Damage

Aphids cause several problems: a) feeding damage – new leaves are small and twisted, or they wilt, dry up and die early; b) leaves turn black, with sooty mould fungi growing on 'honeydew', the waste juices from aphids; c) they spread viruses. Populations develop rapidly as the females give birth to 4-6 live young a day.



How do I identify them?

Look for groups of green insects on the underside of young leaves (photo, left), on shoots and buds. They are about 1 mm long, bright green to nearly black, with two tubes at the rear. Some have wings, up to 2 mm. Look for ants; they come for the honeydew.

How to manage aphids

NATURAL ENEMIES: Many insects feed on aphids, such as ladybeetles, lacewings and syrphids (photo, right). Tiny wasps lay their eggs in aphids. Ants protect aphids from natural enemies.

CULTURAL CONTROL

- Remove weeds from within and around the crop; aphids breeds on many kinds of weeds;
- Burn or bury the remains of crops after harvest;
- DO NOT plant down-wind from crops with aphids;
- Mulch the crop; this makes it more difficult for the aphids to find the crop plants.

CHEMICAL CONTROL

- If insecticides are necessary, use soap sprays; or use synthetic pyrethroids, for example, lambda cyhalothrin or permethrin.

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Sliperi Kabis leaf hopper

Farmer
Fact Sheet

39

What are they?

They are small, leaf-feeding insects with needle-like mouthparts that suck the juices from leaves and stems. They are also called leafhoppers or Jassids. There are many kinds: here we describe the Okra leafhopper on *sliperi kabis*. The scientific name is *Amrasca*

Damage

Eggs are laid in the leaves and leaf stalks. The young, called nymphs, are similar to adults except in size, and they are without wings. The adults are light green, but difficult to see (photo, right - arrows); they are small, about 1-2 mm long, similar in colour to the leaf. The leaves have yellow patches (photo, left), dry up and die early.



How do I identify them?

Look at the leaves to see light yellow to white patches. Look at the underside of the leaf and try and find the jassids. There are not many present on each leaf. The leaves may be more crinkled than normal, but many healthy varieties of *sliperi kabis* have crinkled leaves.

How to manage sliperi kabis leaf hopper

NATURAL ENEMIES: Lady beetles, lacewings, spiders and other predators attack both adults and nymphs.

CULTURAL CONTROL: Plant new gardens as far away as possible from those with jassids.

RESISTANT VARIETIES: One variety appears resistant. See Kastom Gaden Association for samples to test.

CHEMICAL CONTROL

- In Papua New Guinea, derris is used to spray the leaves (**see Fact Sheet no. 56c**); a variety from Papua New Guinea is being multiplied in Solomon Islands. Contact MAL and KGA for plants to test;
- If commercial insecticides are necessary, use synthetic pyrethroids, for example, lambda cyhalothrin or permethrin.

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Pumpkin Beetle

Farmer
Fact Sheet

40

What is it?

It is an insect that attacks crops in the cucurbit family: cucumber, melon, pumpkin, watermelon and gourds. It is known as the Plain or Red pumpkin beetle. In Solomon Islands, the colour of the beetle is orange and not red. The scientific name is *Aulacophora*.

Damage

Adult beetles (photo, right) lay eggs in or on the soil, or on the leaves. Cream-white young (called larvae) hatch and make their way to the roots, feeding on them until they change into pupae; later, they emerge as adults. Adults feed on leaves, chewing large holes (photo, left). Seedlings are particularly susceptible to attack, as well as the flowers and small fruits. The larvae (grubs) eat roots.



How do I identify it?

Look for orange, oval beetles about 8 mm long, often in groups on young and old leaves, and flying between them. Look for round holes in leaves made by the beetles as they feed.

How to manage pumpkin beetle

NATURAL ENEMIES: Little is known about the natural control of these beetles. The beetles may be distasteful to general predators (birds and lizards) and avoided.

CULTURAL CONTROL

- Avoid planting new crops next to those already infested with the beetles;
- Provide manure or fertilizer, mulches and water to encourage fast early growth;
- Plant fast-growing varieties that outgrow the damage caused by the beetles.

CHEMICAL CONTROL: Use derris (**see Fact Sheet no. 56c**): a local Derris variety, originally from Papua New Guinea, is being multiplied by MAL and KGA. See these organisations for cuttings. Use synthetic pyrethroids, such as lambda cyhalothrin or permethrin.

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Taro Plant Hopper

Farmer
Fact Sheet

41

What is it?

It is an insect that has needle-like mouthparts and sucks the sap from taro leaves. It is found only on taro. The scientific name is *Tarophagus*.

Damage

Plant hoppers damage taro by: a) causing leaves to bend down; b) causing plants to become stunted and die early, especially in dry times and when numbers of insects are high; and c) spreading Alomae and Bobone viruses (**see Fact Sheet no. 1**). Corms are smaller than normal.



How do I identify it?

Eggs are laid in leaf stalks and large veins. Look underneath the leaves and at the base of leaf stalks for adults and young. The young are white at first (about 1 mm), later brown and then black with white patches. Adults have short wings (photo, left & above right) or long wings, up to 4 mm (photo, lower right). Look for dirty marks on leaf stalks where they feed and lay eggs. As they walk, they move sideways; and they jump when disturbed.

How to manage taro plant hopper

NATURAL ENEMIES: A red and black bug called *Cyrtorhinus* eats the eggs. However, fire ants protect plant hoppers from predators or beneficial insects such as *Cyrtorhinus*.

CULTURAL CONTROL

- Avoid planting new crops next to those already infested with plant hoppers;
- Prepare “tops” for replanting by cutting off all leaves with dirty marks on them.

CHEMICAL CONTROL

If no egg-eating bugs (*Cyrtorhinus*) are present use: a) synthetic pyrethroids, such as lambda cyhalothrin or cypermethrin; or b) imidacloprid. Consult your MAL extension officer for advice.

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Maize Rust

Farmer
Fact Sheet

42

What is it?

A fungus causes the disease. It infects maize and sweet corn, and in other countries it is found on grasses and relatives of maize. The scientific name is *Puccinia*.

Damage

It is not an important disease. The leaves dry and die early, but most spots occur on the older leaves. The rust comes late, after the seeds have been filled.



How do I identify it?

Look for spots on the older leaves (photo, left), and also on the stem (photo, right). They are oval, up to 2 mm, orange-brown, and release powdery spores. The spores germinate in water on the leaf surface, and infect through natural openings. Hold the leaf against the light, to see spots with a dark centre and a yellow margin.

How to manage maize rust

CULTURAL CONTROL

- Destroy volunteer plants as the rust can only survive on living plants;
- Plant maize during the drier times of the year.

RESISTANT VARIETIES: There are resistant hybrids of maize and sweet corn.

CHEMICAL CONTROL:

- Fungicides are not recommended; the effect of the rust on yield is probably low. If needed, copper and mancozeb could be used.

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Bean Virus

Farmer
Fact Sheet

43

What is it?

It is a disease of long beans and many other legumes. It has also been found in wild passionfruit in Solomon Islands. The scientific name is *Bean common mosaic virus*.

Damage

A virus does the damage. Plants stay small, pods are shorter and fewer than normal, and yields are low. The virus infects the seed;. Aphids spread the virus by feeding on diseased then healthy plants.



How do I identify it?

Look for patches of light and dark green on the leaves (photo, left), and for leaves that are misshapen with bumps on the surface (photo, right).

How to manage bean virus

CULTURAL CONTROL

- Plant beans between other plants, e.g., maize, to hide them from aphids;
- Plant mixture of varieties – see MAL and/or Kastom Gaden Association for advice;
- Do not plant new crops next to those that have the disease;
- Select plants for seed that do not show symptoms; if most plants show symptoms, do not use them for seed, and contact MAL or KGA for a new source of seed.

RESISTANT VARIETIES

Trials are being done in Solomon Islands with varieties of long beans from AVRDC (The World Vegetable Center). Contact MAL and/or KGA extension officers for a source of seed.

CHEMICAL CONTROL

Chemical control is not recommended. Chemicals cannot kill the virus in the seed or in the plants, and aphids spread the virus quickly, before insecticides kill them.

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Kongkong Taro Root Rot

Farmer
Fact Sheet

44

What is it?

It is a disease of kongkong taro (*Xanthosoma*). A water mould in the soil causes the disease. Until recently, water moulds were thought to be fungi. Water moulds produce spores that can swim in soil water. Water moulds also attack roots of taro, and many other kinds of plants. The scientific name is *Pythium*.

Damage

Roots are destroyed (photo, right), so plants cannot take in water or nutrients. Leaves on older plants dry up, leaves wilt and die (photo, left), and plants become stunted; young plants remain small. Corm yields depend on the time of infection. If infection is early, plants do not grow and corm yields are low.



How do I identify it?

Look for plants where leaves are drying up and dying early, where the plants have fewer leaves than normal and side shoots are dead or dying. Often, plants are stunted and easily pulled up.

How to manage kongkong taro root rot

CULTURAL CONTROL

- Do not plant where the land is likely to flood, or water stays after heavy rains;
- Avoid heavy clay soils; or make drains, plant on raised beds or mounds;
- Do not make “tops” for planting from infected plants. If infected plants have to be used, remove all roots, old leaves and soil, and plant in a nursery. Check that leaves and roots are healthy before taking the “tops” to the field for planting;
- Do not plant kongkong taro in land below where root rot occurred before.

RESISTANT VARIETIES: There is no information about resistant varieties of kongkong taro.

CHEMICAL CONTROL: Fungicides are not recommended; they are unlikely to be economic. Pull up the plants, prepare the “tops” carefully (see above), and replant in another garden.

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Black Leaf Mould

Farmer
Fact Sheet

45

What is it?

It is a disease of tomato caused by a fungus. The scientific name is *Pseudocercospora*.

Damage

It is a very serious disease. When the weather is wet and windy, the fungus kills the leaves quickly (photo, left), and fruit yields are low.



How do I identify it?

Look for the disease on the bottom leaves. Look for the leaf spots, and brown patches, especially at the leaf margins, and the mould-like spore masses below.

How to manage black leaf mould

CULTURAL CONTROL

- Remove and burn the lower leaves as soon as the disease is seen, especially after the lower fruit trusses have been picked;
- Collect and burn as much of the crop as possible when the harvest is complete;
- DO NOT plant new crops of tomatoes next to older ones that have the disease.

RESISTANT VARIETIES: Trials are being done in Solomon Islands with varieties from AVRDC (The World Vegetable Centre) (photo, right). See your MAL extension officer for advice.

CHEMICAL CONTROL

- Use chlorothalonil (Bravo), copper oxychloride or mancozeb; start when the first flowers appear; continue at 10-14 days intervals until 3-4 weeks before last harvest.
- Check availability of other products e.g. triazoles. See your MAL extension officer for advice.

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Maize Boil Smut

Farmer
Fact Sheet

46

What is it?

It is a disease caused by a fungus. Maize is the only known host. The scientific name is *Ustilago*.

Damage

The disease came to Solomon Islands about 30 years ago. Galls form on the leaves, stem and cob (photo); the seeds are replaced by black spores masses.

If young plants are infected, they remain stunted and sometimes die, although this is rare. Overall, boil smut is a minor disease of maize and sweet corn in Solomon Islands.



How do I identify it?

Look for galls on leaves, stalks, ears or tassels. Galls are firm at first, white or grey, later they burst and release black powdery spores. Plants may be stunted.

How to manage maize boil smut

CULTURAL CONTROL

- Remove infected plants before the galls rupture, and burn them;
- Do not plant maize in land where the disease was present previously;
- Do not over-fertilize with nitrogen, as this increases susceptibility;
- Do not injure plants during cultural operations.

RESISTANT VARIETIES: The varieties grown in Solomon Islands are probably resistant to the fungus. Sweet corn varieties are more susceptible, but the disease is not common on them.

CHEMICAL CONTROL: In Australia, seed is treated with the fungicides, carboxin (Vitavax) and thiram. See your MAL extension officer for advice.

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Seedling Damping-Off

Farmer
Fact Sheet

47

What is it?

A disease of tomatoes, cabbages, lettuces, and other seedlings, caused by fungi and water moulds. The scientific names are: *Pythium*, *Rhizoctonia*, *Fusarium* and *Phytophthora*.

Damage

There are two types of damage: a) seeds and seedlings are killed before they grow above the soil, or b) they are killed after they have grown above the soil. Sometimes the seedlings survive an attack, but become stunted or grow slowly.



How do I identify it?

Look for following: a) gaps in the rows and seeds that are rotten; b) for seedlings that have fallen over with soft rots on the stem or decayed roots (photo, right); and c) for threads of the fungi, and water moulds, over the soil and seedlings (photo, left).

How to manage seedling damping-off

CULTURAL CONTROL

- Sterilise soil: a) heat it in an earth oven over hot stones covered in leaves or sacks for at least 1 hour, or b) place soil mix in boxes and treat with boiling water;
- If damping-off occurs in seed beds, move the beds to a different site;
- Water soil and plants with rain water, not with water from ponds, streams, etc.;
- Do not overwater seedlings; ensure the seed boxes have good drainage;
- Raise nursery seed boxes more than 1 metre above ground to avoid rain splash.

RESISTANT VARIETIES: No varieties have been reported to be resistant to damping-off.

