



PROTECT YOUR KAVA

**How to manage pests and
diseases affecting kava**



This document was developed by the Australia and New Zealand funded **Pacific Horticultural and Agricultural Market Access Plus (PHAMA Plus) Program**, in close collaboration with: the Fiji Ministry of Agriculture and Waterways; Fiji National University; Australian Department of Agriculture, Fisheries and Forestry; New Zealand's Ministry for Primary Industries; the Pacific Community; and the Market Development Facility.

OVERVIEW

Kava production in Fiji is threatened by various pests and diseases, which can lead to significant loss of yields. Kava Dieback Disease (KDD), caused by Cucumber Mosaic Virus (CMV), and root-knot nematodes are among the most serious threats. Aphid vectors facilitate CMV spread, making integrated pest management critical. Mealybugs are very common, and can damage kava plants, particularly in dry conditions.

This guide outlines key strategies for early identification, disease prevention and sustainable management to improve kava yield and quality.

AIM OF THIS GUIDE

This guide aims to assist kava farmers with:

- Early detection of pests and diseases affecting kava to prevent widespread infection.
- Practical management strategies to control pests and diseases affecting kava.

LAYOUT

The first section of this guide describes the five important pests and diseases (listed below) affecting kava in Fiji:

Pests

1. Aphids
2. Root-knot Nematodes
3. Mealybugs

Diseases

1. Kava Dieback Disease
2. Shot Hole Disease

It outlines the key symptoms of each, and recommended prevention and management strategies for these. The final section outlines good plant health practices for growing kava.

APHIDS



Figure 1. An aphid colony on the underside of a leaf.



Figure 2. Crazy ants tending to aphids for their honeydew. The ants keep predators and parasitoids away and defend the aphids from their natural enemies. Winged aphids can be seen in the lower part of the photo.

Description

- Aphids are small sap-sucking insects (1-2 mm) and are usually referred to as greenfly or blackfly. They are commonly seen on the backs of young leaves or tips of shoots.
- Aphids are a major pest as they spread the Cucumber Mosaic Virus (CMV) by feeding on diseased plants and picking up the virus with their mouthparts. If they fly to healthy plants and feed again, those plants become infected.

Symptoms/damage

- Aphids usually cause yellowing of leaves and stunted growth of shoots on most plants.
- They also carry viruses that can cause mottling, mosaic patterns and curling leaves, which can affect plant growth.
- Many aphids excrete a sticky honeydew on which black sooty mould can grow. Ants might be found with aphid colonies tending to the aphids and getting honeydew in return.

Prevention and management strategies

- Check kava plants regularly for aphids, as well as plants that are nearby.
- Encourage populations of natural enemies of aphids such as lady beetle adults and larvae, lacewing larvae, ground beetles and hoverflies. It is important to keep a lookout for these natural enemies.
- Before planting kava, check surroundings for sources of aphids and remove these sources. Growing kava under trees can also reduce aphid movement into the field.
- If available, use yellow sticky traps or pheromone traps to catch flying aphids before they land on kava.
- Use of chemical pesticides should be avoided and should be a last resort as they can leave chemical residues in kava and can be damaging to the environment.
- Using homemade or natural pesticides can be another option.
- Use horticultural oil (made from petroleum), white oil (made from vegetable oil) or soap solution.

