

Phytophthora parvispora

(Kröber & Rainer, 1993; Scanu & Denman, 2014)

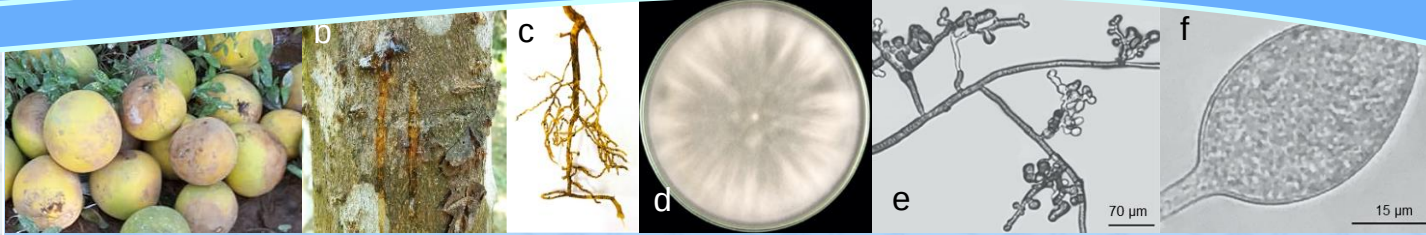


Fig. 1. (a-c) Symptoms of brown pomelo fruit rot, stem gummosis, and root rot in the orchard, respectively; (d) 5-day old culture of *Phytophthora parvispora* on V8 media; (e) typical coraloid mycelia; (f) a persistent sporangium.

Disease: Gummosis and root rot; brown fruit rot; *Phytophthora* disease of citrus

Pathogen: *Phytophthora parvispora*

Classification: **K:** Chromista; **P:** Oomycota; **C:** Oomycetes; **O:** Peronosporales; **F:** Peronosporaceae

Root rot, gummosis, and brown fruit rot, also known as *Phytophthora* disease, are common and destructive diseases of citrus (*Citrus* spp.), especially orange and pomelo. Several *Phytophthora* species have long been reported to cause this disease. A recent study has identified *P. parvispora*, a member of clade 7 and a species closely related to *P. cinnamomi*, as a new pathogen causing gummosis and root rot of citrus in Vietnam as well as in South-East Asia. This pathogen has not been reported in other countries and regions, particularly Australia, as a pathogen of citrus.

Biology and Ecology:

P. parvispora was first elevated to species status from a re-evaluation of *P. cinnamomi* var. *parvispora* in 2014. *P. parvispora* and *P. cinnamomi* are very morphologically similar, except that *P. parvispora* has significantly smaller sizes of sporangia, chlamydospores, oogonia, and oospores and single-celled antheridia compared with two-celled antheridia in *P. cinnamomi*. *P. parvispora* produces much fewer abundant chlamydospores, has higher minimum and maximum temperatures for growth, and grows faster at optimal temperatures than *P. cinnamomi*. Molecular identification by sequencing of the ITS and *cox1* gene regions helps distinguish *P. parvispora* from *P. cinnamomi*.

Like other *Phytophthora* species, *P. parvispora* is a soil and water inhabitant. Swimming zoospores, chlamydospores, and oospores can be spread by rain splash, wind-blown rain, soil, soil water, or movement of infected plant material. Particularly, zoospores in the soil can land on citrus fruit in the lower part by rain splash to induce brown rot.

Distribution:

Europe (Germany, Italy, Portugal), South Africa, Brazil, North America, Taiwan, Vietnam, possibly also Australia.

Host Range:

Citrus species and diverse confirmed host species (*Arbutus unedo*, *Castanopsis chinensis*, *Choisya ternata*, *Mandevilla* sp., *Pinus pinea*, *Beaucamea* sp., and *Agathosma betulina*). The exact host range of *P. parvispora* is still unknown. However, as *P. parvispora* and *P. cinnamomi* are the closest relatives of each other and share a common ancestor, there would be cause for concern if *P. parvispora* has a similar host range (more than 5,000 species, including 4,000 Australian native species) as *P. cinnamomi*.

Impact:

This disease has been reported to cause 10%–30% losses in citrus cultivation. Infected trees have black root rot, gummosis in stems, thin canopy, and twig dieback, leading to reduced yield and fruit size. Fruits in the lower part are more susceptible to disease, leading to the rot and falling to the ground, subsequently making them unmarketable.

Management options:

Improve soil drainage, avoid over irrigation, choose resistant rootstocks where possible, remove infected fruit that falls on the ground and disinfect the surrounding area. Consider using fungicides and fumigation. Several recommended oomycota fungicides (a.i. dimethomorph, metalaxyl, mancozeb, chlorothalonil, and fosetyl aluminium) still shows strong inhibitory activity against *P. parvispora* growth.

Further Reading:

Abad, Z.G., Burgess, T.I., Redford, A.J., Bienapfl, J.C., Srivastava, S., Mathew, R., & Jennings, K. (2023). IDphy: An international online resource for molecular and morphological identification of *Phytophthora*. *Plant Disease*, 107:987–998.
Scanu, B., Hunter, G.C., Linaldeddu, B.T., Franceschini, A., Maddau, L., Jung, T., & Denman, S. (2014). A taxonomic re-evaluation reveals that *Phytophthora cinnamomi* and *P. cinnamomi* var. *parvispora* are separate species. *Forest Pathology*, 44:1–20.
Tran, Q.V., Ha, C.V., Vvedensky, V.V., Le, T.T.L., & Han, V.C. (2023). Pathogenicity and fungicide sensitivity of *Phytophthora parvispora*, a new pathogen causing gummosis and root rot disease on citrus trees. *Microbial Pathogenesis*, 175:105986.

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