CHEMICAL CONTROL

If cultural control methods fail, treat seed with a fungicide, such as thiram. Fungicides can also be used to treat seedbeds and/or seed boxes. See your MAL extension officer for advice; see leaflet *Growing lettuces, Chinese and English (ball) cabbage the organic way* by Joini Tutua.

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Citrus scab

Farmer
Fact Sheet

48

What is it?

Scab is caused by a fungus. It is a disease of lemon, rough lemon and mandarin. Grapefruit, orange and pomelo are also susceptible, but less so. The scientific name is *Elsinoe*.

Damage

Scab is not an important disease in mature plantations. Although infections on the fruit lower market value, they do not affect yield. It is more serious in nurseries of sour orange, rough lemon, Rangpur lime and other rootstocks, making them difficult to bud.



How do I identify it?

Look for the raised scabs on leaves, twigs and fruit (photo). On young leaves, they are surrounded by bright yellow margins. Look for twisted, distorted leaves.

Very small spores produced in the scabs are spread in wind and rain. Insects may also spread them. Spread over long distances is on infected nursery plants and fruits.

How to manage citrus scab

CULTURAL CONTROL

- Establish rootstock nurseries far from orchards infected by scab;
- Prune trees regularly to keep an open canopy free of deadwood.

CHEMICAL CONTROL

Fungicides should be applied to plants in nurseries at the beginning of the leaf flush to prevent scab infection leading to stunted bushy plants that are difficult to bud. Copper (copper oxychloride) or chlorothanonil (Bravo) can be used.

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Broad Mite

Farmer
Fact Sheet

49

What is it?

The mite is too small to be seen with the eye; a microscope is needed. The mite is also found commonly on chilli, bean, bell pepper, eggplant, papaya and tomato. The scientific name is *Polyphagotarsonemus*.

Damage

Young leaves are distorted, and plants stunted. They look as if they have a virus infection, or they have been sprayed with herbicide (photo). Later, flowers may fall down, and those that remain produce distorted fruits. Yields are low, and plants die early.



How do I identify it?

Look for the distorted, stiff, discoloured leaves, on stunted plants with dieback and early death. The mites are very small and live in the buds among the youngest leaves.

How to manage broad mite

CULTURAL CONTROL

- Do not plant new crops next to those already infested with mites;
- Avoid planting new crops downwind from those infested with mites;
- Pull out badly infested crops and burn them.

CHEMICAL CONTROL

Use abamectin, derived from the soil bacterium, *Streptomyces*. Other chemicals that are effective are difocol, sulfur and dimethoate. See your MAL extension officer for advice.

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Giant African Snail

Farmer
Fact Sheet

50

What is it?

It is one of the largest snails in the world that attacks many crops. It has been accidentally or deliberately introduced to many Pacific Island countries. The scientific name is *Lissachatina*.

Damage

The snail attacks many plants, but prefers breadfruit, cassava, cocoa, papaya, peanut, rubber, legumes and cucurbits. Cuttings and seedlings are especially liked. Damage is greatest when outbreaks first occur in a new area. Later, they decline. The snail carries a parasite, the rat lungworm, which infects humans if the snails are not cooked properly.



How do I identify it?

Look for the surface of leaves that have been eaten (rasped) or leaves with large holes in them (photo, lower right); look for ribbon-like excreta and slime trails. Look for snails much larger than local snails (up to 15 cm); look for the typical colour banding on the shell (photo, left). Eggs are cream, about 5 mm diameter, laid below the soil surface or on sides of logs, in batches of 200-300 (photo, top right).

How to manage giant African snail

NATURAL ENEMIES

- Ducks will attack the snail; they are the only livestock that will do so.

CULTURAL CONTROL

- Make a strip of bare earth about 1.5 m wide around cultivated areas. Bands of sand are also effective;
- Collect the snail regularly. Bury or feed them to pigs after boiling for 1 hour.

CHEMICAL CONTROL: Use metaldehyde or methiocarb pellets, but take care to prevent livestock, pets and children from eating them: put the pellets in tins or bamboos in the evening and collect them in the morning. Chemical control needs to be combined with cultural methods to be effective. Poisoned snails should NEVER be fed to pigs or other livestock.

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Sooty Mould Fungi

Farmer
Fact Sheet

51

What are they?

They are fungi that grow over leaf surfaces on the honeydew produced by insects, e.g., aphids, scale insects and whiteflies. Many different sooty mould fungi occur in Solomon Islands.

Damage

They turn leaves black, blocking sunlight, stopping plants producing the food they need to grow. The plants look dirty and unsightly. The fungi do not infect the leaves; they only grow on the leaf surface.



How do I identify them?

Look for: a) black areas on new growth and leaves; b) insects (aphids, scale insects, whiteflies, plant and leaf hoppers) often on the under surface of the leaves; and c) look for ants. The honeydew produced by the insects is food for the sooty mould fungi, and also food for ants.

How to manage sooty mould fungi

First, look to see if there are aphids, scale insects and whiteflies, and that they are alive. Second, check if ants are present. They protect the insects from their natural enemies.

CULTURAL CONTROL

- If ants are present, kill nests in the soil with boiling water. Do not damage the plants!
- Prune lower branches of trees, and remove weeds, to stop ants reaching the leaves.

CHEMICAL CONTROL

- Use soap sprays against the insects (5 tablespoons soap in 4 litres water); or white oil (1 cup cooking oil; 2 cups water; 1 teaspoon dishwashing liquid). Dilute the mixture 6 teaspoons per litre of water and spray on the infested parts (**see also Horticultural oil in Fact Sheet no. 56d**). The addition of malathion (2 ml/litre water) is useful.
- Use synthetic pyrethroids (for example, lambda cyhalothrin or cypermethrin).
- Use Papua New Guinea derris variety or neem; get plants from MAL or the Kastom Gaden Association, as well as methods for making the sprays (**see Fact Sheets no. 56a-c**).

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

White Peach Scale

Farmer
Fact Sheet

52

What is it?

It is an insect that attacks many crops in addition to peach. In Solomon Islands, it is common on chilli, cassava and sliperi kabis. The scientific name is *Pseudaulacaspis*.

Damage

The female scales feed on plant sap, using their long mouthparts. Males do not feed. Leaves turn yellow, fruits are smaller than normal and plants become stunted (**cassava**). With heavy infestations branches die and whole plants die back (**chilli, bell pepper**).



How do I identify it?

Look for thick white crusts on stems or tree trunks. Leaves and fruits are not usually infested. The females (photo, left) and males (photo, right) that make up a heavy infestation are easy to recognize. Some farmers say they look like fungus.

How do manage white peach scale

CULTURAL CONTROL

- Cut out stems of plants infested by white peach scale and burn them;
- DO NOT plant cuttings from plants infested with white peach scale;
- DO NOT plant new crops downwind from those infested with white peach scale, as the young scales, known as crawlers, will spread on the wind to the new crop.

CHEMICAL CONTROL

- Use soap sprays (5 tablespoons soap in 4 litres water); or white oil (1 cup cooking oil; 2 cups water; 1 teaspoon dishwashing liquid). Dilute the mixture 6 teaspoons per litre of water and spray on the infested parts (**see also Horticultural oil in Fact Sheet no. 56d**). The addition of malathion (2 ml/litre water) is useful.
- Use synthetic pyrethroids (for example, lambda cyhalothrin or cypermethrin). These are useful against crawlers.

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READ INSTRUCTIONS BEFORE USING PESTICIDES

Red Sweet Potato Beetle

Farmer
Fact Sheet

53

What is it?

It is an insect on sweet potato (and wild morning glory plants). It is smaller than the beetle on pumpkin and other cucurbits (see **Fact Sheet no. 40**). The scientific name is *Monolepta*.

Damage

Adult beetles (photo, right) feed on leaves (photo, left) and flowers. If the attack occurs soon after planting, the growth of the cuttings is poor; this delays crop maturity, and possibly the yield of storage roots. The larvae probably feed on roots and underground stems.



How do I identify it?

Look for red, oval beetles, about 6 mm long, making holes between the leaf veins. They have a small black triangular spot at the base of the wing cases, and are black underneath. Adults are strong fliers, and fly when disturbed.

How to manage red sweet potato beetle

CULTURAL CONTROL

- Avoid planting new crops next to those where large numbers of beetles are present;
- Practice good crop hygiene: collect and destroy vines after harvest
- Promote healthy plant growth with manures, mulches, fertilizers, and adequate water;
- In the early morning or evening, catch the beetles in flight. Perhaps a game for children!

RESISTANT VARIETIES: None known, but fast-growing varieties may outgrow the damage caused by the beetles

CHEMICAL CONTROL

- Spread ashes over the crop as soon as the beetles are seen (**see Fact Sheet no. 56d**);
- Use synthetic pyrethroid insecticides, such as lambda cyhalothrin or permethrin;
- Use derris. A local Derris variety, originally from Papua New Guinea, is being multiplied by MAL and the Kastom Gaden Association (**see Fact Sheet no. 56c**).

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Sweet Potato Tortoise Beetle

Farmer
Fact Sheet

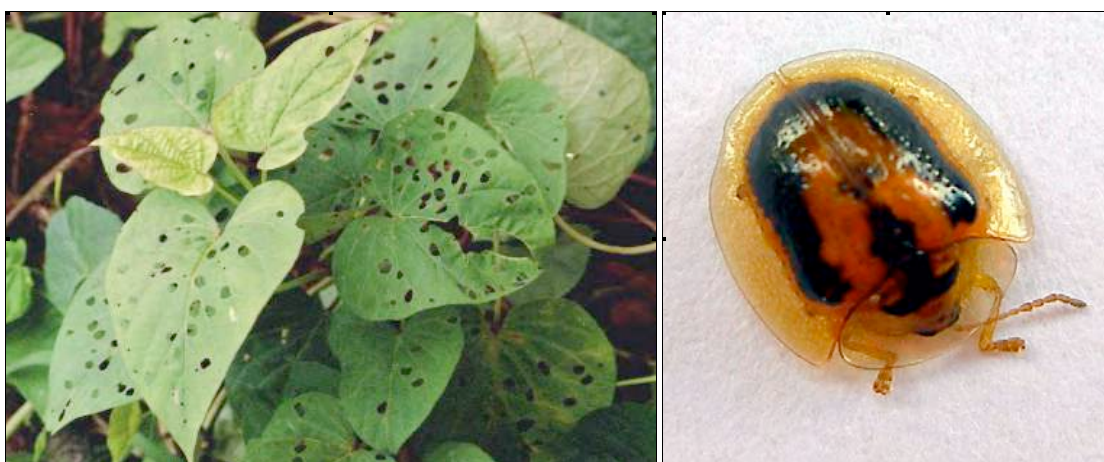
54

What is it?

It is a beetle that feeds on sweet potato, kangkong, and morning glory plants.

Damage

Adults feed on leaves, making small to medium-sized holes (photo, left). The larvae at first eat the leaf surface; later they eat their way through the leaf. The effect on production of sweet potatoes is probably small.



How do I identify it?

Look for the round golden beetles; they are about 5 mm diameter, oval and slightly flattened (photo, right). They have clear wing margins that cover the body and extend over the legs. The larvae have an “anal fork” at the back, which collects skins and faeces; it can be moved from side to side, probably to scare predators.

How to manage sweet potato tortoise beetle

RESISTANT VARIETIES: None known, but fast-growing varieties may outgrow the damage.

CULTURAL CONTROL

- Avoid planting new crops next to those already infested with the beetles;
- Practice good hygiene: collect and destroy vines after harvest;
- Promote healthy plant growth with manures, mulches, fertilizers, and adequate water;
- Remove weeds (especially those in the morning glory family) around the gardens.

CHEMICAL CONTROL

- Spread ash over the crop as soon as the beetles are seen (**see Fact Sheet no. 56d**);
- Use synthetic pyrethroid insecticides, such as lambda cyhalothrin or permethrin;
- Use derris. A local Derris variety, originally from Papua New Guinea, is being multiplied by MAL and the Kastom Gaden Association (**see Fact Sheet no. 56c**).

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Sweet Potato Little Leaf

Farmer
Fact Sheet

55

What is it?

It is a disease caused by a phytoplasma, affecting sweet potato and some wild relatives. Phytoplasma are like bacteria. They survive only inside plants and are spread by leaf hoppers.

Damage

Infected plants have many shoots, small leaves, and few, if any, storage roots. Once infected the plants die. Yield losses of 30-90% occur. The disease mostly occurs on the Guadalcanal Plains, although there have been serious outbreaks on Santa Anna, in the past.



How do I identify it?

Look for yellowing of the veins on young leaves (photo, right); this is the first sign of the disease. Look for vines with many shoots and small leaves, giving the plant a bushy appearance (photo, left).

How to manage sweet potato little leaf

CULTURAL CONTROL

- Remove plants with signs of the disease as soon as they appear, and burn them;
- Only take planting material from gardens without the disease;
- Only select vines for planting from plants that look healthy.

RESISTANT VARIETIES: No resistant varieties are known, although WV5 had greater resistance than others.

CHEMICAL CONTROL

Only use this method if there is a severe outbreak of the disease:

- Use synthetic pyrethroid insecticides, such as lambda cyhalothrin or permethrin;
- Derris may kill the leaf hoppers that spreads the disease. A local derris variety with high rotenone, originally from Papua New Guinea, is available from MAL and the Kastom Gaden Association. Contact them for information and cuttings. (**See Fact Sheet no. 56c**).