ROOT-KNOT NEMATODES

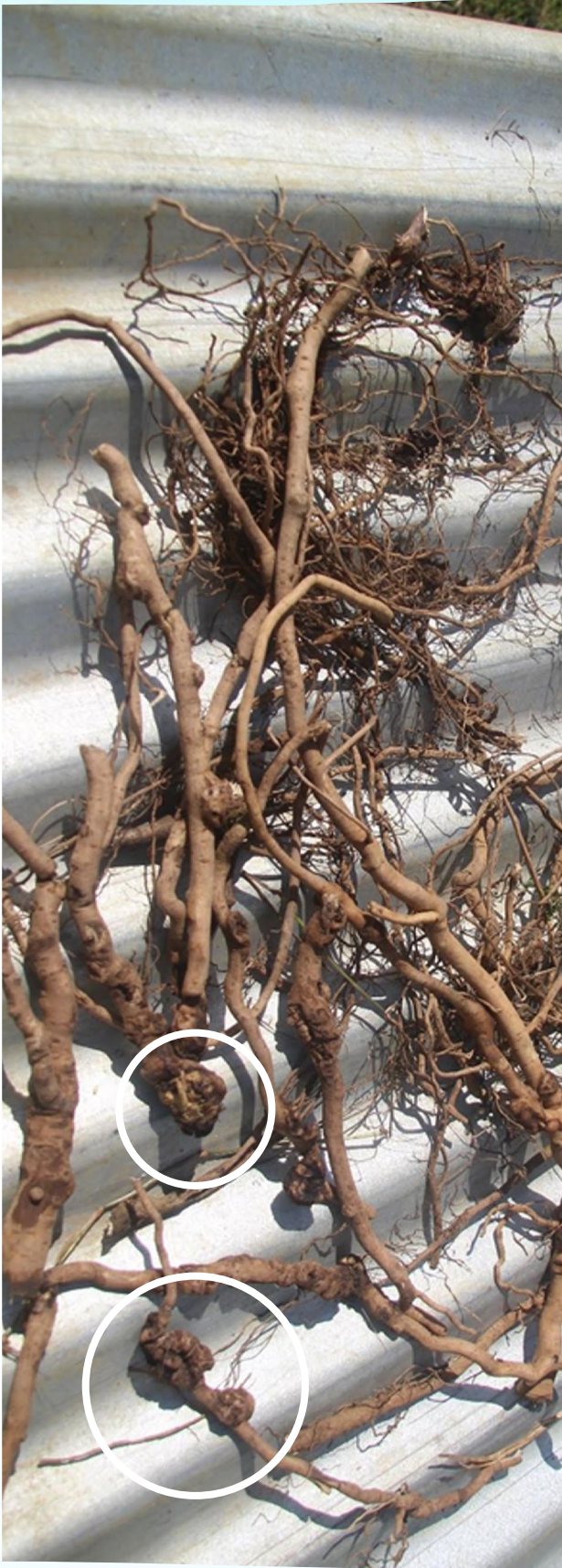


Figure 3. Root-knot nematode damage on roots showing the swelling and galling on infected kava plants and harvested roots that are being dried.

