



Fig. 1. (a) Chlamydospores and hyphal swellings of *Phytophthora cinnamomi* grown on carrot agar at day 5; (b) lupin baiting for *P. cinnamomi* with no soil, sterile soil and unsterile soil respectively; (c) *P. cinnamomi* sporangia and chlamydospores observed on infected lupin root; (d) stunted root and shoot growth of *Correa* sp. in the presence of *P. cinnamomi* compared to control plant, and (e) brown patches in the *P. cinnamomi* infected *Correa* sp. roots. (a) stained with lactophenol with 1% cotton blue and (c) stained with calcofluor white using an Olympus BX51 microscope.

Common Name: *Phytophthora cinnamomi*

Disease: Phytophthora dieback or root rot

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

The hemibiotrophic *Phytophthora cinnamomi* is a soil-borne oomycete pathogen which infects many Australian native plants by attacking their root systems. This causes dieback as plants are unable to take up water and nutrients needed for their growth. Detection can be difficult as plants often appear to be dying from drought. There are several *Phytophthora* species that can cause dieback, however *P. cinnamomi* is the most prevalent in Australia.

Biology and Ecology:

The heterothallic species reproduces asexually via sporangia production and the release of motile zoospores or sexually via mating between A1 and A2 types to form oospores. Most isolates from Australia are of the A2 mating type. Wet conditions help in the spread of *Phytophthora* dieback allowing zoospores to swim in porous soils. Passive spread by human commercial or recreational activities can contribute to its spread.

In susceptible plants, *P. cinnamomi* infect tissues of roots especially feeder roots which later discolour and die. This infection and discolouration can extend into the wood of lower stems. Symptoms are retarded growth and drooping foliage in the early stages of the disease. Wilting, yellowing of shrubs, browning of leaves, epicormic tree growth and dieback can be observed in severely affected plants.

Impact:

Loss of key native plants to dieback can lead to loss of biodiversity, undergrowth plant species, threatened animal species and the disruption of woodland structure. Since February 2019, the Threat Abatement Plan has been put into effect to tackle *Phytophthora* dieback nationally.

Distribution:

It is found in Australasia- Pacific region. It is found in native woodland, heathland and forest in every state and the Australian Capital Territory.

Host Range:

It has a wide host range and can infect over 5000 Australian native species such as jarrah trees, banksias and woody herbaceous understory species. Crops such as macadamia, avocado, pineapple and kiwi plants are also susceptible.

Management options:

To date eradication of *Phytophthora* in infected areas has been unsuccessful. Management strategies involve: A) soil monitoring and assessment; B) minimization of spread by limiting the movement of contaminated soil or plant materials for example via disinfecting shoes or quarantine areas and; C) phosphonates which provides up to two years protection. A few plants in Australia are known to be resistant to *P. cinnamomi* such as *Lomandra longifolia* and some species in the subgenus *Symphomyrtus*.

Further Reading: Gomez et al (2018) *Forests* 9, 634; doi:10.3390/f9100634; Department of the Environment and Energy (2018) Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi*? (<http://www.environment.gov.au/biodiversity/threatened/publications/threat-abatement-plan-disease-natural-ecosystems-caused-phytophthora-cinnamomi-2018>); Hardham and Blackman (2018) *Mol Plant Pathol* 19 (2): 260-285; Islam et al (2017) *Functional Plant Biology* 44(4) 386-399

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