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Natural pesticides against insects

Farmer
Fact Sheet

56a

General instructions

- Select fresh, healthy plant parts to use as pesticides; reject plants with moulds on them;
 - Dry plant parts properly for future use. Keep in an airy container (no plastic containers) in a shady place;
 - Do not use household cooking tools for preparing plant extracts, or containers used for drinking water. Clean all tools well after using them;
 - Avoid contact with crude extracts during preparation; wear protective clothing when applying.
 - Keep plant extracts away from children and house pets
 - Harvest all mature and ripe fruits on trees before spraying
 - Always test the plant extract on a few infested plants before large-scale spraying
 - Wash your hands after handling the plant extract and wash your clothes, too
- See other fact sheets (56b,c,d) for how to prepare plant extracts.

PLANT PESTICIDE AGAINST: **non-sucking insects (chew, bite)**

Control	Ants	Beetles	Caterpillars	Grasshoppers
ASH				
CHILLI				
DERRIS				
FU'U	Possibly a rat poison, but may also be useful as an insecticide			
GARLIC				
GLIRICIDIA				
HORTICULTURAL OIL				
HOT WATER				
MARIGOLD	Insect repellent, and when used as a cover crop reduces root knot nematodes			
NEEM				
PAPAYA				
SOAP				
SOURSOP				
TOBACCO				

PLANT PESTICIDE AGAINST: **sucking insects**

CONTROL	Aphids	Mealybugs	Planthoppers	Scales	Spider mites	Thrips	Whiteflies
ASH							
CHILLI							
DERRIS							
FU'U	Possibly a rat poison, but may also be useful as an insecticide						
GARLIC							
GLIRICIDIA							
HORTICULTURAL OIL							
HOT WATER							
MARIGOLD	Insect repellent, and when used as a cover crop reduces root knot nematodes						
NEEM							
PAPAYA							
SOAP							
SOURSOP							
TOBACCO							

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Preparing natural pesticides 1

Farmer
Fact Sheet

56b

See Fact Sheet 56a for more information on target pests.

General instructions

- Select fresh, healthy plant parts to use as pesticides; reject plants with moulds on them
- Dry plant parts properly for future use. Keep in an airy container (no plastic containers) in a shady place.
- Do not use household cooking tools for preparing plant extracts, or containers used for drinking water. Clean all tools well after using them
- Avoid contact with crude extracts during preparation; wear protective clothing when applying
- Keep plant extracts away from children and house pets
- Harvest all mature and ripe fruits on trees before spraying
- Always test the plant extract on a few infested plants before large-scale spraying
- Wash your hands after handling the plant extract and wash your clothes, too

See other fact sheets (56a,c,d) for more information on natural pesticides.



Chilli



Neem



Soursop



Tobacco

CHILLI: active against *ants*, *aphids*, *caterpillars*, *mealybugs*

- Take one cup dry or 2 cups fresh chillies
- Smash to a fine paste
- Put into bucket with 1 litre water and rub with hands (cover hands with plastic bag)
- Soak of at least 1 hour; squeeze and strain
- Make up to 1 litre with water
- Add 1 teaspoon of soap

NEEM: active against *caterpillars*, *grasshoppers*, and many more; also *fungi* and *nematodes*

For leaves:

- Put 1 kg of leaves plus 5 litres water in a bucket and leave overnight
- Remove the leaves, retain the water and pound the leaves
- Squeeze the leaves and add the 5 litres of water used for soaking them overnight
- Add about 20 ml of diluted soapy water and use

For mature seeds:

- Wash and remove the husk and dry
- Take 12 handfuls of dry seeds (or use 500 grams per 10 litres water)

- Grind them into a fine powder
- Mix the powder in 12 litres water and soak overnight
- Strain, and add 4 teaspoons soap

SOURSOP OR CUSTARD APPLE: active against *aphids*, *caterpillars* (*diamond back moth*), *planthoppers*, *grasshoppers*

- Take 500 g of fresh leaves; boil leaves in 2 litres water until water is reduced to 0.5 litre
- Dilute to 10 litres with water
- Strain, and add 10 teaspoon soap

Also:

- Take two handfuls of seeds and grind into a fine powder
- Mix with 4 litres of water and soak overnight; strain, and add 4 teaspoons soap

TOBACCO: active against *caterpillars*, *aphids*, and more

- Smash 5 large leaves
- Add 1 litre water and leave overnight
- Make up to 2 litres with water
- Strain, and add 4 teaspoons of soap

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Preparing natural pesticides 2

Farmer
Fact Sheet

56c

See Fact Sheet 56a for more information on target pests.

General instructions

- Select fresh, healthy plant parts to use as pesticides; reject plants with moulds on them;
 - Dry plant parts properly for future use. Keep in an airy container (no plastic containers) in a shady place;
 - Do not use household cooking tools for preparing plant extracts, or containers used for drinking water. Clean all tools well after using them;
 - Avoid contact with crude extracts during preparation; wear protective clothing when applying;
 - Keep plant extracts away from children and house pets;
 - Harvest all mature and ripe fruits on trees before spraying;
 - Always test the plant extract on a few infested plants before large-scale spraying;
 - Wash your hands after handling the plant extract and wash your clothes, too.
- See other FS 56c for more information on natural pesticides.



Garlic



Derris



Gliricidia



Marigold

GARLIC: active against *caterpillars, mites, thrips, and possibly some fungal diseases*

- Scrape 4 garlic cloves and soak in small amount of vegetable oil
- Leave overnight
- Make up to 2 litres with water, strain, and add 4 teaspoons soap
- Also, scrape 4 cloves in hot water; add several ground chillies, and 2 tablespoons pure soap. Use spray when water is cool

DERRIS: active against *caterpillars, grasshoppers, aphids, spider mites, plant hoppers; beetles*

- Take 2 roots of Derris (20 cm long and as thick as a small finger) and smash well
- Put roots in a bucket overnight and cover with water
- Make up to 2 litres with water
- Strain, and add 4 teaspoons soap

GLIRICIDIA: active against *aphids, caterpillars, whitefly*

- Grind or pound 0.5 kg leaves
- Soak overnight in water
- Make up to 20 liters with water
- Strain, and add 10 teaspoons soap

Note: *Gliricidia* is also a rat poison. Mix the amounts above with boiled rice. But may need to make up fresh ever day. Place the 'food' in a bamboo to protect it from children, pets and domestic animals. Bacterial action converts chemicals in the leaves to brodifacoum-like substances.

MARIGOLD: active against *insects and is a repellent*

- Collect 2.5 kg leaves/flowers; pound and mix with enough water to cover material
- Filter and make up to 18 litres water; Add soap

PAPAYA: active against *thrips*

- Shake 1 kg leaves in 1 litre water and squeeze through cloth
- Add 4 litre soap solution (100 g soap/25 litres water)

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Preparing natural pesticides 3

Farmer
Fact Sheet

56d

See Fact Sheet 56a for more information on target pests.

General instructions

- Do not use household cooking tools for preparing plant extracts, or containers used for drinking water. Clean all tools well after using them;
 - Avoid contact with crude extracts during preparation; wear protective clothing when applying;
 - Keep plant extracts away from children and house pets;
 - Harvest all mature and ripe fruits on trees before spraying;
 - Always test the plant extract on a few infested plants before large-scale spraying;
 - Wash your hands after handling the plant extract and wash your clothes, too.
- See other fact sheets (56a,b,c) for more information on natural pesticides.



Soap



Hot Water



Ash



Horticultural Oil

SOAP: active against *scale insects, mealybugs and aphids*

- Use soap (pure soap, not detergent)
- 5 tablespoons of soap in 4 litres water; **OR**
- 2 tablespoons of dish washing liquid in 4 litres water

HOT WATER: active against *ants, nematodes in yams and sterilise nursery soil*

- **ANTS** Use to destroy nests, but be careful not to pour hot water onto the roots of small plants that might be growing close to the nests. You will kill the plants!
- **SOIL** Use hot water to sterilise soil: pour over the soil that you have placed in seed boxes or soil spread thinly on the ground containing the nursery soil
- **YAM** Use hot water to kill nematodes in yams with dry rot before cutting and planting. Dip whole yams in hot water at 51°C for 10 mins (use a thermometer and clock – do NOT guess)

ASH: active against *grasshoppers and beetles*

- Take ash from fire (make sure it is cool!)
- Beat to make fine
- Put in coarse cloth or into a strainer
- Shake thinly over each leaf

HORTICULTURAL OIL: active against *powdery mildew and also many sucking insects, especially scales, aphids*

- 3 tablespoons (1/3 cup) cooking oil in 4 litres water
- ½ teaspoon detergent soap
- Shake well and use

MILK: powdery mildew fungi

- Use milk, diluted to 10% (1 part milk, 9 parts water);
- Add soap if milk does not spread over leaf surface.

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Melanesian Coconut Beetle

Farmer
Fact Sheet

57

What is it?

It is a very large beetle that attacks banana, betel nut, coconut, oil palm, sugarcane and wild palms. Also known as Coconut rhinoceros beetle. The scientific name is *Scapanes*. (The other large coconut beetle, *Oryctes*, is NOT present in Solomon Islands.)

Damage

Damage can be severe when coconuts are planted in land cleared from forest, where the rotting logs provide breeding sites. The adults bore into the crown of coconuts, and if the growing point is damaged, the palms die. All palms may be damaged within 5 years, discouraging farmers from planting or replanting coconuts. However, as the logs rot away so the attack declines.



How do I identify it?

Look for the horns on the adult male beetles (photo, right), they are characteristic, whereas females are more difficult to recognize. In the field, look for V-shaped cuts in twisted spiraling leaves; and for fibre pushed from the tunnels that the beetles make into the crown. Follow the tunnel to find the beetle. The large, C-shaped larvae (photo, left) are found under rotting logs.

How to manage the Melanesian coconut beetle

RESISTANT VARIETIES: Fast-growing varieties are more likely to outgrow the damage caused by the beetles.

CULTURAL CONTROL

- Remove or burn breeding sites, logs in particular;
- Plant *Pueraria* or other pasture legumes as soon as the trees have been cut down to cover the logs and stumps; this can reduce egg laying;
- In Papua New Guinea, the beetle has been found breeding in rotting stumps of *Gliricidia* shade trees in cocoa plantations.

CHEMICAL CONTROL

- A pheromone (a chemical attractant) is used for trapping beetles in Papua New Guinea;
- Use Furadan granules: place the granules in the base of the leaves in the crown.

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Plant-eating Ladybeetles

Farmer
Fact Sheet

58

What is it?

They are beetles that attack plants. Some feed on eggplant and tomato, others on long beans, legumes and weeds. The common name is Eggplant ladybird beetle or 26-spotted ladybird. The scientific name is *Epilachna*. The number of spots varies; it is not used for identification.

Damage

Both adults and young (larvae) do the damage. They eat the surface of the leaves (photo, right); the larvae graze the under surface, leaving the upper surface intact; adults feed on both sides of the leaf, sometimes making holes as they chew. Seedlings may be killed, and growth and yield of mature plants is reduced.



How do I identify them?

The adults are typical ladybirds - orange with black spots - but the upper surface is covered in short downy hairs, unlike beneficial ladybeetles (those that eat aphids and other pests). The pale yellow larvae (6 mm) have long, dark-tipped branched spines on their backs. Look for the distinctive grazing on one side of the leaf, often leaving the surface of the other side intact.

How to manage plant-eating ladybeetles

CULTURAL CONTROL

- Handpick the larvae, and perhaps the adults. Do it when the beetles are first seen;
- Remove weeds from around the crop.

CHEMICAL CONTROL

- Use contact insecticides, e.g., malathion, or synthetic pyrethroids, such as lambda cyhalothrin or permethrin;
- Use derris. A local Derris variety, originally from Papua New Guinea, is being multiplied by MAL and the Kastom Gaden Association (see Fact Sheet no. 56c).

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Coconut Hispine Beetle

Farmer
Fact Sheet

59

What is it?

It is an insect that attacks coconut, betel nut, sago palm, oil palm, and ornamental and wild palms. It is also known as the Coconut leaf hispa. The scientific name is *Brontispa*.

Damage

The adult beetles and larvae feed on the spear leaf, causing severe damage to seedlings and young palms. Irregular greyish blotches develop (photo right); when severe, this gives the palm a scorched appearance (photo, centre). Yields are reduced; severe attacks can kill the palms.



How do I identify it?

Look for the narrow brown streaks on the leaflets, and red and black beetles (8-10 mm long) between leaflets of the spear leaf (photo, left). Look for fronds with ragged leaflets, with those still green bearing large, dry, dead blotches, parallel to the length of the leaflets.

How to manage the coconut hispine beetle

NATURAL ENEMIES: *Brontispa* is usually under control by its natural enemies: minute wasps, earwigs and fungi.

RESISTANT VARIETIES: The Local Tall and Rennell varieties are more resistant than Federated Malay States and Malayan Dwarf. The hybrid between Rennell Tall and Malayan Dwarf is susceptible.

CHEMICAL CONTROL

- Use insecticides only in nurseries and on young palms after planting out, especially where susceptible varieties are planted in areas with dry seasons, e.g., Guadalcanal Plains;
- Use contact insecticides, e.g., malathion, or synthetic pyrethroids, such as lambda cyhalothrin or permethrin;
- Use derris. A local derris variety, originally from Papua New Guinea, is being multiplied by MAL and the Kastom Gaden Association (see **Fact Sheet no. 56c**).