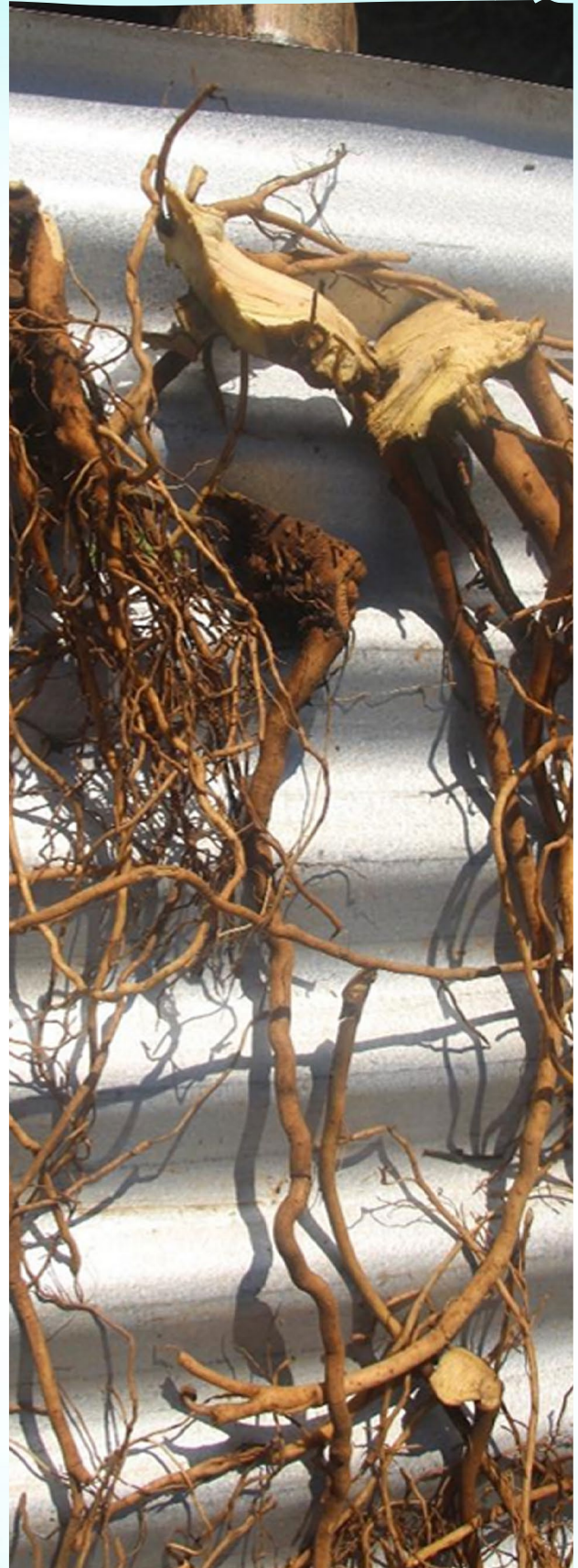


Figure 4. Healthy kava roots with no nematode damage.

Description

- Root knot nematodes are tiny worm-like organisms that usually cause distinctive swellings (galls) or deformities on the roots of affected kava plants.
- They are impossible to see with the naked eye and live in the soil.
- Adult female nematodes are spherical in shape and live inside roots.
- They can feed and develop within the galls. Such deformations disrupt the movement of food and water for the plants.



Figure 5. A nematode viewed under the microscope.

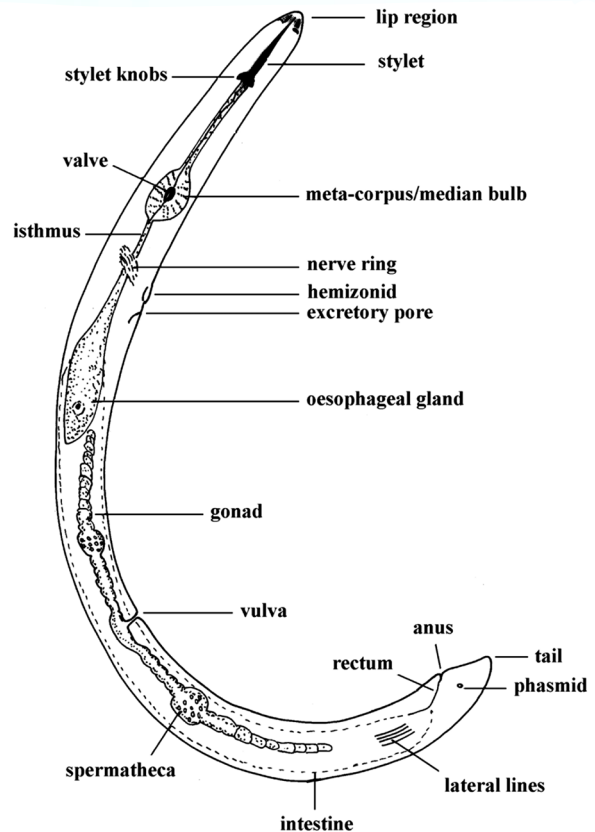


Figure 6. Nematodes are microscopic soil worms that attack plant roots.

Symptoms/damage

- Swollen, gall-like formations on roots.
- Nematode feeding disrupts movement of water and nutrients in the plant so plants are usually stunted and can also cause wilting.
- Plants are then prone to attacks from other pests and diseases.

