

Phytophthora root rot

Phytophthora root rot, a form of 'dieback', is a disease that affects many native plants and ecosystems, important crops and horticultural plants in Australia and throughout the world. Its global spread has been the consequence of trade and human migration. In Australia, the disease infects an especially large range of mainly woody perennial plant species and is also a major threat to some rare and endangered species.

History

Phytophthora root rot is a plant disease caused by the soil fungus *Phytophthora cinnamomi*. The fungus was probably introduced into Australia through European settlement, and has now spread to affect hundreds of thousands of hectares of native vegetation, especially in Western Australia, Victoria, Tasmania, South Australia and coastal Queensland.

Ecology

P. cinnamomi fungus grows through the root system (and sometimes the stem) of a plant, destroying it and preventing the plant from absorbing water and nutrients. The first symptom of a plant infected by phytophthora root rot is wilting and yellowing of the foliage. The foliage then dries out and the young feeder roots darken. Infected plants usually die from lack of water and nutrients, although some can survive the disease.

Once the fungus has spread through the root system of a plant, it releases zoospores (asexual spores) into the surrounding soil, if the conditions are warm and moist. The spores easily spread through stormwater and drainage water. During drought or when temperatures are cooler, *P. cinnamomi* produces two different types of spores — chlamydospores and oospores — which can survive for long periods of time in soil or dead plant material. When conditions become more favourable for the spores, they will germinate and infect new plants. Major human activities that may spread phytophthora root rot include road building, timber harvesting, mine exploration, the nursery trade and bushwalking.



Dieback caused by the phytophthora root rot fungus affects a wide variety of ecosystems, such as the banksia woodland shown here. Photo: John Hicks

Impact

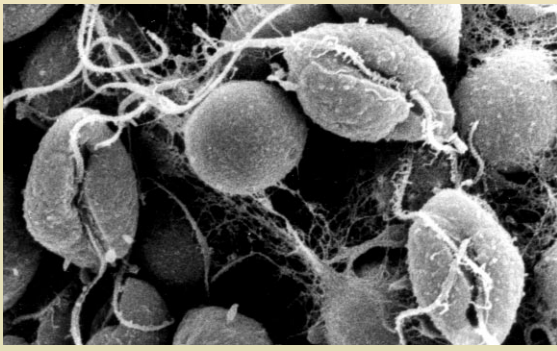
While phytophthora root rot does not usually cause severe damage in undisturbed vegetation in areas where annual rainfall is less than 600 mm, it can cause severe epidemics in areas with higher rainfall.

Many Australian native plants are susceptible to *P. cinnamomi*, including a number of threatened species and many that are currently not threatened. The fungus has often been found in eucalyptus trees, grevilleas and banksias, native peas, heaths, hibbertias, club mosses, ferns, cycads, conifers, rushes, grasses and lilies. An outbreak of phytophthora root rot can also affect native animal species, by destroying the plants that provide them with food and shelter.

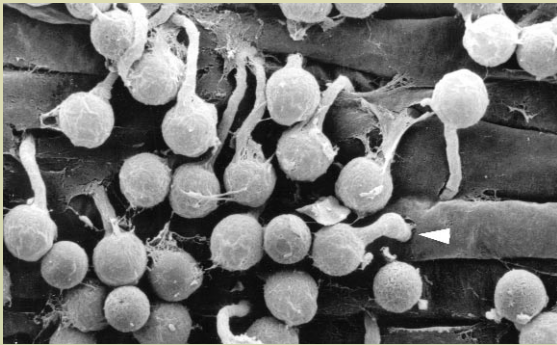
Control

Attempts to eradicate *P. cinnamomi* from infested areas have been unsuccessful. The disease has spread over most of Australia, but because it is hard to diagnose, mapping the infected areas is a complex task. This makes management and control of the disease very difficult. The only way to combat the disease is by limiting the spread of the fungus and reducing its impact, but there is no straightforward, universal method for doing this. The fungus must be tackled using a management plan based on quarantine, hygiene and treatment with the chemical phosphite.

Quarantine is important in reducing the spread of *P. cinnamomi* into areas of high conservation value. Recovery plans for threatened species or ecosystems



Three *Phytophthora cinnamomi* zoospores and a number of cysts on the surface of a root. Each zoospore has two tail-like flagella that allow the spores to 'swim' in water to reach a new host plant.



The surface of an onion root with *Phytophthora cinnamomi* cysts — zoospores that have lost their flagella, attached themselves to the root and begun to germinate on the root surface.

Scanning electron micrographs reproduced with permission of the Australasian Plant Pathology Society from Hardham (2001) *Australian Plant Pathology* 30, 90-98

often include fencing off significant ecosystems or plant populations, and restricting public access.

Hygiene measures, such as sanitising tools, machinery, boots and tyres, are probably the most effective way to prevent the fungus from spreading as a result of human activity.

Spraying infected plants with low levels of phosphite during the active growth months has had some success and can induce long-lasting resistance against the fungus. Phosphite has a low toxicity for mammals and breaks down quickly in the soil, but at high levels it can be harmful to certain plant species. However, phosphite must be used carefully, as more research is required to fully determine its limitations and optimal methods of use.

Further research is being done to improve our methods to control *P. cinnamomi*. Researchers are focusing on the vulnerability of plant species and ecological communities, especially those at high risk, and on the effectiveness of existing and new control measures. There is also extensive research into the nature, ecology and the population dynamics of the fungus itself. This research will help provide crucial information, such as measuring the risk of spread of the fungus, and assist in the search for more effective ways to manage it.

How the Australian Government is dealing with a national problem

Dieback caused by the root rot fungus *Phytophthora cinnamomi* is listed as a key threatening process under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Under the EPBC Act the Australian Government in consultation with the states and territories has developed the *Threat Abatement Plan for Dieback Caused by the Root-Rot Fungus Phytophthora cinnamomi*.

The threat abatement plan aims to reduce the impacts of the fungus by:

- implementing management programs in specific areas that are a high conservation priority because of the species or ecological community under threat
- encouraging better understanding through the collection of information that expands our understanding of the ecology and biology of *P. cinnamomi* in Australia, its effects, and methods for managing the pathogen
- educating land managers to increase their knowledge of *P. cinnamomi* and the role of humans in spreading the pathogen and to ensure skilled and effective participation in management activities
- coordination of national, regional and local management activities and administration.

Phytophthora root rot control programs also need to be coordinated with other activities that may be taking place, including the on-ground protection of threatened plants and animals. The threat abatement plan provides a framework that enables the best use of the resources available for *P. cinnamomi* management. The Australian Government works with the states and territories to deal with this national problem.

More information about the threat abatement plan is at: <http://www.deh.gov.au/biodiversity/threatened/tap/phytophthora/index.html>

Printed on recycled paper (2004)

For further information, contact:



Australian Government
Department of the
Environment and Heritage

GPO Box 787 Canberra ACT 2601
Phone: 1800 803 772
Web site: <http://www.deh.gov.au>



Natural Heritage Trust

Helping Communities Helping Australia
A Commonwealth Government Initiative