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Coconut Leafminer

Farmer
Fact Sheet

60

What is it?

It is an insect that feeds on leaves of coconut betel nut, sago palm, and ornamental and wild palms. It is also known as the Coconut leaf hispid. The scientific name is *Promecotheca*.

Damage

Both the adult beetles and young (larvae) do the damage. Damage is greatest on mature palms. Adults (photo, right) make narrow furrows in leaflets of the youngest 3-4 leaves, and the larvae live inside the leaf, below the top layer, eating it as they tunnel, (photo, left). In severe attacks, flower production stops, young nuts fall, and nut production is set back for at least 2 years. Outbreaks occur every 10-15 years, possibly associated with droughts.



How do I identify it?

On mature coconuts, look for signs of adult feeding (7-9 mm and brightly coloured) on the lower parts of young fronds; hold the leaflets to the light to see the feeding grooves as fine white lines (photo, right). Look for the larvae in the upper part of the leaflet. The older larvae should be visible at the end of the tunnels or mines.

How to manage the coconut leafminer

NATURAL ENEMIES: Minute wasps parasitise eggs and larvae; ants disturb the adults and attack the egg masses.

CHEMICAL CONTROL

- Hand pick the eggs and adults on seedlings in nurseries, and young palms in the field;
- Prune and burn infested fronds.

CHEMICAL CONTROL: Not recommended. It is difficult and uneconomic to spray mature coconuts; and insecticides will delay the re-establishment of natural enemies, which control the leafminer. If necessary, in nurseries, use malathion or synthetic pyrethroids, such as lambda cyhalothrin or permethrin.

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Cocoa Weevil Borer

Farmer
Fact Sheet

61

What is it?

It is an insect that attacks cocoa and commercial forest trees such as *Eucalyptus* and *Terminalia*. The scientific name for the weevil is *Pantorhytes*.

Damage

Larvae do the damage. They bore into trunks and branches, making tunnels 1-3 cm deep (photo, middle). The tunnels weaken the trees, causing tip dieback, branch death, and tree death if splits occur at the fork (jorquette). The yield of pods is reduced. Wounds allow entry of the bark canker water mould, *Phytophthora* (see **Fact Sheet no. 6**), and termites.



How do I identify it?

Look for holes in trunks and branches, particularly at the jorquette. Look for jelly-like substance at the holes where the larvae feed. Adult beetles (15 mm) have a red abdomen with white spots (photo, left); they are relatively slow moving.

How to manage the cocoa weevil borer

NATURAL ENEMIES: Plant soursop trees in the plantation to attract crazy ants (photo, right) and *Oecophylla*.

CULTURAL CONTROL

- Hand pick weevil adults during the midday when they come down from the canopy;
- Kill larvae in tunnels with wire;
- Grow cocoa beneath coconuts where crazy ant populations are higher.

CHEMICAL CONTROL: Clean the entrance of tunnels and apply Dichlorvos, white oil, Ridomil and water. Applying insecticides in any other way has little or no effect, and their use is not recommended.

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Coconut Spathe Bug

Farmer
Fact Sheet

62

What is it?

It is an insect that attacks coconuts and also betel nuts. The scientific name is *Axiagastus*. The spathe is the cover of the coconut flower.

Damage

The bug (photo, left) occurs in large numbers on the young male and female flowers, using its long needle-like mouth parts to suck the sap. There is loss of young nuts when populations are high, and outbreaks on Santa Cruz (Nendo Island) are thought to have caused coconuts to become dry and banana-shaped (photo, right), but it is uncertain if *Axiagastus* was the cause.



How do I identify it?

Look for dark brown bugs with yellow marks, about 15 mm long (photo, left, is a spathe bug that occurs outside Solomon Islands). The bug has a strong unpleasant smell when held or disturbed. Look for the long piercing mouthparts on both young and adults, which are used to suck sap from flowers and young fruit. Their feeding in this way is thought to causes nut fall, as well as damage to those nuts that remain, so that they become long and thin, without “meat” and “milk”.

How to manage the coconut spathe bug

NATURAL ENEMIES

- Wasps and flies that attack eggs, nymph and adults have been found in Papua New Guinea and probably also occur in Solomon Islands.
- Ants reduce populations of the bug, so plant soursops among coconuts to attract colonies of *Oecophylla*, the weaver ant.

CHEMICAL CONTROL

The use of insecticides is not recommended. It is difficult and uneconomic to spray mature coconuts. Insecticides will also kill the natural enemies.

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Powdery Mildew

Farmer
Fact Sheet

63

What is it?

There are two fungi that cause the disease. They infect cucumber, melon, pumpkin, squash, zucchini, some legumes and ornamentals. The scientific names are *Sphaerotheca* and *Erysiphe*.

Damage

The disease can be a major problem. Leaves die early and the size and number of fruits is smaller than usual. Early leaf death can result in sunburned fruit, fruits that ripen early, do not store well, or have poor flavour. The fungus can only survive on living plants.



How do I identify it?

Look for white, powdery fungal spots on upper and lower leaf surfaces (photo, left & right), leaf stalks and stems. Look for the fungus on shaded older leaves. The fungal spots expand and multiply rapidly, so look for leaves that gradually turn yellow, then brown, dry out and die.

How to manage powdery mildew

CULTURAL CONTROL

- Plant in sunny places, and, if possible, choose areas with good air circulation;
- Do not plant crops of cucurbits one after another in the same garden;
- Do not plant new crops next to those that have the disease, and remove weeds.

RESISTANT VARIETIES: Check company descriptions of varieties, and choose those with resistance to powdery mildew.

CHEMICAL CONTROL

- For organic production, use horticultural oil, potassium bicarbonate (10 g/l) or wettable sulphur (2-3 g/l). If only a few plants are grown, use milk diluted 1 part milk in 9 parts water (**see Fact Sheet no. 56d**);
- For commercial plantings, use wettable sulphur, chlorothalonil (also suitable for Gummy stem blight), or triazoles). See your MAL extension officer for advice.

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Brown Plant Hopper

Farmer
Fact Sheet

64

What is it?

It is an insect that attacks rice and wild grasses. The scientific name is *Nilaparvata*.

Damage

Both adults (photo, centre) and nymphs (photo, left) cause damage. They have piercing mouthparts used to suck plant sap. Egg laying blocks the water and food channels inside the plant. High populations on susceptible varieties, between tillering and flowering, cause plants to wilt and dry up; this condition is known as hopperburn (photo, right).



How do I identify it?

Look at the base of the plants, for the nymphs, and winged and wingless adults. Look for the sooty mould fungi (see Fact Sheet no. 26) on the stems when many plant hoppers are present.

How to manage brown plant hopper

NATURAL ENEMIES: Spiders eat the nymphs and adults, as do ladybird beetles, dragonflies and damselflies. Two species of egg-sucking bugs are present, plus wasps, fungi and mites.

CULTURAL CONTROL

- Drain the paddies for 3-4 days during the early stage of infestation;
- Split applications of nitrogen fertilizer (apply fertilizer three times);
- Avoid staggered planting, preventing plant hoppers moving from older to younger crops;
- Remove volunteer plants; and rotate rice with other crops.

RESISTANT VARIETIES

Most varieties have been bred for resistance. See your MAL extension officer for advice.

CHEMICAL CONTROL

Ask MAL for current recommendations, timing and method of application.

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Coconut Flat Moth

Farmer
Fact Sheet

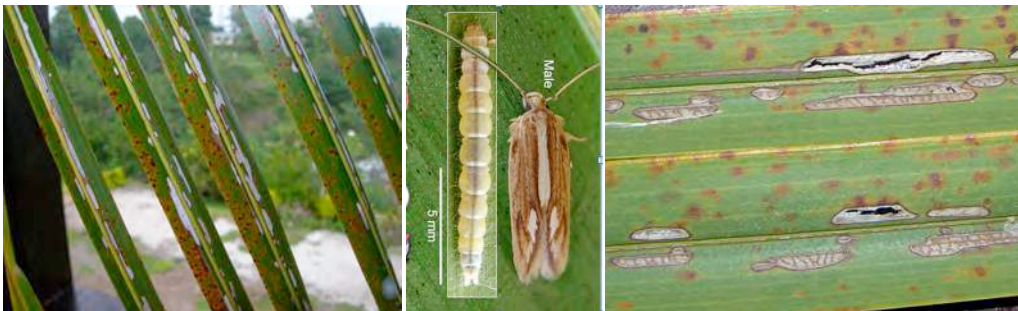
65

What is it?

It is an insect that attacks coconut leaves, and those of other palms. The scientific name is *Agonoxena*.

Damage

The caterpillars (photo, centre) do the damage (photo, left). They eat the green parts of the leaf, mainly on the lower surface. The damaged areas, mostly near the midrib, become grey (photo, right). Nut production is probably not affected, but growth of seedlings may slow from the attack.



How do I identify it?

Look for long, thin, grey patches on the leaflets. Look for green caterpillars, up to 2 cm long, under a thin web covering the leaflets. When disturbed they fall to the ground. The adult moth is mostly brown (photo, centre). It may be possible to find the eggs: look on the underside of the leaflets, near the tips and along midribs; they occur singly or in rows.

How to manage coconut flat moth

NATURAL ENEMIES

Many small wasps lay their eggs in the caterpillars and pupae. There is also a fly that attacks the caterpillars. Ants destroy the pupae and eat the eggs, and spiders attack the adults.

CULTURAL CONTROL

There are no cultural control methods, nor are there resistant varieties for this pest.

CHEMICAL CONTROL

Insecticides are not recommended. Normally, natural enemies will keep the flat moth under control. If insecticides are required on, for example, seedlings in the nursery, use malathion or synthetic pyrethroids, such as lambda cyhalothrin or permethrin.

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Brown Coffee Scale

Farmer
Fact Sheet

66

What is it?

It is a soft scale, an insect common on soursop and other trees. The scientific name is *Saissetia*.

Damage

Damage is done in three ways:

- The scale has a poison causing spots on the leaves as it feeds;
- The scale sucks the plant sap, causing misshapen leaves, which wilt and/or die early; and causes fruits to be smaller than normal;
- Sooty mould fungi grow on honeydew waste produced by the scale as it feeds.



How do I identify it?

Look for the shiny, brown, dome-shaped adults, round to oval, about 2 mm across, mostly on the undersides of leaves, on stems, fruits (photo), and fruit stalks. Look for sooty moulds on leaves, and especially look for ants that come for the honeydew.

Females lay about 500 eggs; the young (called crawlers) are difficult to see; they spread on wind, planting materials, animals, and people. After several moults they settle and feed. There are no males.

How to manage brown coffee scale

NATURAL ENEMIES: Tiny wasps, too small for the naked eye, lay their eggs in the scale insect.

CULTURAL CONTROL: Prune infested stems, branches and fruits; apply mulch, manure or commercial fertilizers; destroy ant nests with boiling water - without ants, the wasps bring about natural control; prune low branches and remove weeds to stop ants reaching leaves and fruits.

CHEMICAL CONTROL: Not recommended because they will kill the natural enemies. But if needed:

- Use soap sprays (5 tablespoons of soap in 4 litres water), or white oil (1 cup cooking oil; 2 cups water; 1 teaspoon dishwashing liquid; dilute 3 teaspoons per 0.5 litre water and spray. (Add malathion if necessary). Apply second soap or oil application after 3-4 weeks;
- To kill ants, use synthetic pyrethroids (for example, lambda cyhalothrin or cypermethrin); but only after other measures have failed, as they will kill the scale insects' natural enemies.

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Betel Nut “Disease”

Farmer
Fact Sheet

67

What is it?

It is a disease of unknown cause that kills betel nuts in Reef Islands. It is not known elsewhere.

Damage

The disease appeared in about 1975. It kills betel nuts, usually when they are mature, about to bear fruit, sometimes earlier. Betel nut production in the Reef Islands is low, and nuts are imported from other islands to satisfy local demand.



How do I identify it?

Look for red streaks, 1-2 cm wide, on the trunks, some reaching to soil level. Look for rots inside the trunks, black decayed flower buds (photo, lower centre), and sometimes spotting on older leaves (photos, above). As the disease develops, the leavers become fewer and shorter; the last leaf is like a short fan (photo, lower right). Remove the leaves, tracing the lines of rot to the shoot; note the gum (photo, lower left). Termites colonise the stem as it rots.

How to manage betel nut disease

There is no known cause, although inspections have been made for fungi and viruses.

QUARANTINE: DO NOT take propagating material - seed or seedlings - to any other part of Solomon Islands.

RESISTANT VARIETIES: None are known. Coconuts seem unaffected by the disease.

CHEMICAL CONTROL: Chemical control is not appropriate as the cause is unknown.

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Cassava Green Mottle

Farmer
Fact Sheet

68

What is it?

It is a virus, first found in Choiseul in the late 1970s. Recently, plants with similar symptoms have been found on Malaita. The scientific name is *Cassava green mottle 'nepovirus'*.

Damage

On Chosieul, a few plants with the disease can be found in most gardens. Diseased plants grow slowly, and at harvest stems and edible roots weigh half those grown from healthy cuttings. Occasionally, plants are severely stunted without edible roots or, if present, they are small, and woody when cooked. However, as three cuttings are planted per mound, healthy plants have more space and nutrients, and may make up for the loss in yield of those diseased.



How do I identify it?