Prevention and management strategies

- Existing infestations can be reduced when the piece of land to be planted is left to recover for at least three years. This practice is called fallowing.
- When preparing soil for planting in nurseries; soil solarisation should be carried out. This can either be done by covering a recently cleared piece of land (from where you will be collecting your potting soil) with black heavy duty plastic, or filling black heavy duty plastic bags with soil, and exposing them to sunlight. As the name suggests, this process uses the sun's heat to sterilise the soil by killing weed seeds, pests and pathogens.
- Plant in soil with high organic matter or mulch or improve soil with amendments as this also increases the population of natural enemies of nematodes in the soil.
- To prevent the spread of nematodes, avoid moving plants and soil from nematode infested areas, and clean gardening tools thoroughly before using them in the field.

MEALYBUGS



Figure 7. Mealybugs can significantly harm kava plants, causing stunted growth, yellowing leaves, and potentially transmitting diseases. Some are known to feed on roots.



Figure 8. Mealybugs feeding on leaves.

Description

- Mealybugs are insects in the family Pseudococcidae, unarmored scale insects found in moist, warm habitats.
- They are considered pests as they feed on the sap of crops, greenhouse plants, house plants and trees and also act as a carrier (vector) for several plant diseases.
- Mealybugs are most often present on leaves and stems, particularly in tight, protected spaces.
- Some mealybugs feed on roots. Some ants live with them, protecting them from predators and feeding off the honeydew which they excrete.

Symptoms/damage

- Damage plants by sucking sap from roots, leaves and stems.
- Heavy infestations cause stunting and distorted leaves, which turn yellow and fall off.
- This pest has a rapid multiplication rate, and a waxy body protecting it from natural enemies and pesticides.
- Small size allows them to hide in plant crevices, and an ability to feed on many plant species.

Prevention and management strategies

- Regular monitoring of plants especially stem end, underside of leaves and shoots.
- Using homemade or natural pesticides can be another option.
- Use horticultural oil (made from petroleum), white oil (made from vegetable oil) or soap solution. Spraying may not kill all mealybugs but it can help in reducing the population. This can be sprayed later in the afternoon to minimise the chance of leaves becoming sunburnt.
- White oil ($\frac{1}{2}$ cup cooking oil in 4 litres of water and $\frac{1}{2}$ teaspoon pure hand soap).
- Soap solution (5 tablespoons pure hand soap (not detergent) in 4 litres of water).
- Introduce natural enemies such as lacewings.

KAVA DIEBACK DISEASE (KDD)



Figure 9. Kava plant with advanced damage due to Kava Dieback Disease (A & B).

Description

- Kava Dieback Disease (KDD) is caused by Cucumber Mosaic Virus (CMV), a virus spread by aphids (*Aphis gossypii*) from infected to healthy plants.
- The virus, CMV, causes a moving soft rot that begins from the shoot tips or leaves of the kava plant to the stem and then the roots. Hence the name kava dieback disease.
- The most likely source of infection is infected planting material.

