

Phytophthora cinnamomi



Taxon	Family / Order / Class / Phylum / Kingdom
<i>Phytophthora cinnamomi</i> (Rands 1922)	Pythiaceae / Pythiales / Oomycetes / Oomycota / Chromista

COMMON NAMES (English only)

Phytophthora crown and root rot
Phytophthora root rot
Ink disease (on chestnuts and oaks)

SYNONYMS

None.

SHORT DESCRIPTION

This fungus-like organism is a soil-borne pathogen causing disease on many woody hosts. Primary infections in the root system result in two main types of (visible) symptoms: bleeding cankers on trunks and/or crown symptoms (little leaves, yellowing, wilting) eventually leading to chronic decline or death.

BIOLOGY/ECOLOGY

Dispersal mechanisms

Motile zoospores, swimming in the water filling soil pores, are the main propagules of natural dispersal. Long-distance dispersal results from movement of infected soil or plants, mediated by man activities (road making, trade...).

Reproduction

P. cinnamomi, as with most other species in this genus, produces different spore types: zoospores, chlamydospores and oospores. Only the latter are sexual spores. Their production under natural conditions seems to be rare, especially in most invaded areas where only one mating type is present.

Known predators/herbivores

A number of reports describe the parasitic or antagonistic activity of several species of bacteria, actinomycetes and fungi on *Phytophthora* spp, especially *P. cinnamomi*.

Resistant stages (seeds, spores etc.)

Oospores and chlamydospores are usually resistant forms in fungi. However, oospores are often lacking and chlamydospores are not thick-walled in *P. cinnamomi*.

HABITAT

Native (EUNIS code)

G: Woodland, forest and other wooded land. *P. cinnamomi* was first described on cinnamon trees.

Habitat occupied in invaded range (EUNIS code)

G: Woodland, forest and other wooded land , I2: Cultivated areas of gardens and parks. In invaded areas, *P. cinnamomi* has been reported on nearly one thousand species or varieties, mainly woody ornamental, fruit and forest species.



Red oak trees showing ink disease symptoms caused by *Phytophthora cinnamomi*

Photo: X Capdevielle, INRA France

Habitat requirements

P. cinnamomi is highly sensitive to frost and rather thermophilic, with the minimum temperature for growth 5-6°C, optimum between 24 and 28°C and maximum 32 to 34°C. Water is required for spore formation and dispersal but the disease can develop in relatively dry areas or locations, with occasional heavy rainfall.

DISTRIBUTION

Native Range

Probably South-East Asia-Oceania (Indonesian islands, Papua New Guinea)