Look for deformed young leaves with faint (photo, right) or distinct yellow spots or green patches (mottles), and twisted margins (photo, left). Usually, the shoots recover from the symptoms and appear healthy.

There is no information on spread of the virus. But by comparison with different diseases caused by similar viruses, it is thought that it spreads in sap, perhaps when branches collide in the wind, in seed or by nematodes - small worm-like organisms too small to be seen by eye.

How to manage Cassava green mottle virus

QUARANTINE: DO NOT take cassava cuttings from Choiseul to other parts of Solomon Islands.

CULTURAL CONTROL: Cultural control is very important, and is the main method of management.

- Take cuttings for planting only from plants that are free from symptoms at harvest;
- Remove plants with symptoms as soon as they are seen, and burn them. DO NOT wait until harvest, as by then the plants may have recovered from symptoms.

RESISTANT VARIETIES: None are known.

CHEMICAL CONTROL: Chemical control is not appropriate for this disease, as spread is unknown.

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Coconut Basal Stem Break

Farmer
Fact Sheet

69

What is it?

It is a disease caused by a fungus found in Yandina, Russell Islands, in 1978. The scientific name is *Marasmiellus cocophilus*. Other than coconut, some grasses are also attacked.

Damage

In August 1978, a few 8-9-month-old Malayan Dwarf x Rennell seedlings snapped at the junction of stem and nut. In March 1979, about 7,000 seedlings were affected. Those that remained healthy were planted, but many developed small leaves (photo, right). A few died, but most produced new roots and leaves 5-6 months after planting, and looked normal.

In East Africa, in the late 1960s, the fungus was said to kill palms up to 8 years old with losses of over 90% in some areas. That is the reason the outbreak in Yandina was so important.



How do I identify it?

Look for outer leaves of seedlings that are dying early, swollen leaf bases, with cracks, rots, fungal threads and small white mushrooms, leading to a stem break between leaves and roots.

How to manage coconut basal stem break

QUARANTINE: From 1979 until 1986, seednuts from Russell Islands were treated before sending to other islands. The treatments stopped when it was found that the fungus did not kill the palms in the field, and no further disease outbreaks occurred in the nursery. Also, other diseases in East Africa were later thought to responsible for the coconut deaths reported.

CULTURAL CONTROL: Remove the husk; this stops the fungus colonising the coconut seedling and then attacking the roots and base of the leaves. BUT note, some varieties (e.g., the Malayan Dwarf x Rennell hybrid) rot when treated this way. Keep nurseries free of weeds.

CHEMICAL CONTROL: Seednuts should be taken directly from the palm, partially dehusked by trimming at the top and three sides and dipped in an appropriate fungicide for 15 minutes. The addition of a wetting agent is considered beneficial. The fungicide Calixin (tridemorph) was used in Solomon Islands when seednuts were sent from Yandina to Guadalcanal.

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Marasmiellus Rots

Farmer
Fact Sheet

70

What is it?

The rots are caused by a fungus; they cause several diseases: Coconut shoot rot, Banana sheath rot, Taro corm rot. The scientific name is *Marasmiellus inoderma*.

Damage

Banana: The fungus rots the leaves, they grow slowly and plants are stunted (photo, top centre). Patches of fungus occur between leaves of the stem, and produce toadstools (photo, top right). **Coconut:** Spores enter seednut on the palm, germinate and kill 1-2% of shoots; then the fungus enters the nut and grows on the “milk”. In the nursery, a white fungus grows at the base of the leaves, and toadstools on the husk. **Taro:** The fungus rots the outer leaves, causing shallow corm rots (photo, lower centre), and toadstools on the leaves (photo, lower left). Common on the Guadalcanal weather coast. Overall, the damage from these rots is small.



How do I identify them?

Look for seednuts that do not grow, remove the husk and look for a white fungus where the shoot should be, or thick fungal mats inside the nut. Look for early death of leaves of banana and taro, and white fungus binding the leaves. Look for white or light brown toadstools on stems/leaves of taro and banana.

How to manage Marasmiellus rots

CULTURAL CONTROL: Remove dead seednuts from the nursery before toadstools form; remove diseased taro and bananas; apply manures around bananas to promote vigorous growth, and, importantly, look carefully at stems of taro and banana for the fungus before planting.

RESISTANT VARIETIES: Local tall coconuts are more resistant than Malayan Dwarf and hybrids.

CHEMICAL CONTROL: Post-harvest dips have not been effective against this fungus on coconut.

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Banana Black Cross

Farmer
Fact Sheet

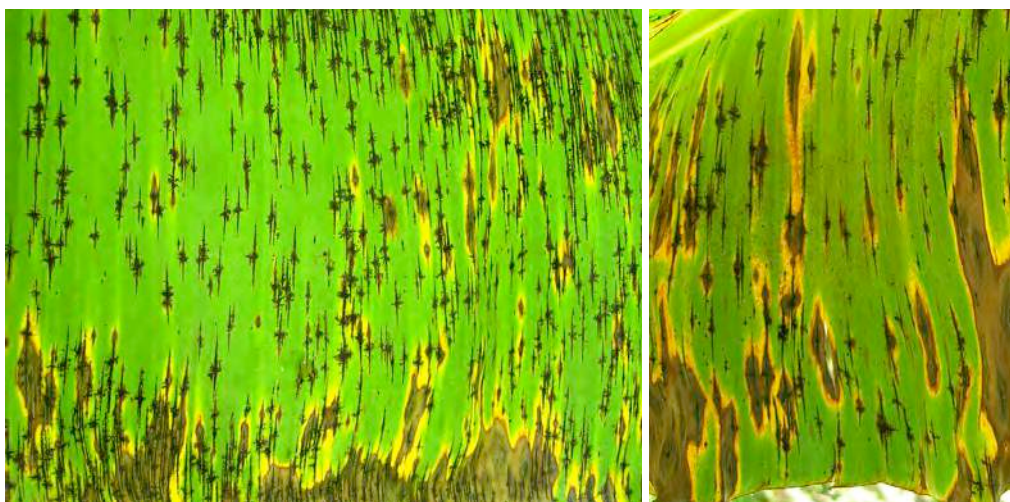
71

What is it?

It is a disease caused by a fungus, which is only known to infect bananas. It is known by different names: Banana black cross, Black cross disease, Tar spot. The scientific name is *Phyllachora*.

Damage

Usually, the disease is of minor importance. On susceptible varieties, it is worse when they are planted under shade. In this case, the spots are dense, covering most of the leaf surface. Further damage to the leaf occurs when the spots become infected by Diamond leaf spot (photo, right) (see Fact Sheet no. 71).



How do I identify it?

Look for the black, four-pointed stars, up to 60 mm long, most clearly seen on the lower surface of older leaves (photo, left). The longer part of the star is parallel to the leaf veins, that is, at right angles to the length of the leaf. The spots are scattered, but sometimes in large groups. Spores are produced on the under side of the leaf, and spread in wind and rain.

How to manage banana black cross

CULTURAL CONTROL: If damage is severe, it is probable that the bananas are growing under shade or too close together. Reduce shade and increase the space between plants.

RESISTANT VARIETIES: Cavendish varieties are resistant. Some of the FHIA varieties bred in Honduras, Central America, are susceptible. In lowlands Papua New Guinea, the varieties FHIA 02, FHIA 17, FHIA 18 and FHIA 23 were susceptible to infection, whereas FHIA 03 and FHIA 25 were free from disease.

CHEMICAL CONTROL: The disease is of minor importance in commercial varieties and, even in those that are susceptible, it is not worthwhile using fungicides to control it.

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Cordana Leaf Spot

Farmer
Fact Sheet

72

What is it?

It is a disease caused by a fungus, which is only known to infect bananas. The common name is Cordana leaf spot or Diamond leaf spot. The scientific name is *Cordana*.

Damage

Usually, the disease is of minor importance on Cavendish bananas, but can sometimes be severe on plantains, that is, cooking bananas. However, it is not likely to lower yields so that control measures are required.



How do I identify it?

Look for the diamond-shaped brown spots, with a yellow border, often common at the margin of the leaf. Look to see if the spots are on star-shaped spots of *Phyllachora* (photo, right) (see **Fact Sheet no. 71**). The fungus probably needs a wound to infect. Spores are produced on the underside of the leaf in large numbers, and spread in wet, windy weather.

How to manage Cordana leaf spot

CULTURAL CONTROL

Control measures are unlikely to be needed against this disease.

RESISTANT VARIETIES

Cavendish varieties are resistant. Cooking bananas are susceptible, but the damage is usually small. There is no information on the FHIA varieties from Honduras, Central America.

CHEMICAL CONTROL: Not needed. It is not an important disease of commercial varieties, and is not likely to affect the yield of susceptible varieties enough for fungicides to be worthwhile.

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Sorghum Leaf Streak

Farmer
Fact Sheet

73

What is it?

It is a disease caused by a bacterium. It infects sorghum, millet, Johnson grass. Maize is a minor host. The common name is Bacterial leaf streak. The scientific name is *Xanthomonas*.

Damage

The spots and streaks join together to form large dead areas, usually beginning on the lower older leaves, and moving upwards. However, whether the disease affects yield is not known. Only one variety is grown in Solomon Islands; this is for livestock feed, and it usually matures before major damage is done.



How do I identify it?

Look for narrow, reddish-brown, 2-3 mm wide, 5-15 mm long, rectangular, streaks on the leaves and stalks (photo, left); the streaks join together in wet weather, and move from the lower leaves upwards. Look for leaves that die and hang down around the stem (photo, right).

The bacteria ooze from the spots during wet weather, and are spread in wind and rain. The bacteria also spread from crop debris in the soil, and also from wild grasses.

How to manage sorghum leaf streak

CULTURAL CONTROL: After harvest, burn all leaves and stems; do not plant sorghum on the same land two crops in succession; and take seed only from crops free from the disease.

RESISTANT VARIETIES: There is no information on resistant varieties in Solomon Islands, although there are reports of resistance elsewhere.

CHEMICAL CONTROL: Not a method to use. Sorghum is not grown commercially in Solomon Islands; it is grown for village poultry where use of chemicals would be uneconomic.

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Maize Mosaic Virus

Farmer
Fact Sheet

74

What is it?

The disease is caused by a virus that infects maize and sweet corn, and the wild grass, *Rottboellia* (itch grass), which is common on the Guadalcanal Plains and elsewhere in Solomon Islands. The scientific name: is *Maize mosaic nucleorhabdovirus*.

Damage

Although a common disease, and individual plants are severely affected, usually only a few are present in any one garden. Plants are stunted (photo, right), cobs are absent, or deformed, with fewer seeds than normal. Sweet corn appears to be more susceptible than maize.



How do I identify it?

Look for stunted plants with light green to yellow stripes along the leaves (photo, left). These stripes are either narrow, the width of a single leaf vein, or in bands 1-2 cm wide.

The virus is spread by an insect called a plant hopper (*Peregrinus*) that lives and breeds on maize and *Rottboellia*. The plant hoppers feed on these plants, acquire the virus and, after a few days, spread it as they feed. They continue to spread the virus until they die.

How to manage maize mosaic virus

CULTURAL CONTROL: Pull out plants as soon as symptoms are seen. DO NOT wait; otherwise, the insects will breed and spread the disease. Pull out by grasping the young leaves, holding them together, to prevent the insects in the “funnel” from escaping. Burn the plants and insects.

RESISTANT VARIETIES: Maize and sweet corn have been bred for resistance to this disease.

CHEMICAL CONTROL: Not a method to use. It would not be practical to use insecticides to kill the plant hoppers that spread the virus. Removal of plants is the best option.

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Coconut Seedling Blight

Farmer
Fact Sheet

75

What is it?

It is a disease caused by a fungus that only infects coconut. The common name is Coconut seedling blight. The scientific name is *Bipolaris*.

Damage

This is mostly a disease of coconut seedlings. Weak seedlings, growing under poor conditions - crowding, poor nutrition and too much shade - are most affected. Infection causes leaves to dry up and die early, and the defoliation slows growth.



How do I identify it?

This is a distinctive disease on seedlings, especially in crowded nurseries. Look for large numbers of oval, brown leaf spots that rapidly expand, join together and develop into a blight. Large parts of the leaves are killed. Spores of the fungus are mostly formed on the underside of the leaf spots during wet weather, and are spread by wind.

How to manage coconut seedling blight

CULTURAL CONTROL: In the nursery, make sure seedlings have enough water, correct nutrition (get advice from your extension agent), and that the space between them is sufficient to allow movement of air. If the problem remains, reduce the shade, or remove it completely.

RESISTANT VARIETIES: None known

CHEMICAL CONTROL

Fungicides should only be considered after the reduction of shade and the application of fertilizer, especially potassium. If fungicides are required, use chlorothalonil, copper oxychloride or mancozeb.

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Grey Leaf Mould

Farmer
Fact Sheet

76

What is it?

It is a disease caused by a fungus. There are several common names: Tomato leaf mould, Leaf mould, Tomato grey leaf mould. The scientific name is *Passalora*.

Damage

It is a serious disease in cooler, wetter, highland areas of Solomon Islands. Plants rapidly lose leaves, from the bottom upwards. If infection comes before fruits are formed, crop loss is high. Infected flowers may fail to set fruit. In coastal areas in Solomon Islands, another leaf mould disease, Black leaf mould, *Pseudocercospora*, occurs (see Fact Sheet no. 45).



How do I identify it?