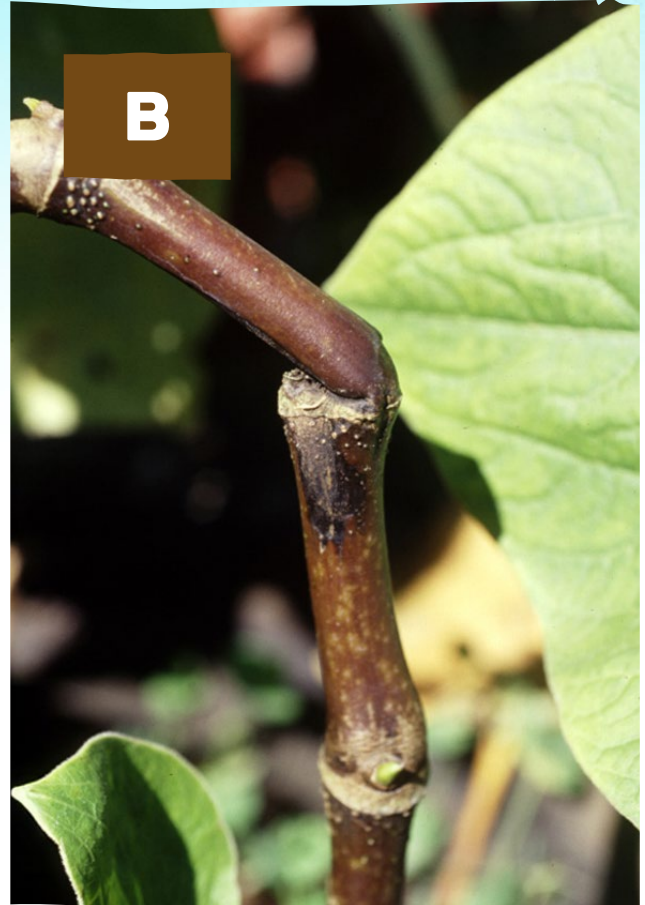


Figure 10. Early soft rot developing in a kava stem, causing it to bend. Stem rot starts at the tip or the nodes on kava stems and spreads quickly.



Figure 11. Advanced soft rot in a kava stem.

Symptoms/damage

- Leaves show distinct yellow patches against a green background together with leaf distortions such as crinkling, puckering and blistering.
- The dieback of stems begins as a black, soft rot that can first appear on the tip of the stem or on a node. This rot rapidly spreads, causing the stem to blacken and collapse, giving the stem a “melt down” appearance as the soft tissues completely disintegrate. This progressive decay often occurs in cycles of new growth appearing before the disease takes hold again.
- Advanced cases lead to root rot and eventual death of the entire plant.





Figure 12. The first sign of Kava Dieback Disease is young leaves with sharply defined patches of yellow or white (A & B). This is called a mosaic symptom, and it usually occurs together with leaf distortions, such as a crinkling or puckering along the veins. If the stems of these leaves are cut, brown lines are seen inside and this is how the rot starts off (C). This is the start of the black soft rot of the stems.

A



B



Figure 13. The most common leaf symptoms are mosaic patterns (A & B), which are accompanied by distortions such as puckering (Figure 14) and crinkling (Figure 15).



Figure 14. Puckering of kava leaves.



Figure 15. Crinkling of kava leaves.

Prevention and management strategies

- Grow kava traditionally; less virus infection will occur on small isolated plots planted underneath trees.
- Plant with non hosts or poor hosts of the virus, which includes more trees and much of the natural vegetation. Some examples of crops you can plant with are cassava, taro and bananas. When aphids feed on non host plants on their way from one kava plant to another, they lose the virus and the second kava plant escapes infection. When kava plants are separated by a buffer zone, aphids cannot effectively spread the virus.
- Use well drained and fertile soils for fast growing and strong plants.
- Have a simple nursery set up to increase chances of survival of young kava plants and to have well established roots.
- Avoid monocropping and use natural barriers non hosts and poor hosts to reduce the spread of the virus.
- Weekly monitoring for KDD is an important farm management practice for detecting and controlling its spread.
- Upon detecting signs of the disease in the field, break off the infected stem right at the base of the plant and burn or bury them. This works because the virus cannot spread well through the whole plant, leaving the other stems disease-free.