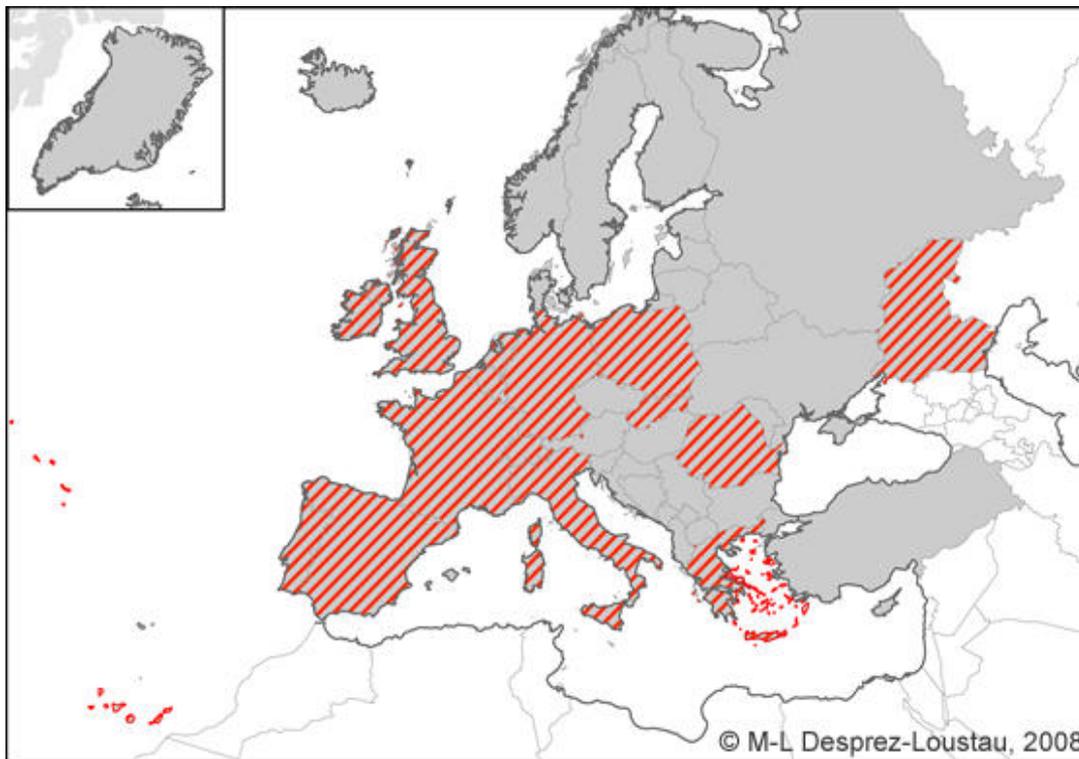
Known Introduced Range

Most temperate and subtropical areas in the world (Americas, Europe, Australia, New Zealand, Asia). In European natural environments, *P. cinnamomi* has been observed mostly in France, Italy, Spain and Portugal. Reports in other countries are mainly from nurseries.

Trend

Climatic models predict increasing range and damage with climate warming.

MAP (European distribution)



Legend

	Known in country		Known in CGRS square		Known in sea
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INTRODUCTION PATHWAY

P. cinnamomi was introduced in Europe several centuries ago, possibly as early as the 15th or 16th century by Portuguese, Spanish or French explorers, but most likely in the 18th century, based on the appearance of chestnut root disease. Subsequent spread probably occurred through transport of contaminated soil and infected nursery stock.

IMPACT

Ecosystem Impact

P. cinnamomi has been reported on several hundreds of species in the world. In Europe, *P. cinnamomi* has been associated with the widespread mortality of mature chestnut and evergreen oak trees, especially cork oak and holm oak. *P. cinnamomi* could also be a crucial limiting factor in natural regeneration and reforestation of these species, due to the high susceptibility of young seedlings. Deciduous oaks, especially pedunculate oak, are hosts to the pathogen, but rather tolerant. Other native species, mainly belonging to the families *Ericaceae*, *Cistaceae* and *Leguminosae*, have been known to be infected.

Health and Social Impact

Unknown.

Economic Impact

P.cinnamomi is a serious problem in chestnut and avocado orchards, as well as in ornamental and forest nurseries (on *Chamaecyparis*, heathers, rhododendrons and other conifers and Ericaceae, in addition to chestnuts and oaks). Red oak, which has been widely used for plantations especially in France, proved highly susceptible to ink disease and is no longer planted in high hazard areas.

MANAGEMENT

Prevention

Prevention of disease spread primarily involves the production and distribution of clean nursery stock. The problem is that infected plants can remain asymptomatic for a long time, and therefore be distributed since no systematic detection of the pathogen is prescribed by current regulation.

Mechanical

Unknown.

Physical

The potential of soil solarization to control the pathogen has been demonstrated in infested orchards.

Chemical

The efficacy of some chemicals, especially phosphites, has been proved against *P. cinnamomi*. However, chemical treatments are not a management option in natural ecosystems on a wide scale basis, for environmental reasons (detrimental side-effects), not to mention practical and economic reasons. The application of fungicides might be considered in a few situations, for example to stop extension of the disease front or for the preservation of threatened flora.

Biological

Some soils have been shown to be “suppressive”, i.e. preventing disease expression, which can be attributed to higher levels of antagonistic microflora. Manipulation of the floristic composition of the understorey can stimulate such microflora. The “Ashburner system”, based on amendments to the soil and cover crops to promote soil suppressiveness, has been used with success in infested avocado groves.

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