Forest Phytophthoras

Greslebin, A., Hansen, E. M., and La Manna, L. 2011. *Phytophthora austrocedrae* Phytophthoras 1(1). doi: 10.5399/osu/fp.1.1.1806

Phytophthora austrocec

Overview

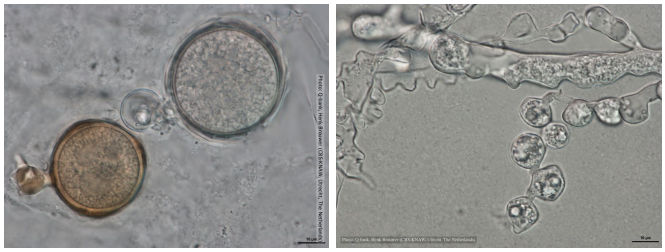
Phytophthora austrocedrae Gresl. & E.M. Hansen (2007) was isolated from necrc stem and roots of *Austrocedrus chilensis* (Cupressaceae). It is homothallic with s sporangia, oogonia with amphigynous antheridia, and very slow growth. It is the del ciprés", a lethal disease of *Austrocedrus* in Argentina. *Austrocedrus chilensis* cordillera) is endemic to southern Argentina and Chile. It is the most widely distı species of the few conifers inhabiting the slopes of the Andes Mountains in Patag

Etymology: *'austrocedrae'* refers to *Austrocedrus*, the tree that is attacked by th

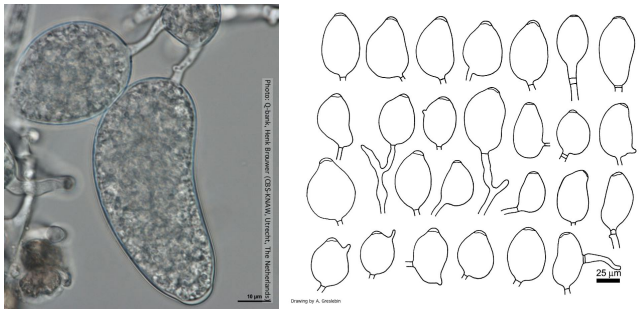
Morphology

Sporangia are borne terminally on mostly unbranched sporangiophores. Sporan frequently have hyphal swellings. Sporangia are ovoid, limoniform or ellipsoid ai papillate. They average 50 x 36 µm (range 22-83 µm x 15-58 µm) with the lengt about 1.4, and frequently have distorted shapes. Sporangia with hyphal projecti attachment to the sporangiophore are frequently observed in all isolates. Sporar observed in solid media.

Oogonia form in single-strain culture after about 20 days. Oogonia are globose c averaging 39 µm diameter (range 22-56 µm), with hyaline to light brown, smoot Oospores are globose, 31 µm diameter, hyaline, with smooth walls. Antheridia a amphigynous and one-celled. Hyphal swellings usually form in liquid and solid m more abundant in the former. Swellings are globose to subglobose and catenula with distorted shapes.



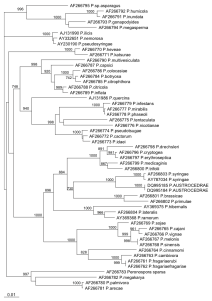
Oogonia with and without brown pigment (left), hyphal swellings (right). Photos from Q-bank, used with permission.



Sporangium with distorted shape, from Q-bank (left); morphology of sporangia from Greslebin et al. 2007 (right) used with permission.

Genetics

The ITS sequence was identical to sequences of *Phytophthora* DNA extracted fro diseased trees. *P. austrocedrae* is in clade 8 of the Cooke et al. (2000) molecula the genus, with *P. lateralis*, another pathogen of Cupressaceae, and other aggre pathogenic species. *P. syringae* is the closest described relative.

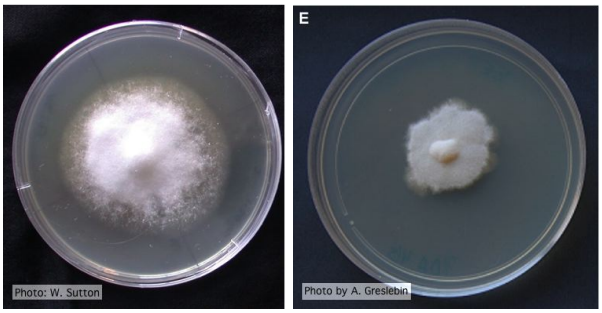


Phylogeny of *P. austrocedrae* based on ITS rDNA sequence analysis (Greslebin et al. 2007)

Growth

In V8 and tomato juice (TA) agar the colony is uniform, without growth pattern, shaped in the center and appressed or mostly submerged at the margins. In cor (CMA) the colony is appressed, with little or no aerial mycelium and the submer shows an arachnoid pattern. In potato dextrose agar (PDA) the colony is uniforn growth pattern, densely felty to woolly, with abundant and dense aerial myceliur very slow and favored by cool temperatures. Optimum temperature is 17.5°C, v at 25°C.