Look for yellow spots and irregular yellow patches on upper surfaces of lower leaves, with brown to green areas on the underside. Look for plants where leaves dry up and die rapidly.

The fungus survives as spores or as cotton-like fungal growth in dead tomato plants of the last crop. Spores are spread in air currents, by water splash, or on tools and clothing.

How to manage grey leaf mould

CULTURAL CONTROL: Remove infected lower leaves as soon as the first three or four fruit bunches have been picked; after harvest, remove and destroy (burn) **all** plant debris; do not plant one crop of tomatoes after another on the same land.

RESISTANT VARIETIES: Leaf-mould resistant varieties are available. However, the fungus changes readily (there are many strains), and varieties may not be resistant to them all.

CHEMICAL CONTROL

Use chlorothalonil (Bravo), copper oxychloride or mancozeb. Treatment should start when the yellow spots are first seen, and continue at 10-14 days intervals until 3-4 weeks before last harvest. It is important to spray both sides of the leaves.

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Sugarcane Fiji Disease

Farmer
Fact Sheet

77

What is it?

A virus causes the disease. It infects sugarcane, and pitpit or lossi - the variety with edible flowers. An insect plant hopper called *Perkinsiella* (photo, right) spreads the virus.

Damage

Plants are stunted with short, narrow, horizontal leaves (photo, left). The poor growth results in small stems for eating, compared to healthy plants of the same age. However, in Solomon Islands, gardens have only a few sugarcane plants; usually plants are harvested before the disease appears, and the number of plants with the disease is usually low.



How do I identify it?

Look for galls (outgrowths or bumps) on the under surface of the leaves, along the midrib and large veins; some are very small, others up to 50 mm long, 2-3 mm wide and 1-2 mm high. The galls are a sign of the disease. Diseased plants look as if cattle have eaten them.

How to manage sugarcane Fiji disease

CULTURAL CONTROL

- Remove plants as soon as symptoms are seen, and burn them;
- DO NOT use stems from diseased plants for growing, even if some stems appear healthy;
- If plant hoppers are present on the young leaves, hold the leaves together to stop them from escaping and spreading the virus, then pull out the plant and burn it.

RESISTANT VARIETIES: There is no information on these in Solomon Islands, but resistant varieties have been bred in Australia.

CHEMICAL CONTROL: The use of insecticides is not a method of control that can be recommended for sugarcane grown for household use.

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Cabbage-heart Caterpillar

Farmer
Fact Sheet

78

What is it?

It is a pest of plants in the cabbage (*Brassica*) family - broccoli, cauliflower, Chinese cabbage, head cabbage, mustard and radish. It is called the Large cabbage-heart caterpillar. The scientific name is *Crocidolomia*.

Damage

Caterpillars do the damage. They feed on plants of all stages of growth, except seedlings; mostly they feed at the centre or “heart” of the plants, and cause severe damage (photos, left & right). They often occur with Diamond back moth caterpillars (see Fact Sheet no. 20).



How do I identify it?

Look for eggs laid in groups (10-100 eggs) on the undersides of outer leaves. Look for caterpillars with white or pale green stripes (photo, right). Look for thick webs over the leaves.

How to manage cabbage-heart caterpillar

NATURAL ENEMIES: There is no information about them in Solomon Islands; however, it is likely that small wasps, flies, ladybeetles and lacewing larvae are natural enemies.

CULTURAL CONTROL: Check seedlings in the nursery for eggs and young caterpillars; if found, remove leaves or plants; hand pick caterpillars from plants in the field when numbers are low; grow plants under nets; use mustard as a “trap” crop – plant it between rows of cabbages and other *Brassic*as (eggs are laid on mustard rather than cabbages); destroy crop remains after harvest, and remove weeds in the *Brassic*a family before planting and as the crop grows.

CHEMICAL CONTROL

- Use Bt or Spinosad (bacteria products); make sure the spray covers all parts of the leaves;
- Use Bt or Spinosad as soon as damage is seen;
- With Bt, small larvae are more susceptible than fully grown ones;
- Other insecticides should be avoided, as they will kill natural enemies.

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Sliperi Kabis Virus

Farmer
Fact Sheet

79

What is it?

The virus infects sliperi kabis and ornamental Hibiscus. The scientific name is *Hibiscus chlorotic ringspot virus*.

Damage

Symptoms are common wherever *sliperi kabis* is grown, with patches of light green, scattered amongst the normal dark green of the leaves (photo, lower leaf and to right). It is likely that the virus is present in all *sliperi kabis* in Solomon Islands. However, it is difficult to know if the virus affects growth, as there are no healthy plants to compare. Ringspots occur on Hibiscus, but are uncommon on *sliperi kabis*. The ringspots are pale green circles, 2-3 mm diameter.



How do I identify it?

Look for patches of light and dark green on the leaves (photo, lower leaf & leaf to right); sometimes the leaves are misshapen, but that is not common. Look for ringspots on Hibiscus leaves.

How to manage sliperi kabis virus

- There is no information of the affect of the disease on plant growth, this and the fact that growers rarely recognise symptoms, suggests that the impact of the virus is small. However, it is recommended to take cuttings from plants with the best growth.
- There is no information on the way the virus is spread, other than in infected cuttings - this is the most important way. Beetles and, perhaps, fungi spread similar viruses in other crops, but nothing is known for this virus.

Another cause of yellowing on sliperi kabis leaves

Note, insects called jassids (yellow, 2 mm long leaf hoppers) also cause pale green patches on the leaves of *sliperi kabis*. Patches occur at the leaf margins and between the main veins (**see Fact Sheet no. 39**). The jassids may inject a poison into the leaves as they feed. Derris can be used to manage the jassids (**see Fact sheet no. 56c**).

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Maydis Leaf Blight

Farmer
Fact Sheet

80

What is it?

It is a disease caused by a fungus that attacks maize and sweet corn. The disease also affects sorghum and many grasses. Another common name is Southern leaf blight of maize. The scientific name is *Cochliobolus*.

Damage

The disease can be severe, depending on the weather, strain, and varieties grown. Damage is worse if infection occurs before the silk stage, and temperatures and humidity are high during ear development. Yield loss is probably low in Solomon Islands, as imported varieties of maize have resistance. Some strains of the fungus are seedborne and kill seedlings at germination.



How do I identify it?

Look for light brown, oval spots with darker margins, becoming rectangular, up to 2.5 cm long between the veins. Look for large areas of dead leaf as the spots grow together.

How to manage maydis leaf blight

CULTURAL CONTROL: Grow maize and sweet corn in the open, adding manures (animal or plant), mulches or commercial fertilizer to improve plant growth and disease resistance; remove remains of maize harvests or plough them into soil; remove self-sown maize and/or sweet corn plants; **DO NOT** grow maize on the same land, one crop after another; and plant at wider than normal distance to reduce humidity in the crop, if disease is severe.

RESISTANT VARIETIES: Most varieties grown in Solomon Islands have some resistance, and this is the main method of managing the disease.

CHEMICAL CONTROL: Fungicides should only be use if resistant varieties are unavailable. The fungicides should be applied when lesions first appear, and repeated depending on the weather conditions. Mancozeb and chlorothalonil (Bravo) are recommended.

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Bacterial Spot

Farmer
Fact Sheet

81

What is it?

It is a disease caused by a bacterium that attacks tomato and pepper. The scientific name is *Xanthomonas*.

Damage

The disease is worse in wet weather. Small, dark-brown spots, 2-3 mm across, develop on the leaves (photo, left), leaf stalks and stems (photo, right). The shapes of the spots vary; and some have yellow margins. Slightly raised spots occur on the fruits. Spots join together, especially at leaf tips and margins, and leaves turn yellow and sometimes drop off.

Rain and overhead watering spread the disease from plant to plant. It is also spread on the outside of seed. The bacteria can survive on plant remains in the soil.



How do I identify it?

Look for large numbers of small, irregular-shaped spots on the leaf and stem. The spots may also occur on the fruit.

How to manage bacterial spot

CULTURAL CONTROL

- Leave 2-3 years between crops on the same land. Rotate with other crops, but not pepper;
- Remove weeds within the crop and at the borders. Remove crop debris after final harvest;
- If hand watering, avoid splashing water on the leaves; mulch plants to stop water-splash;
- DO NOT use seed from infected plants;
- DO NOT work in the crop when plants are wet, as the disease can be spread on clothes.

CHEMICAL CONTROL: Use copper fungicides, or copper plus mancozeb. Apply after transplanting and at 7-10 day intervals. Note, in wet, windy weather sprays often fail to give good control.

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Blossom End Rot

Farmer
Fact Sheet

82

What is it?

It is NOT caused by insects, fungi, bacteria or other organisms. It is a rot of tomato, pepper and eggplant. It occurs because fruits lack calcium. Calcium is an important part of cell walls. Plants take up calcium in water through their roots. If there is either too little water, or too much, plants become short of calcium. Too much nitrogen fertilizer can make blossom end rot worse.

Damage

Blossom end rot occurs at any time when plants are flowering and fruiting, but it is more common on the first fruit. Grey areas appear at the blossom or flower end of fruits, and these darken and become larger as the fruits grow. Large rots quickly dry out and become leathery.



How do I identify it?

Look for large brown spots at the base of the young fruit where the flowers were.

How to manage blossom end rot

Note, once fruits show signs of blossom end rot they cannot be made healthy again, so it is important to prevent the problem from occurring.

CULTURAL CONTROL

- DO NOT allow the soil to dry out; try to make sure that the soil is moist at all times, particularly at the flowering stage;
- Grow tomatoes in well-drained soil that contains plenty of organic matter; organic matter holds water, and also gives the plants the nutrients they need, including calcium;
- Plant on raised beds if there is a chance that the plants will get too much water;
- In hot, dry times, provide shade and windbreaks;
- Mulch the plants after transplanting with dried grasses, and other dried weeds, to help prevent the soil from drying out. The mulch should be at least 10 cm thick.

RESISTANCE VARIETIES: Plum- or pear-shaped varieties are more susceptible.

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Insect-eating Ladybeetles

Farmer
Fact Sheet

83

What are they?

They are insects that eat other insect pests - aphids, mealybugs, scale insects, and eggs of caterpillars - and also mites. There are several different kinds in Solomon Islands.

How do I identify them?

Look for adults with bright shiny, round bodies, which are red or orange with black markings or spots (photo, left). Look for eggs, which are a creamy yellowish-orange, laid in groups close to aphid colonies. Look for the larvae, which are long, active, dark with yellow or red spots and patches (photo, right). They look like miniature crocodiles! Look for the pupae attached to a leaf or branch, looking like a curled up larva. Both adults and larvae eat other insects.



Note, the adults do not have soft, short hairs over their bodies, like the ladybeetles that eat the leaves of crop plants (see **Fact Sheet no. 58**).

How do I manage insect-eating ladybeetles?

Ladybeetles are very good biological control agents, but there are two facts that are important: a) they need food to survive; and b) they are easily killed by insecticides. This is what you can do to spread them in a crop, and help them survive.

MOVE THEM AROUND

Handpick adults and larvae, and pluck leaves with eggs and pupae, place them in a collecting (jam) jar, and release them on crop plants with aphids, mealybugs, scales and mites.

GIVE THEM FOOD

Plant flowers in the field and around the edges to encourage ladybeetles to stay. Basil and marigolds are useful garden flowers.

USE OF PESTICIDES

Use pesticides only if ladybeetles are absent or in low numbers. If pesticides are needed, use ones that are active for a few days only, for example, Derris, pyrethrum, or synthetic pyrethroids. These are destroyed rapidly by sunlight.

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Hoverflies

Farmer
Fact Sheet

84

What are they?

They are a type of fly whose larvae (maggots) feed on greenfly (aphids). There are several different kinds in Solomon Islands. The one shown here is *Ischiodon*.

How do I identify them?

Look for adults with one pair of wings, and yellow and black-banded bodies (photo, left). They are often seen hovering over flowers, quickly changing direction and hovering again, or sitting on flowers sucking nectar. They lay a single white oval egg among aphids. The maggots (photo, right) are up to 10 mm, light green at first then darker, and have strong mouthparts to grab, hold and suck aphids dry. They have short soft spines on their sides (photo, right).



Hoverflies are common and occur in many crops and among weeds. Some adult hoverflies are mistaken for wasps: they have narrow waists like wasps, and they are found on flowers. However, hoverflies do not sting, and they have only one pair of wings. Wasps have two pairs, and fold their wings along their bodies at rest, whereas hoverflies hold them out sideways.

Hoverfly maggots are important pest control agents, eating aphids mostly, but also thrip, small caterpillars and mealybugs.

How do I manage hoverflies?

There are two facts that are important: a) the adults and maggots need food to survive; and b) they are easily killed by insecticides. This is what you can do to help them survive.

GIVE THEM FOOD

Plant flowers in the field and around the edges to provide nectar for adult hoverflies. Large open flowers, such as daisies, are particularly good sources of food for the adults.

USE PESTICIDES CAREFULLY

Use pesticides only if aphid populations are high and hoverfly maggots are absent or in low numbers. If pesticides are needed, use ones that are active for a few days only, for example, Derris, pyrethrum, or synthetic pyrethroids. These are destroyed rapidly by sunlight.

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Sunscald

Farmer
Fact Sheet

85

What is it?

