THE DECLINE OF *AUSTROCEDRUS* FORESTS IN PATAGONIA (MAL DEL CIPRÉS): ANOTHER PHYTOPHTHORA-CAUSED FOREST DISEASE

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Austrocedrus chilensis, an indigenous Cupressaceae of the Patagonian Andes forests, is suffering a disease that has been called "mal del ciprés". This disease was first reported more than 50 years ago but, in spite of many studies, its causes remained unclear until recently.

The disease begins in the root system, the distribution and pattern of spread of mortality in a stand is consistent with a soil-borne pathogen, and it is associated with seasonally poorly drained soils. Symptoms include defoliation, basal resinous exudates and red-brown necrotic lesions in the inner bark extending up the bole from killed roots. Brown cubic rots in roots and sapwood caused by wood-decomposer fungi are frequently- but not always- associated with dead or dying trees. These characteristics have led several workers to suggest that a *Phytophthora* species might be the causal agent of the disease.

Several attempts to find a *Phytophthora* species responsible for the disease have been made. Five species were isolated from soil and/or associated streams: *P. syringae, P. cambivora, P. gonapodyides* and the undescribed taxa "Pgchlamydo" and "P. taxon raspberry" and another two species -*P. pseudotsugae* and *P. cactorum*- were reported from soil and/or fine roots in a previous study. None of them showed a clear relationship with the disease. Isolations from the margins of the necrotic lesions in the inner bark using *Phytophthora*-selective media initially failed, but an ELISA test on necrotic phloem tissues was positive for *Phytophthora*, and subsequent DNA extraction from necrotic bark and amplification of ITS DNA using *Phytophthora*-specific primers was successful. Thus encouraged, isolation attempts were renewed and were finally successful.

The isolated species was an undescribed taxon of *Phytophthora* that was formally named *Phytophthora austrocedrae*. It is homothallic with amphigynous antheridia and semi-papillate sporangia, very slow growing with a maximum radial growth rate ranging from 1.0–1.8 mm/day in V8A at optimal temperature (17.5C). ITS rDNA sequence places it near *P. syringae* in phylogenetic clade 8 of the genus. It was isolated from symptomatic trees in all localities affected by "mal del ciprés," throughout the range of the disease, showing that the pathogen is widely distributed. Pathogenicity tests fulfilled Koch's postulates demonstrating it is the primary cause of the disease.

This work presents our current knowledge on "mal del ciprés" including a re-evaluation of the symptomatology, the results of pathogenicity tests and the known distribution of the pathogen in Patagonia. A discussion of subjects that should be addressed in future work is also presented.