Maximum radial growth rate at optimum temperature on V8 agar ranged from 1 mm/day.



Colony morphology of *P. austrocedrae* at 16°C after 4 weeks on tomato juice agar (left) and potato dextrose agar (right).

Distinguishing characteristics for identification

Phytophthora austrocedrae is isolated from necrotic lesions of stem and roots of *chilensis*. It is homothallic, characterized by semi-papillate sporangia, oogonia w

amphigynous antheridia, and very slow growth with optimum temperature lower *Phytophthora* species. Phylogenetic analysis indicates that its closest relative is *syringae*, another species frequently isolated from soil and streams in *A. chilens*

The searchable web-based database *Phytophthora*-ID is useful for rapid identific *Phytophthora* species based on sequencing of the ITS or Cox spacer regions, fol BLAST searching the database. *Phytophthora*-ID maintains a database of sequer selective for sequence accessions that come from trusted sources including publ reviewed studies whenever possible.

Disease History

High levels of mortality of *A. chilensis* trees were reported in 1948 in Isla Victori Huapi National Park, in Patagonia, Argentina, near plantings of exotic trees colle around the world. In 1953, similar mortality was reported in an *Austrocedrus* sta a forest nursery in Epuyen, about 150 km distant from Isla Victoria. Since then, been reported in many places throughout the range of *A. chilensis* on the easter Andes in Argentina. In all cases, it has been assumed that the cause was the dis mal del ciprés (MDC, cypress sickness) (Havrylenko et al. 1989). Although *Phyto* suspected as a causal agent, no successful isolations were reported until 2007.

Impacts in the Forest

In Argentina *Austrocedrus chilensis* grows across a broad moisture gradient alor foothills. *A. chilensis* can be found either in mixed stands with *Nothofagus* spp. *Austrocedrus* stands on drier sites. It also grows in open, xeric forests or in isola the limit of the Andean forest and the Patagonian steppe, acting as a barrier aga advance. *Austrocedrus chilensis* is valued not only because of its ecological func because of the quality of its wood and its scenic importance (Greslebin et al. 201 protected species, with harvest strictly regulated by the state.

P. austrocedrae - necrotic lesion in phloem with resin pocket (left), landscape view of mal del ciprés showing stages of decline (right).

MDC is associated with specific site conditions at both microsite and landscape s et al. 2008), particularly high soil moisture and poor drainage (Baccala´ et al. 19 Rosso 1999, La Manna & Rajchenberg 2004). Tree death tends to occur in cluste stands, at least when disease incidence is low (Rosso et al. 1994).

Concern about the disease has increased due to the constant expansion of the a The disease affects tourism, recreation and commercial forestry. Appropriate sil management of affected stands is difficult because the epidemiology of the disea understood. Public institutions in charge of forest management have authorized with affected forests to fell the dead trees, which has had the serious consequen replacement of native forest with exotic introduced species. (Greslebin et al. 201

Forest and Wildland Hosts and Symptoms

In Argentina, *Austrocedrus chilensis* is the only known host of *P. austrocedrae*. susceptibility of other species is largely untested. The North American incense ce (*Libocedrus decurrans*) is very similar to *Austrocedrus*, both in appearance and susceptibility has not been tested.

The main symptom of *P. austrocedrae* in naturally infected trees is a necrotic les from killed roots up to 1 m high on the tree bole. The necrosis affects the entire the phloem and the sapwood is superficially stained. Both active and inactive les encountered. When active, lesions are bright chestnut brown, moist and flexible. they are dark brown, dry and hard, and difficult to distinguish from the outer ba is associated with the amount of root affected, but it is not totally reliable as an i

percentage of necrotic tissues of main roots and root collar (Floria & Greslebin 2
Sometimes, especially in stands where the disease is very active, older foliage i
turns bright yellow and then red by the end of the summer. This symptom is usu
with the presence of active lesions at the root collar. Resin exudation is often as
Phytophthora lesions. Resin flow usually emerges from a resin pocket in the phlo
active margin of a lesion.

Host Latin Name	Host Common Name	Symptoms	Habitat	Re
Austrocedrus chilensis	Chilean cedar	Canker, Decline	Forest	Arg

Educational and Management Materials

- Novedades sobre el Mal del Ciprés
- La causa del "mal del ciprés"
- El Mal del Ciprés

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