Sunscald is not caused by pests or diseases. It is caused by the sun heating the fruit when there are not enough leaves on the plants. It is a problem of capsicum, large red chilli pepper, tomato and eggplant. The leaves fall down when they are attacked by insects, diseases, lack water or branches are broken.

Damage

Symptoms occur on the side of the fruit facing the sun, while it is still green. On capsicum, a white, soft, sunken area develops that later dries out and becomes like paper (photo). On tomato, the damaged area is white, shiny and blistered, becoming sunken and wrinkled.

Fruits affected by sunscald are not marketable, but the good parts can still be used in the home. Sometimes, the damage provides entry points for fungi and bacteria that cause rots.



How do I identify it?

On the sides of fruit facing the sun, look for sunken areas that are white and papery on capsicum, and white and shiny becoming wrinkled on tomato.

How to manage sunscald

RESISTANT VARIETIES: None known; but choose those that develop good leaf cover.

CULTURAL CONTROL

- Provide sufficient nitrogen (manure or commercial fertilizer) for healthy plant growth;
- At least once a week look for signs of insect pests and diseases destroying the leaves;
- Water regularly in dry weather, to prevent plants from wilting;
- On tomatoes, remove flowers until plants are big enough to support fruit and have enough leaves to provide protection;
- Stake (or provide wires or strings) plants to minimise damage due to wind and harvesting;

CHEMICAL CONTROL: Use pesticides only to protect leaves from damaging insects, mites and diseases. For insects: **nos. 31 and 28**; for mites, **no. 49**; and for diseases, **nos. 45, 76 and 81**.

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The World Vegetable Center

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Thrips

Farmer
Fact Sheet

86

What are they?

Thrips are small, 2 mm long, narrow insects that live in young leaves and flowers. In Solomon Islands they are common on tomato and bell pepper.

Damage

Thrips pierce plants cells and suck out the juices. As they feed, the cells collapse causing pits, shiny brown leaves (photo, lower right), scars on fruits (photo, left), and twisted growth. Damaged fruits are unsuitable for market, and damaged leaves dry out and die early. In other countries, thrips spread viruses, but it is not known if this happens in Solomon Islands.



How do I identify them?

Look on the underside of leaves and inside flowers. Use a hand lens to see the long slender, black bodies of the adults. Look for brown, silvered leaves, and black/brown specks where thrips feed; these are faeces. The presence of faeces is a way of telling thrips from mites.

How to manage thrips

NATURAL ENEMIES: Other kinds of thrips, mites, lacewing larvae and ladybird beetles eat thrips.

CULTURAL CONTROL:

- Intercrop peppers and e.g., yard long beans to slow spread of thrips between rows;
- Rotate with non-host plants to break lifecycle, and destroy remains after harvest;
- Destroy weeds within and around crops to prevent build up of thrips populations;
- Use a hose with a strong jet of water to remove thrips from the plants.

CHEMICAL CONTROL:

- Use botanical sprays such as onion, garlic, chilli and papaya (**see Fact Sheet no. 56b,c**);
- Use horticultural oils or soap (**see Fact Sheet no. 56d**);
- Use neem to discourage adults from feeding and laying their eggs on the plants;
- Use synthetic pyrethroids (e.g., lambda cyhalothrin or cypermethrin) only as a last resort.

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Cotton Leaf Roller

Farmer
Fact Sheet

87

What is it?

It is an insect that attacks sliperi kabis, and sometimes okra, in Solomon Islands. Elsewhere, it is a major pest of cotton.

Damage

The caterpillars roll the leaves, eating the edges and parts between the main veins (photo, top left). At first, the caterpillars stay together, later they stay alone inside the rolled leaves. Serious damage can occur (photo, top right), worse on broad-leaf varieties (“frog”) than those with deeply divided leaves (“noodle hair”). Early leaf fall is common.



How do I identify them?

Look for rolled sliperi kabis leaves. Look for webbing around the caterpillars. Look for caterpillars with two black spots just behind the head (photos, lower left & right).

How to manage cotton leaf roller

NATURAL ENEMIES: There are no reports from Solomon Islands.

CULTURAL CONTROL: Pinch rolled leaves to kill the caterpillars; prune rolled leaves, and burn.

CHEMICAL CONTROL: Use botanical sprays from onion, garlic, chilli and derris, or use neem to discourage adults from laying eggs on the plants (**see Fact Sheet no. 56b,c**); use horticultural soap or oils (**see Fact Sheet no. 56d**); use commercial products containing bacteria, such as spinosad (Success) and Bt – *Bacillus thuringiensis* var. *kurstaki*; use commercial pyrethrum and derris, or synthetic pyrethroids (e.g., lambda cyhalothrin or cypermethrin) only as a last resort.

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Dasheen Mosaic Virus

Farmer
Fact Sheet

88

What is it?

It is a disease caused by a virus. It affects taro (photos, top row), kongkong taro (photo, bottom, left), edu (photo, bottom right), kakake, and ornamental plants in the same family. The virus is spread by aphids or green fly (see **Fact sheet no. 38**) or in planting material.

Damage

Light green streaks occur along the main veins of the leaf or between the veins. Often the streaks have a feather-like shape. Sometimes, the streaks occur all over the leaf (photo, top left), but often they just show in a single patch (photo, top right). Only one or two leaves show symptoms, before healthy leaves appear. Usually, damage is slight.



How do I identify it?

Look for leaves showing feather-like symptoms, often along the main veins, but sometime between the veins. The colour of the patterns is yellow-green or grey, clearly distinct from the green of the leaves.

How to manage dasheen mosaic virus

There is no way to control this disease. It is probable that all taro in Solomon Islands have the virus inside them. Signs of the disease only appear occasionally; at other times the plant looks normal. Usually, damage to leaves is slight, and yields are not affected or only slightly. If leaves are severely twisted and growth is poor, put a rice bag over the plant, pull it out and burn it, together with any insects.

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Taro Rhabdoviruses

Farmer
Fact Sheet

89

What are they?

They are viruses that affect taro. One virus is called Colocasia bobone disease virus (CBDV), the other Taro vein chlorosis virus (TaVVCV). The viruses are spread by planthoppers (**see Fact sheet no. 1**) or in planting material. Under the microscope the viruses look the same, but they affect taro in different ways. These diseases do not have names in Solomon Islands.

Damage

The viruses affect the leaves. CBDV causes dark green crinkled patches on the leaves (Photos, top right & left); TaVVCV causes yellowing of the veins, either the large ones (photo, bottom right) or smaller ones (photo, bottom left). Sometimes the yellow veins have a feather-like pattern (photo, bottom right). As the leaves age the yellow lines turn brown. It is not likely that the viruses lower corm yield, BUT they might cause alomae when present with other viruses.



How do I identify them?

CBDV: Look for leaves showing deformed, thickened patches which are dark green (CBDV).
TaVVCV: Look for plants showing bright yellow, feather-like symptoms along the main veins.
Look to see that only 1 to 2 leaves show symptoms before healthy leaves appear.

How to manage taro rhabdoviruses

These viruses are not important on their own, but may occur with others causing alomae.

- Do not grow “male” and “female” taro in the same garden;
- If signs of these diseases are seen, mark plants with a stake; at harvest cut off the corms, sell or eat them, and burn the plant and suckers – DO NOT REPLANT;
- If alomae occurs, remove the plants and/or use chemicals to kill the planthoppers (**see Fact sheet no. 1**).

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Coconut leaf spots

Farmer
Fact Sheet

90

What are they?

They are leaf spots caused by fungi. One is called Brown leaf spot (photo, left) and the other Grey leaf spot (Photo, right). They affect coconut, betel nut, oil palm and other palms.

Damage

Both are more severe on older leaves. But neither is likely to lower nut production. The spots are worse at rainy times of the years, and also where soil conditions are poor. Rain and wind spread the spores.



How do I identify them?

Brown leaf spot: Look for oval spots on the upper surface of older leaves, 10 mm long and 4 mm wide. The spots have a grey centre and a relatively wide dark brown margin. Black powdery spore masses develop on the underside of the leaves. **Grey leaf spot:** Look for spots up to 15 mm long, grey with a thin dark brown border. Sometimes the spots join together, and sometimes have yellow margins. Tiny black dots in the spots are where the spores develop.

How to manage coconut leaf spots

CULTURAL CONTROL: Leaf spots are diseases of older leaves and not worthwhile controlling, although occasionally they are severe during long periods of wet weather, and/or where palms are growing in poor soil. If control measures are warranted, improve nutrition and growing conditions. If spots occur in nurseries, and these are under shade, decrease shade levels.

CHEMICAL CONTROL: It is very unlikely that fungicides would be needed against these diseases. If they are, use chlorothalonil, copper oxychloride or mancozeb.

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Citrus Canker

Farmer
Fact Sheet

91

What is it?

Bacteria cause spots on leaves, fruits and twigs; those on twigs result in cankers. The scientific name is *Xanthomonas*.

Damage

The spots are raised blisters with sunken centres, brown, on leaves (photo), fruits and twigs; where storms are common, leaves fall early and fruit drops before it is mature. The centres of the spots on the leaves may fall out. Canker develop on the twigs, and cause dieback.



How do I identify it?

Look for the raised spots, light brown at first, gradually darkening and forming a crater, on leaves, stems and fruit. Hold the leaves to the light, and look for a water-soaked margin to the spot, surrounded by a bright yellow ring. Check that the leaves are not distorted or misshapen.

How to manage citrus canker

QUARANTINE: Do not take plants from Guadalcanal, until it is known where the disease is in Solomon Islands. If necessary, only take seed of rootstocks and graft local scions on them.

CULTURAL CONTROL: Check that plants from nurseries are disease free; do not work in infected orchards when the foliage is wet from dew and rain; plant windbreaks around blocks and/or between rows of large citrus plantations. (A 10 m tall windbreak is effective for about 100 m.)

RESISTANT VARIETIES: Valencia orange and mandarin have resistance.

CHEMICAL CONTROL: Apply 2 or 3 sprays of copper 3 weeks apart, beginning when the fruits are about 0.5 cm diam. The important time is the 90 days after petal fall, when fruits are susceptible. Where leafminers are a problem, use petroleum oil on the leaves. Leafminers do not spread canker, but damage the leaf increasing the number of canker infections.

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Frog-eye Leaf Spot

Farmer
Fact Sheet

92

What is it?

It is a disease of capsicum (peppers), and chillies caused by a fungus. The scientific name is *Cercospora*.

Damage

In wet weather, leaves fall (photo, left), and this leads to loss of fruit yield. In severe cases, a stem-end rot occurs on the fruits.



How do I identify it?

Look for brown roughly circular spots, up to 10 mm diameter, with whitish centres. Look for leaves with brown spots and areas between that are yellow (photo, right top row).

How to manage frog-eye leaf spot

CULTURAL CONTROL

- Do not plant one crop of capsicum or chilli after another on the same land. Leave a gap of at least 3 years between crops where the disease occurred;
- The fungus is seed borne. Make sure fruits selected for seed do not have fruit-end rots.

RESISTANT VARIETIES

None known.

CHEMICAL CONTROL

Use chlorothalonil (Bravo), copper oxychloride or mancozeb. Treatment should start when the spots first appear, and continue at 10-14 days intervals until 3-4 weeks before last harvest. It is important to spray both sides of the leaves.

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Yam Scale

Farmer
Fact Sheet

93

What is it?

It is an insect that attacks yams, ginger, taro, turmeric and other plants in the field and also when stored. The scientific name is *Aspidiella*. It is called an armoured scale.

Damage

The scales damage the yams when stored. When they occur in large numbers (photo, right¹), the yams look white (photo, left). They have long tube-like mouthparts that pierce yam tubers and feed on the flesh beneath, and this causes the tubers to dry out.



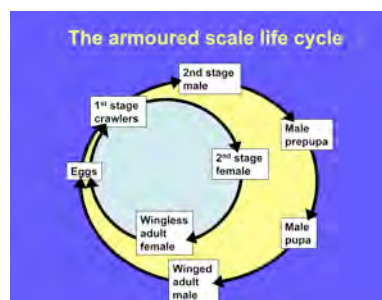
How do I identify it?

Look for stored yams that are light brown to grey. If possible, use a hand lens to look for the scales, less than 1 mm diameter. Note, the scale is covered by the waxy “armour”, which protects it. Eggs are laid and tiny “crawlers” spread the scale before settling down to feed. The females stay in place, feeding and breeding; males change to tiny fly-like insects with wings, mate then die.

How to manage yam scale

CULTURAL CONTROL: Check the surface of yams before they are stored. If scales are seen, refer to **CHEMICAL CONTROL** below; inspect stored yams regularly, and remove those with scales. Eat them, or refer to **CHEMICAL CONTROL** below and store the yams again.

CHEMICAL CONTROL: Use horticultural oil or soap solution on yams with scale: a) after harvest and before yams are placed in the store; b) during storage on yams where infestations begin; and c) at the time of planting before the tubers are cut (see **Fact Sheet no. 56d**).



