

Phytophthora

Phytophthora palmivora and *Phytophthora nicotianae*

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Introduction

Phytophthora is a major disease affecting papaya crops in Australia. A survey of papaya growers shows that it was rated the most significant issue in papaya production. Caused by several species of the oomycete pathogen *Phytophthora*, it leads to significant yield losses and can affect the quality of papaya fruits. The disease is most prominent in the summer and autumn due warm, wet conditions. It can affect the roots, trunk and fruit of the plant.

Disease information

Phytophthora palmivora is the most common species causing disease in papaya. Occasionally *Phytophthora nicotianae* has also been known to cause infection. The disease spreads via water, soil and infected plant material. It can survive in the soil for years, infecting new plants when conditions are favourable. Severe infections in the roots and trunks can lead to plant death, often through causing instability in the plant. Fruit phytophthora is capable of downgrading large volumes of fruit. The disease is particularly destructive in poorly drained soils or areas with excessive irrigation.

Symptoms

Root rot

Root rot infection will cause the tap root become black, soft, and rotten. The first signs visible above the ground is yellowing of the canopy with leaves eventually collapsing, beginning from the oldest leaves. Crop yields will reduce due to poor nutrient uptake and stress of the plant. The loss of the tap root exposes the plant to instability and causes the plant to roll out. Root rot is often the first sign of the disease.



A papaya tree which has fallen out, revealing that the tap root has been rotte away, a symptom of phytophthora root rot

Trunk phytophthora

Trunk phytophthora lesions generally form on the stem near the soil line. A white substance will exude from the wound. In severe cases, the stem can collapse, leading to the death of the plant. Trees that have trunk wounds are more susceptible to trunk phytophthora.



Far left: Trunk phytophthora infection on a papaya plant. It can be identified by the white exudate. Left: A papaya tree which has snapped at the point where it was weakened by a trunk phytophthora infection

Fruit phytophthora

Infected fruits develop dark, water-soaked lesions that quickly enlarge. The fruit's flesh softens and may emit a foul odour. Phytophthora is discernable from other fruit diseases by a white exudate. Tight fruit columns can predispose fruit to fruit phytophthora, and it is often seen when ants carry soil into the fruit column to nest.



Papaya fruit with advanced phytophthora infection.

Management

Cultural controls

- **Site Selection:** Choose well-drained soils for planting papaya. Avoid planting in low-lying areas prone to waterlogging.
- **Water Management:** Implement proper irrigation practices to prevent water accumulation around the plant base. Do not overwater or keep soil saturated.
- **Crop Rotation:** Rotate papaya with non-host crops to reduce the pathogen load in the soil. The recommended rotation is 2-7 years.
- **Mounding:** Mounding rows will help to ensure that plants are not waterlogged. Trial work has shown that a single row mound was able to reduce root rot incidence from 58.3% on flat ground to 18%.



Trials have shown that mounding is an effective way to reduce phytophthora root rot infection

- **Not mulching:** Although the presence of organic matter is known to reduce the disease in the soil, previous trials have shown that the presence of organic mulch on the soil can exacerbate the disease by preventing the soil from drying out.
- **Clean seedlings:** Ensuring that the nursery is clean and there is no contamination with Phytothphora at the seedling stage will ensure that infected plants are not being taken to the paddock.
- **Single plants:** If possible moving to single plants as opposed to multiple plants that are thinned will help to reduce the disease. Once plants are desexed around the selected plant Phytophthora inoculum levels increase quickly on the decaying root systems. Single plants also have a stronger root system.

Chemical controls

- **Fungicides:** Apply metalaxyl at planting followed by fortnightly applications of phosphorus acid according to the permit (<https://permits.apvma.gov.au/PER14490.PDF>). For fruit the application of copper hydroxide is recommended on a fortnightly basis during the critical period according to the permit (<https://permits.apvma.gov.au/PER14417.PDF>).

During critical periods spraying fortnightly with copper hydroxide is recommended to reduce fruit phytophthora



Conclusion

Phytophthora remains a critical challenge for papaya production in Australia, particularly during warm, wet conditions that favour its infection. The disease causes severe damage to the roots, trunks, and fruit of papaya plants, leading to significant yield losses and downgrading of fruit quality. Effective management of this disease requires a combination of cultural practices, such as site selection, proper water management, and crop rotation, alongside the strategic use of fungicides like metalaxyl and phosphorus acid. By integrating these approaches, growers can reduce the impact of Phytophthora.

References

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