SHOT HOLE DISEASE

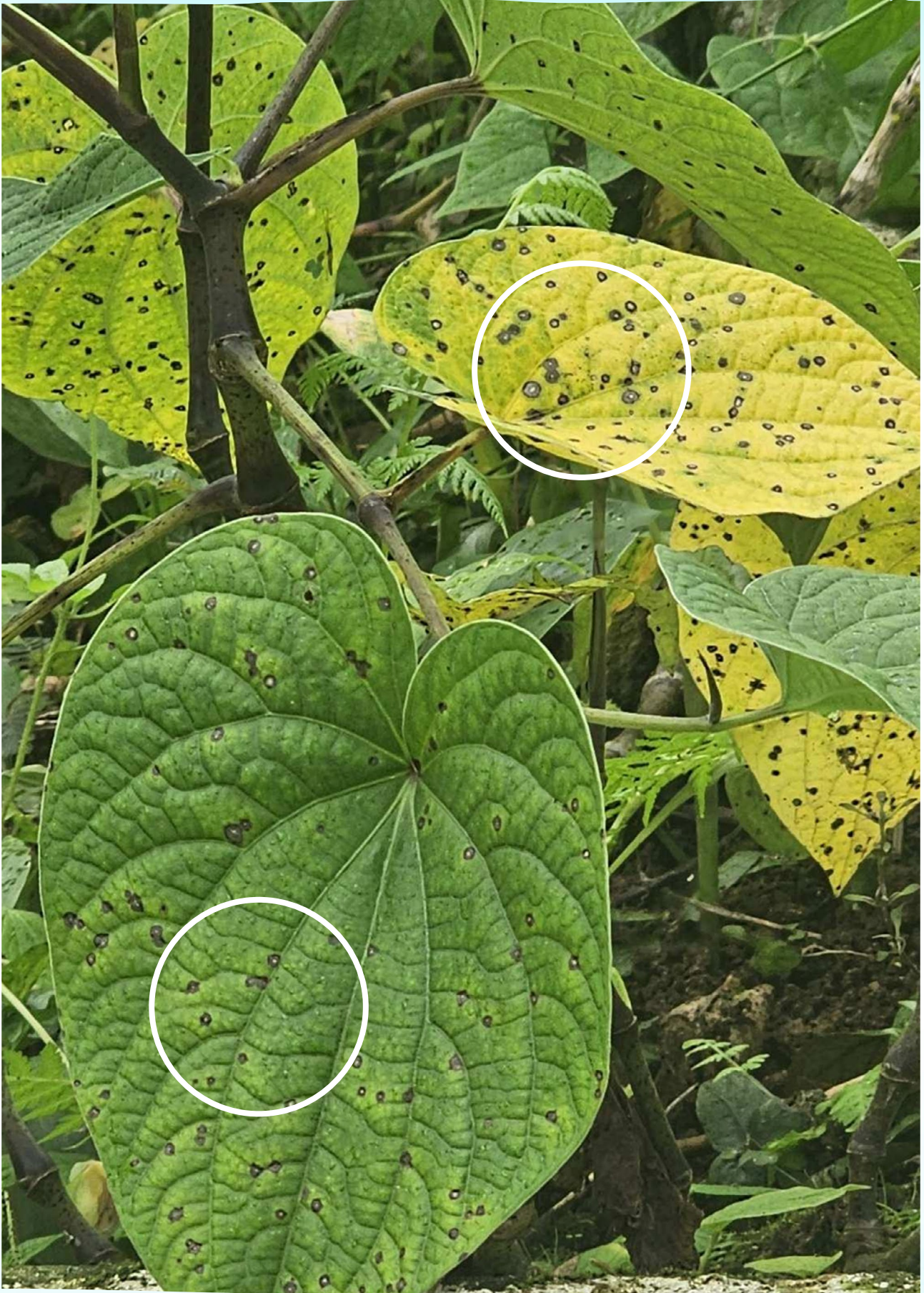


Figure 16. Shot hole symptoms.

Description

- Shot hole disease is a fungal disease favoured by wet weather.
- It is spread by wind and splashing water, with symptoms appearing 2 to 3 weeks after infection.

Symptoms

- Shot hole appearance on affected leaves starts off with small, black spots (2-3 mm in diameter) that later develop whitish grey centers that fall out and yellowing of leaves.
- In severe cases, there can be major loss of leaves and eventually death of plants.