¹ Kindly provided by Georg Goergen, International Institute of Tropical Agriculture, Benin

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Taro Leaf Spots

Farmer
Fact Sheet

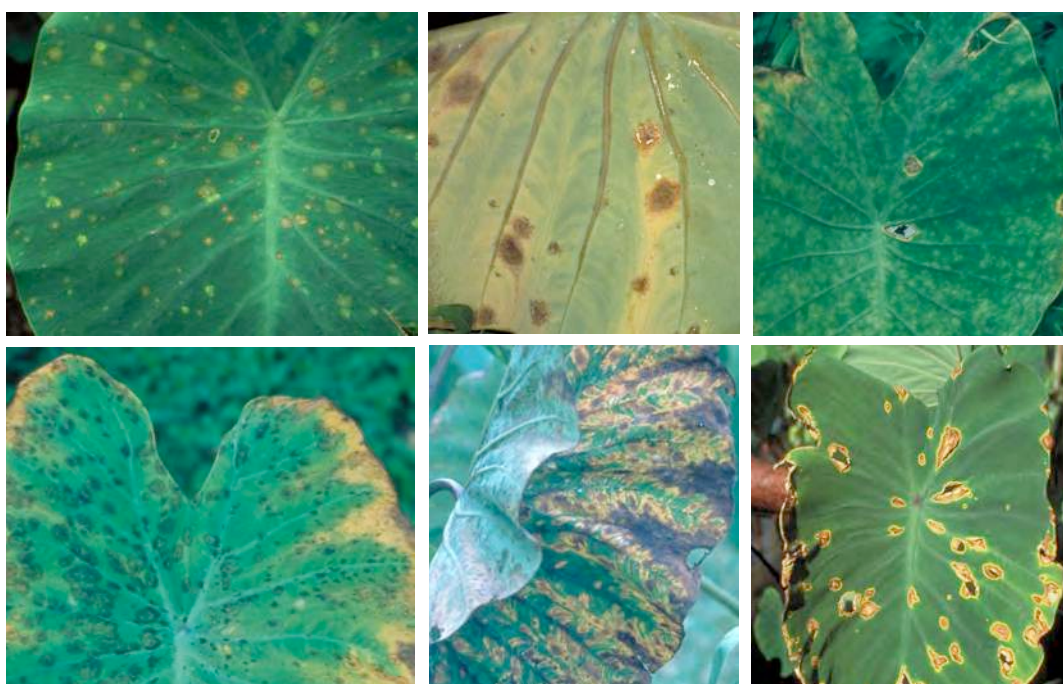
94

What are they?

Leaf spots caused by fungi: Brown (Ghost spot) (photos, left top & bottom), Orange (photos, middle top & bottom) and White leaf spot (photo, right top), and Shot-hole (photo, right bottom). Scientific names are: *Cladosporium*, *Neojohnstonia*, *Pseudocercospora* and *Phoma*.

Damage

None of the diseases is likely to affect corm yields; they mostly occur on older leaves. Brown and Orange leaf spots on the top of the leaf do not always show on the underside. The fungi producer spores and these are spread by rain-splash or wind driven rain.



How do I identify them?

Brown, Orange and White leaf spots are similar. Look for leaf spots up to 15 mm diameter, without clear margins. Look for spots on the top of the leaf which do not penetrate below. Centre of spots on underside may go darker as spores develop. Look for centres of the spots that have fallen out, known as shot-hole.

How to manage taro leaf spots

These are common diseases, but only on older leaves and control measure are not needed.

RESISTANT VARIETIES: Some varietal differences are said to exist for all four diseases. This is especially true for Shot-hole.

CHEMICAL CONTROL

No fungicides are recommended because these diseases do not cause yield loss.

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Cassava Brown Leaf Spot

Farmer
Fact Sheet

95

What is it?

The leaf spot is caused by a fungus. The scientific name is *Cercosporidium*.

Damage

The spots usually occur on older, lower leaves, but not until 5-6 months after planting. The leaf spots cause the leaves to fall down. Spores are produced on the spots on the lower surface and these are spread in rain-splash and wind-driven rain.



How do I identify it?

Look for brown round spots up to 15 mm diameter with yellow margins on older leaves (photo¹). Look on the underside of the leaf to see spots with grey margins without a clear line between spot and healthy leaf. Small veins crossing the spots are black. Look for spots with split centres, that sometimes fall out.

How to manage cassava brown leaf spot

There are reports of yield losses of up to 30% in Africa, 23% in South America, and 17% in India. There is no information from Solomon Islands.

If control is needed, plant cassava at wider than usual spacing so that water on the leavers dries out faster and there is less time for the spores to germinate; plant in the wet season so that plants mature in the dry season; use a crop rotation of between 3 and 5 years.

RESISTANT VARIETIES: No information is available from Solomon Islands. Check if there are differences in leaf fall between varieties, and choose those with the least.

CHEMICAL CONTROL

For chemical control, if needed, copper fungicides.

¹ The photo is used with kind permission of Eric McKenzie, Landcare Limited, New Zealand.

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Sweetpotato Flea Beetle

Farmer
Fact Sheet

96

What is it?

It is a very small beetle that feeds on sweetpotato. Its scientific name is *Chaetocnema*.

Damage

The beetles (photo, right¹ & arrowed left) are about 1.5 mm long. They feed on the top of the leaves, scraping off the surface and creating light green, pencil thin, irregular feeding marks (photo, left). It is unlikely that the feeding on the leaves affects the yield of sweetpotato roots.



How do I identify it?

Look for the feeding marks on the top surface of the leaf: they are very clear.

There have been no studies on the Sweetpotato flea beetle in Solomon Islands, but it is likely that the females lay eggs in the soil at the base of sweetpotato or other plants. The eggs hatch in 7 to 14 days, and the larvae, small white worm-like bodies, feed on the sweetpotato roots. These form pupae and about a week later the adults emerge.

How to manage sweetpotato flea beetle

CULTURAL CONTROL

- Select vines from plants without the feeding marks, ensuring that the cuttings do not contain adult beetles;
- Do not replant sweetpotatoes in the same plots where beetle damaged occurred in the previous crop, plant them as far away as possible.

RESISTANT VARIETIES: No resistant varieties are known.

CHEMICAL CONTROL: Not recommended; it is unlikely that the damage affects yield.

¹ By kind permission of the Mississippi Entomological Museum, Mississippi State University.

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Yam Rust

Farmer
Fact Sheet

97

What is it?

It is a disease caused by a fungus. Yams are the only crops infected. The scientific name is *Goplana*.

Damage

Yellow spots or pustules (photo) develop on the upper leaf surface (rarely on the underside), but sometimes on leaf stalks and stems. It is a minor disease in Solomon Islands; it comes late in the yam season, damage is relatively small, and tuber yields probably not affected. However, in recent years severe outbreaks have occurred in Pohnpei, Federated States of Micronesia.



How do I identify it?

Look for the yellow to light orange pustules on the leaf, more obvious on the upper surface, sometimes present on the leaf stalks and stems. At first, the pustules are covered, but later the leaf cells break open and the yellow spore can be seen. The spores are spread in the wind.

How to manage yam rust

The disease is usually of only minor importance and control measure are not needed.

QUARANTINE

In the 2000 to 2001 yam season in Pohnpei, FSM, a serious outbreak of yam rust occurred. The rust had been recorded there before, but was not known to cause a serious disease. This time, more than 80% of the plants were affected in some areas. Yam dieback (**see Fact Sheet no. 16**) was also present. It was suggested that a new strain of yam rust had developed with pustules on the stem as well as on the leaves. If true, this rust is a threat to countries elsewhere.

Do not bring any yams from Pohnpei to Solomon Islands, except through MAL.

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READ THE INSTRUCTIONS BEFORE USING ANY PESTICIDE

Green Vegetable Bug

Farmer
Fact Sheet

98

What is it?

A large green bug on brassicas, cucurbits, legumes and other crops. The scientific name is *Nezara*.

Damage

The bugs feed on young flowers, fruits and seeds using needle-like mouthparts. Feeding leads to brown or black spots. It also allows entry of fungi and bacteria that cause rots. On Yard long bean, the bugs sucks the seeds, and the pods become misshapen, dry and shrivelled.



How do I identify it?

Look for a large green bug about 15 mm long with long needle-like mouthparts often feeding on the seeds of Yard long beans and other legumes (photo, left). Look for them in the morning when they sit in the sun. Eggs are laid in batches on undersides of leaves, and the nymphs are black at first, becoming greener as they moult (photo, right). The bugs are strong flyers.

How to manage the green vegetable bug

CULTURAL CONTROL

- Avoid planting crops of beans next to older ones, as the bugs easily fly to the new crop;
- Weed around the crop, as many weeds are breeding hosts for the Green vegetable bug;
- Plant a trap crops such as Rattle pod, *Crotalaria*; the bug goes to the *Crotalaria* first.

CHEMICAL CONTROL:

- Use synthetic pyrethroids, eg lambda cyhalothrin or permethrin. Use those that are least persistent in the environment, and have low toxicity against bees.
- Use a variety of *Derris*, brought many years ago from Papua New Guinea. It contains rotenone, an insecticide. Contact MAL or KGA for plants to grow and test.

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Turnip Mosaic

Farmer
Fact Sheet

99

What is it?

It is a virus that infects many plants, brassicas in particular. In Solomon Islands, it has been found on Chinese cabbage. The scientific name is *Turnip mosaic potyvirus*.

Damage

The leaves show patches of yellow, and the plants are not suitable for the market. Often, darker green areas remain along side the main veins. It is a common and important disease.



How do I identify it?

Look for leaves with light and dark green patches. Spread of the virus is not through seed. It is spread by aphids (green fly). They feed on diseased plants with their long needle-like mouthparts, pick up the virus, fly to another plant, feed again and transfer the virus. It happens quickly. The virus also spreads in sap when growers handle plants.

How to manage the turnip mosaic

The virus has a wide host range, insecticides do not prevent its spread, and there are several strains. Once infected, plants cannot be cured, so it's important to prevent infection.

CULTURAL CONTROL

- Do not plant susceptible crops next to those with the disease; and do not plant them down-wind from infected crops; wind can carry adult winged aphids to healthy crops;
- Remove plants with symptoms from the nursery, and check others regularly;
- Wash hands frequently with soap and water when handling seedlings and transplanting;
- Weed around nurseries and crops in the field, as weeds are hosts of the virus and aphids.

RESISTANT VARIETIES: Resistant varieties of chinese cabbage are available.

CHEMICAL CONTROL: This is not an option. By the time the aphids are dead, they have already fed and passed on the virus. Sprays of mineral oil (see **Fact Sheet no. 56d**) may repel aphids.

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Cucumber Mosaic Virus

Farmer
Fact Sheet

100

What is it?

It is a virus that infects plants in many families, especially those in the cucumber, legume and tomato (including pepper/chilli) families. The scientific name is *Cucumber mosaic cucumovirus*.

Damage

When alone in many plants, eg chilli, tomato and pumpkin, the virus causes faint yellow patches on the leaves. In other plants, eg banana (photo, left) and snake gourd (photo, middle & right), symptoms are clearer. In both cases, yield loss is probably small. But often the virus occurs with other viruses (**see Fact Sheet no. 5**), symptoms are severe, and yield loss is likely.



How do I identify it?

Look for leaves with light and dark green patches. Spread is by aphids (green fly). They feed on diseased plants using long needle-like mouthparts, pick up the virus, fly to another plant, feed again and spread the virus. It happens quickly. The virus also spreads in sap when growers handle plants, and in some plants spread occurs in seed, but this is rare.

How to manage the cucumber mosaic

Note that once infected, plants cannot be cured, so it's important to prevent infection.

CULTURAL CONTROL

- Use only virus-free seed, ie if using own seed, take it from healthy-looking plants;
- Do not plant susceptible crops next to those with the disease; and do not plant them down-wind from infected crops; wind can carry adult winged aphids to healthy crops;
- Remove plants with symptoms from the nursery, and check others regularly;
- Wash hands frequently with soap and water when handling seedlings and transplanting;
- Weed around nurseries and crops in the field, as weeds are hosts of the virus and aphids.

RESISTANT VARIETIES: There are varieties of cucumber and courgette (zucchini) with resistance.

CHEMICAL CONTROL: This is not an option. By the time the aphids are dead, they have already fed and passed on the virus. Sprays of mineral oil (**see Fact Sheet no. 56d**) may repel aphids.

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Bacterial Stem Rot

Farmer
Fact Sheet

101

What is it?

It is a disease caused by a bacterium that lives in the soil. The scientific name is *Erwinia*.

Damage

A wet soft rot develops at the base of the leaf stalks (photo, arrowed). Serious losses can occur in Chinese cabbage crops, especially during hot wet weather.



How do I identify it?

Look for leaves that have wilted, and show a grey smelly rot at the stem base. Infections start from wounds (made by insects, planting or weeding) on the side closest to the soil. The outer leaves wilt, and then the whole plant. As the plants die, the bacteria are released into the soil.

How to manage bacterial stem rot

CULTURAL CONTROL

- Avoid waterlogging: plant Chinese cabbage on raised beds;
- Allow wind movement between the plants; do not plant Chinese cabbages too close;
- Mulch plants with straw or dried grass to stop soil splash during heavy rains;
- Do not damage plants when weeding, allowing entry of bacteria;
- Remove plants with signs of stalk rot as soon as it appears, and burn them;
- Remove crop debris or bury it deeply in the soil before a new crop is planted; preferably allow a few months for the crop remains to decompose before planting another crop;
- Rotate with other crops that are resistant to disease, eg beans, cucumbers or tomatoes.

RESISTANT VARIETIES: The variety Pak Choy is susceptible, so try other Chinese cabbage.

CHEMICAL CONTROL: This is not an option for this soil borne disease, unless the problem is associated with soil insects. In this case, use, eg imidacloprid.

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