

Phytophthora palmivora

Pests and Diseases of American Samoa

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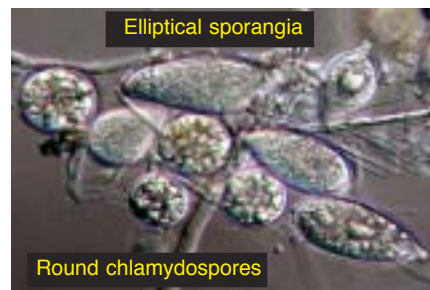
The organism that caused the 1845-46 Irish Potato Famine was named *Phytophthora*, the “plant destroyer”. Though initially considered a fungus, or water mold, this organism is more like certain algae and has been moved from the kingdom Fungi to Chromista. There are about 80 species of *Phytophthora*, all damaging to plants. One of the most common tropical species is *P. palmivora*, with more than 150 plant hosts. Some of the most important hosts are black pepper (*Piper nigrum*), rubber (*Hevea brasiliensis*), durian (*Durio zibethinus*), coconut (*Cocos nucifera*), cocoa (*Theobroma cacao*), breadfruit (*Artocarpus altilis*), and papaya (*Carica papaya*). In American Samoa, the last three hosts are attacked by *P. palmivora*.

Disease Cycle

Phytophthora palmivora has four types of spores that may directly, or indirectly, cause infection. Sporangia are produced on infected fruit, leaves, stems, or roots. They are able to germinate directly on the plant surface or in the soil. They can also germinate to produce small, swimming zoospores. Zoospores swim in soil water or on a wet plant surface until they eventually enter the plant. Sporangia and zoospores are spread by rain splash, wind-blown rain, soil and soil water.

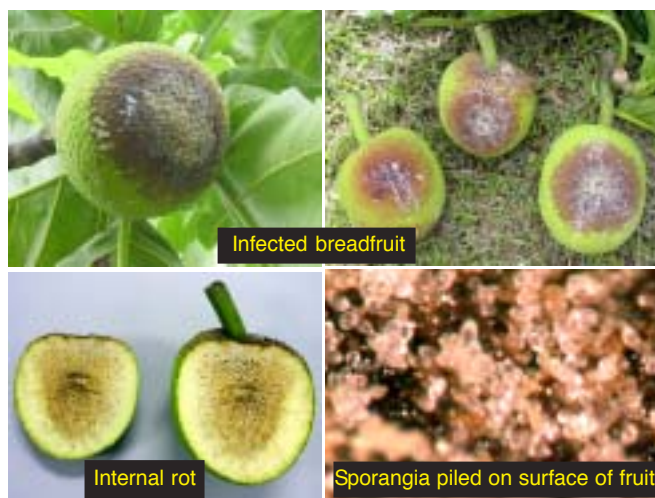


Round, thick-walled chlamydozoospores are produced by the mycelium of some isolates; they germinate under certain conditions and form sporangia. Oospores are formed when two different mating types of the organism, called A1 and A2, are present. This sexual phase is a potential problem as it produces genetically different offspring, any of which might be able to overcome the host's resistance. *Phytophthora* species need a host plant to live in. Therefore, chlamydozoospores and oospores are important survival structures. They are able to live in soil or dead plant material during times when host plants are absent. Oospores have not been reported in American Samoa.