Prevention and management strategies

- Begin by using clean and disease-free cuttings or seedlings in a nursery or a designated area for seedlings. Select healthy vigorous growing seedlings that are less likely to be affected by disease.
- Make sure kava farms are free of weeds and other plants that can host the disease.
- Allow spacing of more than a metre between kava plants to improve air movement, reducing moisture around leaves which helps to reduce growth of fungal spores.
- Kava plants should be grown in a suitable environment and can be planted with taro, *dalo-ni-tana* and under coconut trees. Stressed plants are easily affected by disease.

SUMMARY OF PREVENTION AND MANAGEMENT STRATEGIES

Aphids

- Regularly check kava and nearby plants for aphids.
- Promote natural predators like lady beetles, lacewings, ground beetles and hoverflies.
- Inspect and clear the area before planting to remove aphid sources.
- Use traps (yellow sticky or pheromone) to catch flying aphids.
- Avoid chemical pesticides; use them only as a last resort due to potential residue and environmental harm.
- Using homemade or natural pesticides can be another option.
- Use horticultural oil (made from petroleum), white oil (made from vegetable oil) or soap solution.



Figure 17. The adult ladybug beetle (A) and its larvae (B) are natural enemies of aphids.

Root-knot Nematodes

- Leave land fallow for at least three years to reduce nematode infestations.
- Solarise nursery soil by exposing it to sunlight before planting.
- Use organic matter, mulch, or soil amendments to encourage natural enemies of nematodes.
- Prevent spread by avoiding movement of infested soil or plants, and cleaning tools thoroughly.

Mealybugs

- Monitor plants regularly, especially the stem ends, undersides of leaves and shoots.
- Use natural or homemade pesticides as alternatives to chemicals. Options include:
 - Horticultural oil (petroleum-based).
 - White oil (½ cup cooking oil and ½ teaspoon pure hand soap in 4L water).
 - Soap solution (5 tbsp pure hand soap—not detergent—in 4L water).
- Spray in the late afternoon to avoid sunburn on leaves. These sprays help reduce mealybug populations, though they may not eliminate them entirely.

Kava Dieback Disease (KDD)

- Choose a suitable place to grow kava and plant strong vigorous plants.
- Use the best method of planting, for instance planting in nurseries or have an area for raising seedlings.
- Plant with suitable plants/crops such as taro, *dalo-ni-tana* (cocoyam/tannia) or cassava which are natural barriers to Cucumber Mosaic Virus (CMV) movement.
- Use natural barriers or cover crops such as planting under trees, coconuts, pawpaw, yams and sweet potatoes.
- Slow the spread of the virus by regularly monitoring for early symptoms, and breaking off any affected branch at the base, put it in a sack and burn or bury it.
- Wash all farming equipment after use.

Shot Hole Disease

- Use clean, disease-free cuttings or seedlings, as healthy and vigorous plants are less likely to be affected.
- Keep kava farms free of weeds and other host plants.
- Space kava plants more than one metre apart to improve airflow and reduce fungal growth.
- Grow kava in a suitable environment, ideally intercropped with taro, *dalo-ni-tana*, or under coconut trees, since stressed plants are more prone to disease.

GOOD PLANT HEALTH PRACTICES FOR GROWING KAVA

Step 1. Choose a good place to grow kava

- Grow traditionally: less virus infection will occur on small and isolated plots planted underneath trees.
- This is because tiny insects called aphids are carriers of CMV. They spread the virus from one kava plant to the next. If these insects feed on plants that cannot be infected by the virus (non-host plants) on their way from one kava plant to another, they will lose the virus and the second kava plant escapes infection.
- Because of this effect the aphids cannot spread virus well when the kava plants are separated by a “buffer zone” of other plants that cannot be infected.
- Kava grows better under shade – tree cover helps because most trees are also non hosts of the virus. This helps as they will block the virus from reaching kava plants growing below them when virus-carrying aphids fly in from far away and feed first on the trees above the kava.
- Choose well-drained and fertile soils:
 - Well-drained and fertile soils are needed for strong, vigorous plants.
 - Strong and vigorous plants can better fight attacks from CMV in kava plantations.
 - Kava should not be grown in the same place continuously as this will build up the nematode population.



