



Pacific Pests, Pathogens & Weeds - Fact Sheets

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Papaya *Phytophthora* fruit & root rot (152)



Photo 1. Papaya fruits infected by *Phytophthora palmivora*. Note the white cottony growth of the water mould, and that the disease is spreading from the older, lower, fruits upwards.



Photo 2. Close-up of a papaya fruit showing the cottony growth of fruit rot, *Phytophthora nicotianae*, identical in appearance to that caused by *Phytophthora palmivora* (Photo 1).



Photo 3. Tree shown in Photo 3 with basal stem rot caused by *Phytophthora palmivora*.



Photo 4. Lower stem or "foot" rot on papaya caused by *Phytophthora palmivora*.



Photo 5. Stem rot on papaya caused by *Phytophthora palmivora*.



Photo 6. Root rot and/or basal stem rot caused by *Phytophthora palmivora*, resulting in a wilt and rapid death of the trees.

Common Name

Papaya fruit and root rot, *Phytophthora* fruit rot

Scientific Name

Phytophthora palmivora. Note, *Phytophthora nicotianae* has also been recorded as the cause of this disease in e.g., Australia and Fiji. This fact sheet assumes the symptoms and management for both are similar.

Distribution

Worldwide. *Phytophthora nicotianae* is recorded on papaya from Australia, Cook Islands, Federated States of Micronesia, Fiji, and French Polynesia. *Phytophthora palmivora* is recorded on papaya from Australia, Cook Islands, Federated States of Micronesia, Fiji, Palau, Papua New Guinea, and Samoa.

Hosts

Papaya and a wide range of valuable plantation crops (e.g., coconut, cocoa) and fruit trees (e.g., avocado, citrus, breadfruit).

Symptoms & Life Cycle

The disease is favoured by high soil temperatures and soils saturated with water due to heavy rainfall or poor drainage. It is especially common after long rainstorms or cyclones. Waterlogged soils starve roots of oxygen that plants need for healthy growth, and the water allows the swimming spores of the water mould to spread the disease.

Ripe and unripe fruit are infected while still attached to the stem; lower fruit are infected first. Rots develop quickly and become covered in a white growth containing spores of the water mould (Photos 1&2). Fungi and bacteria invade the fruits, increasing the rots, and causing the fruit to shrivel and fall.

Stems, especially of younger trees, also become infected through leaf and fruit scars. Rots develop, and these cause the tops of the trees to wilt and die. Rots also form at the base of the stem near soil level (Photo 3-5); in this case the decaying roots are the source of infection. These lower rots also cause leaves to turn yellow, wilt and collapse, with only a few small leaves remaining at the top of the tree (Photo 6).

Water moulds survive in the soil as thick-walled resting spores called "chlamydozoospores". When conditions are right, the chlamydozoospores germinate and produce spores called "sporangia". Yet another spore is produced inside the sporangia called 'zoospores' (see **Fact Sheet no. 149**), and these are capable of swimming short distances in the water between soil particles. If they reach the fine feeder roots of papaya they germinate and infect. Once inside the plant, the water mould develops more sporangia and zoospores. These symptoms are similar to those that occur on *bele* (see **Fact Sheet no. 149**).

Spores of water moulds are spread in rain splash and in wind driven rain to the lower fruit and young stems. They are also spread in surface water, and in soil on machinery and shoes.

Impact

Phytophthora is an oomycete also known as a water mould; it is not a fungus. Although *Phytophthora* species look like fungi, they are related to algae. The disease can be serious, causing rots of fruit, stems and roots, especially during wet weather.

Detection & inspection

Look for fruit with rapidly developing rots that are covered in white cottony growth, and also look for rots in the stem where fruit is produced. Later, look for wilting leaves as the root system decays. Look to see if the disease spreads to the roots of nearby plants as the water mould moves through the soil, or to fruit in rain splash.

Management

CULTURAL CONTROL

Cultural control is particularly important in the management of this disease:

- *Location*: Do not plant papaya near cocoa blocks as *Phytophthora palmivora* causes black pod and canker of cocoa and may be a source of infection for papaya.
- *Soil drainage*: Plant papaya only in land that is well drained. Waterlogged soil favours water moulds. Also, plant on mounds or raised beds to prevent accumulation of surface water.
- *Crop rotation*: Do not replant papaya in soil where *Phytophthora palmivora* infection occurred previously. Root rot is commonly a replant problem.
- *Hygiene*: Collect and burn all fallen fruit and stems of papaya trees when harvests are complete.

RESISTANT VARIETIES

None are known.

CHEMICAL CONTROL

Use chlorothalonil, copper, or mancozeb (protectants); or alternate with metalaxyl or phosphorous acid (systemics).

AUTHOR Grahame Jackson

Information (and Photos 1,3,6) Gerlach WWP (1988) *Plant diseases of Western Samoa*. Samoan German Crop Protection Project, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Germany; and from *Diseases of fruit crops in Australia* (2009). Editors, Tony Cooke, Denis Persley, Susan House. CSIRO Publishing. Photo 2 Kohler F, Pellegrin F, Jackson G McKenzie E (1997) *Diseases of cultivated crops in Pacific Island countries*. South Pacific Commission. Pirie Printers Pty Limited, Canberra, Australia. Photos 4&5 Liberato JR, Suzuki MS, Dent A (2006) Phytophthora Fruit Rot and Root Rot of Papaya (*Phytophthora palmivora*) PaDIL - (<http://www.padil.gov.au>).

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