Breadfruit Rot

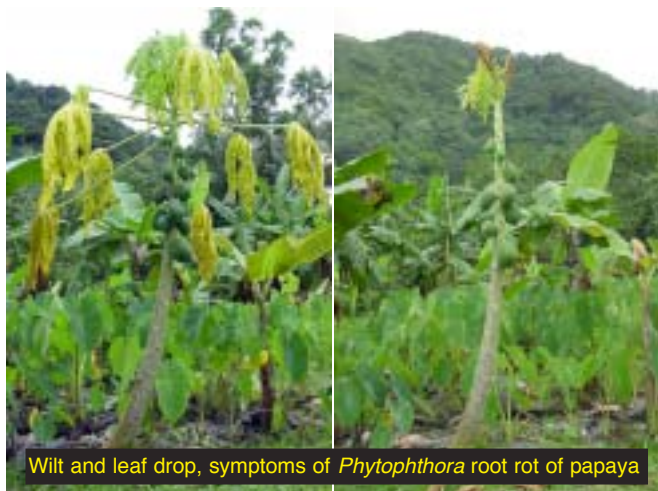
Rot of breadfruit occurs sporadically in American Samoa. Strong winds and rain favor its spread from fruit to fruit and to nearby trees. Severe infections can destroy all fruits on a tree. The disease begins as small brown spots at the stem end, base, or on the sides of the fruit. Spots enlarge quickly and rot the inside of the fruit. In wet weather the spots usually have a white, frosty look due to masses of *P. palmivora* sporangia.



Papaya Root Rot

Phytophthora palmivora attacks the fruit, stem, and roots of papaya. At present this is an uncommon disease in American Samoa, but in areas with infested soil, it can destroy the crop. The first symptoms of root rot are seen in the lower leaves which turn yellow, wilt, and fall. The upper leaves turn light green and new leaves are smaller, forming a clump at the top of the plant. These symptoms are caused by rotting roots, which deprive the plant of needed nutrients and water.

Germinating spores of *P. palmivora* attack the lateral roots, causing small reddish-brown spots. These spots enlarge quickly, especially when the soil becomes flooded, and rot the whole root system. The roots turn into a soft, dark brown, stringy mass that can no longer nourish or support the plant. Leaning or fallen plants with small tufts of yellow-green leaves are typical symptoms of papaya root rot.



Black Pod and Stem Canker of Cocoa

An average of 20-30% of the world's cocoa crop is lost to *P. palmivora* each year. In some areas, like American Samoa, cocoa cannot be grown economically because of this disease. The first symptom of black pod is a brown or black spot on the fruit that quickly grows to cover the whole pod. Sporangia may form on the surface of the fruit. The infection goes deep and affects the cocoa seeds, causing them to discolor and shrivel. Eventually the pod itself shrivels, turning into a black, hard, mummy.



Canker is an infection of the stems and branches. There may be no symptoms until leaves on a branch wilt, turn brown, and die. Most often, however, there is a dark area on the bark that oozes reddish fluid. As the disease progresses, the canker girdles the stem causing leaf and branch death.



Integrated Management of *Phytophthora palmivora*

Cocoa

- In dry climates removing and destroying diseased pods and dead branches can reduce infection.
- In wet climates good soil drainage, tree spacing, and pruning allow plants and fruit to dry. This inhibits spore germination and infection.
- Biological controls are still being tested. Some bacteria and fungi, for example, are known to compete with *Phytophthora* and protect the plant surface.
- Chemical control is an option, but not cost-effective in small plantings. Consult the EPA for registered products.
- Resistant cultivars are available but their effectiveness needs to be tested against *Phytophthora* in the area.

Breadfruit

- There are no effective controls against *P. palmivora* on breadfruit.

Papaya

- Plant on land not previously used for growing papaya.
- Be sure seedlings are disease-free before planting.
- Virgin soil technique: if planting in infested soil, dig a hole 12" wide x 4" deep; fill with clean soil forming a mound 1-2" high; plant healthy seedling on the mound. When roots have grown into infested soil (3 months), the plant will no longer be susceptible.

Bibliography

- Drenth & Guest. 2004. Diversity and Management of *Phytophthora* in Southeast Asia. ACIAR, Canberra.
- Irwin & Ribeiro. 1996. *Phytophthora* Diseases Worldwide. APS Press, St. Paul, MN.
- Ko. 1994. Compendium of Tropical Fruit Diseases. APS Press, St. Paul, MN.

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