Figure 18. Nematode damage on kava roots.

Step 2. Start with healthy plants

Stems used for planting must only come from plants that do not show any signs of Kava Dieback Disease (KDD). It is best to use planting materials from areas where there is no active KDD.



Figure 19. Choose healthy planting materials.

Step 3. Use the best method of planting

- When planting kava, it is best to first grow the planting materials in a nursery.
- Germinate healthy stems (*kasa*) in beds or in trays using peat moss before hardening in black plastic nursery bags.
- This helps the roots establish well before they are transplanted to the field.
- It also reduces attack from diseases that may be present in the soil if planted directly.
- This method of planting takes about three months from nursery to field transfer.
- However, if planting directly in the field, plant more than one cutting in a hole as survival rates may be low.



Figure 20. The best practice is to first germinate in trays (A) before hardening them in black plastic nursery bags (B).

Step 4. Plant with intercrops

- It is important that kava grows in the best environment possible to ensure that plants are strong and better able to resist the effects of the virus or other pests and diseases if they come.
- Kava needs shade, high humidity and protection from drying winds to grow well.
- This can be done if kava is grown among other useful crops or intercrops.



Figure 21. Kava is best grown as an intercrop.



Figure 22. Avoid monocropping.

Step 5. Smart cropping

- Use natural barriers to reduce the spread of diseases.
- Intercrops which are non-hosts (plants that do not carry the Cucumber Mosaic Virus (CMV)) or poor or dead end hosts (plants that the virus does not multiply in) provide another very useful benefit. If CMV appears, they will block movement of the virus by aphids which fly from plant to plant.
- Good intercrops (non or only occasional hosts of CMV) include taro, *dalo-ni-tana* (cocoyam/tannia), via (swamp taro), bananas, coconuts, citrus, *masi* (mulberry tree), cassava, pawpaw, sugarcane, yams and sweet potato.
- Avoid planting the following “bad intercrops”:
 - Cucurbit plants (pumpkin, watermelon and cucumber).
 - Solanaceous plants (tomato, tobacco, capsicum, chilli and eggplants).
 - Leguminous plants (peanuts and snake beans), passionfruit and pineapples.
- Just like the bad intercrops, there are some common weeds that carry the virus and these should be controlled.
- Some crops or weeds show signs of the virus on their leaves.
- Other host plants can be full of viruses without showing any signs of infection.
- Two of the most important examples of symptomless hosts are the weeds, mile-a-minute and the coral tree (*drala*), which are a common fencing material that farmers use.



Figure 23. Taro plants intercropped with kava.

Step 6. Actions to take to slow spread of the disease from plant to plant if it appears

- Remove diseased stems as soon as they appear to greatly reduce dieback disease development.
- This works because the virus cannot spread well through the whole plant, leaving the other stems disease-free.
- Removing infected stems is a good way to reduce the amount of virus in the crop.
- Most re-growth will be virus-free.
- It is very important though, to do this properly, in the way described below.
 - If the disease is present in your local area, plants must be examined every week for early signs of kava dieback disease on leaves or stems.
 - When found, remove the stem showing these signs by breaking it off at the first node.
 - Do not cut with a knife as the knife may carry the virus and spread it to other plants.
 - Put the stems together with all of its leaves in a plastic bag, empty rice or fertiliser bag.
 - Tie up the bag and remove them from the kava planting area.
 - Destroy the infected materials either by burning or burying deep in the soil.
 - This method does not always work with young plants.
 - If the plant is less than one year old, it is better to uproot and remove the whole plant.
 - This will not be a problem if the nursery stock of young plants is kept ready for use as replacements.



Figure 24. Avoid these weeds: mile-a-minute (A) and commelina (B).



For more information, visit your nearest agricultural office or call 3384233 or email agrihelp@moa.gov.fj

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Version 1 - 2025