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## ***PHYTOPHTHORA* ‘TAXON AGATHIS’, A NEW PATHOGEN OF KAURI? NO, JUST AN OLD ONE UNDER A DIFFERENT NAME**

There has been considerable publicity recently about a “new” fungus\* (see note) that is associated with the death of kauri (*Agathis australis*) in Auckland and Northland. There have even been suggestions that the survival of kauri is at stake. Reports in the media and in information items produced by the Auckland Regional Council (see [www.kauridieback.co.nz](http://www.kauridieback.co.nz)) give a clear impression that a virulent pathogenic fungus has been recently introduced and that it is spreading rapidly.

The fungus is not new. It was first found in New Zealand in 1972 by scientists from the Forest Research Institute (now trading as ‘Scion’) in a small patch (ca 1.5 ha) of dying kauri saplings and rickers on Great Barrier Island. Isolations made from basal cankers and soil from the diseased area and from soil in two healthy areas (one adjacent to the diseased area and another 4 km away) consistently yielded a species of *Phytophthora* which was identified as *Phytophthora heveae* by the Commonwealth Mycological Institute.

Pathogenicity tests showed that this fungus was capable of killing kauri seedlings (see Gadgil 1974 for full details). As *P. heveae* was isolated not only from the diseased area but also from soil from areas with healthy kauri, it was apparent that the fungus was pathogenic only under a specific combination of environmental conditions.

Wet soil appeared to favour pathogenic activity as most of the affected trees on Great Barrier recovered during the following dry summer. Because it was causing only minor damage in a small area in which it was known to be present, *P. heveae* came to be regarded as an insignificant pathogen of kauri and except as a record in the archives, was largely ignored.

Interest in the fungus was revived in 2006 when Landcare Research scientists investigating death of kauri in the Waitakere Ranges isolated a species of *Phytophthora* that was morphologically identical with the Great Barrier isolates identified as *P. heveae*. A comparison using molecular techniques of the Great Barrier and Waitakere isolates with *P. heveae* isotype isolates from Malaysia showed that all New Zealand isolates were identical and close to but distinct from the Malaysian *P. heveae*.

Acceptance of the modern tendency for basing species separation on phylogenetic analysis rather than morphology meant that another name for the New Zealand isolates was required. More work is needed to determine whether the New Zealand species is new and until that decision is made, an informal name, *Phytophthora* ‘taxon Agathis’ is being used (for full details see Beever *et al.* 2009).

This interim name has no status under the Code of Botanical Nomenclature and its adoption gives no indication of the connection between the recent Waitakere isolates and the Great Barrier isolates identified as *P. heveae*. This has given rise to an almost universal misapprehension that a new, recently introduced pathogen has been found.

Let us be quite clear. The fungus now known as *Phytophthora* ‘taxon Agathis’ is the same species identified as *Phytophthora heveae* from Great Barrier Island in 1974. It is not a recent introduction. It is not a rapidly spreading virulent pathogen. A survey of the original disease site on Great Barrier Island in 2007 showed that the diseased area now occupied ca. 10 ha (Beever *et al.* 2009). The fungus was already present in the adjacent area in 1972, so the extension of the diseased area does not indicate spread of the fungus.

Its detection in the Waitakere Ranges (and more recently, in Trounson Kauri Park) is unlikely to represent recent introductions. Although most likely to have been present, it was not detected before because environmental conditions were not suitable for it to have caused serious damage. Its presence in sites containing healthy kauri and the recovery of affected trees in a dry season on Great Barrier Island has shown that the fungus is pathogenic only under a specific combination of environmental conditions.

*Peter Gadgil*

\***Note:** In this article, the word ‘fungus’ is used in its general sense, broadly defined as “an organism traditionally studied by mycologists”. Strictly speaking, species of *Phytophthora* should be called Oomycete fungi (Brasier 2009). I consider such pedantry unnecessary in a general article - *P. Gadgil*.

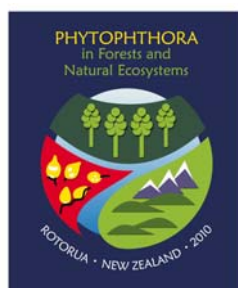
## Phytophthora References

Beever, R.E.; Waipara, N.W.; Ramsfield T.D.; Dick, M.A.; Horner, I.J. 2009: Kauri (*Agathis australis*) under threat from *Phytophthora*? pp. 74-85 in "Phytophthoras in Forests and Natural Ecosystems", Proceedings of the Fourth Meeting of IUFRO Working Party S07.02.09, (Goheen, E.M.; Frankel, S.J. tech. cords.), General Technical report PSW-GTR-221, USDA Forest Service, Albany, CA, USA.

Brasier, C. 2009: *Phytophthora* biodiversity: how many *Phytophthora* species are there? Pp. 101-115 in "Phytophthoras in Forests and Natural Ecosystems". (full reference above).

Gadgil, P.D. 1974: *Phytophthora heveae*, a pathogen of kauri. *New Zealand Journal of Forestry Science* 4: 59-63.

### 5<sup>th</sup> IUFRO Meeting on Phytophthora Diseases in Forests and Natural Ecosystems



#### Where?

[Centra Hotel \(Auckland\)](#) and [Blue Baths \(Rotorua\)](#)  
New Zealand

#### When?

7-12 March 2010.

**For more information**  
see [www.phyto2010.com](http://www.phyto2010.com)

## IDENTIFICATION OF MYCORRHIZAL FUNGI USING MOLECULAR ANALYSIS

*Pinus radiata*, in common with other members of the Pinaceae, is highly dependant on mycorrhizal associations for survival and growth. This association between a fungus and the roots of higher plants is a symbiotic one, increasing the mineral and water absorbing capacity of the plant from which the fungus obtains its energy source (carbon compounds) directly. Two major groups of mycorrhizal associations, ectomycorrhizas and endomycorrhizas are recognised, based on whether the fungus grows mainly on the surface of the root or penetrates inside the root.

*Pinus radiata* is exclusively ectomycorrhizal. The associated fungus forms a continuous sheath or mantle around a rootlet and hyphae extend outwards from the sheath in the surrounding litter and soil. It may also form fruiting bodies above or below ground. Much of the earlier work on identifying the fungal partners of *P. radiata* mycorrhizas was based on establishing a connection between the identifiable fungal fruiting bodies and the fungi actually forming the mantle, which could not be identified directly. As many mycorrhizal fungi do

not form fruiting bodies, this approach limited the amount of information that could be gathered. Molecular methods such as direct sequencing and molecular fingerprinting, developed from the mid 90s on, have largely removed this limitation, making direct identification of mycorrhizal fungi possible.

A research project at Scion investigated *P. radiata* mycorrhizas in a nursery and four plantation sites using molecular techniques. Seven previously unreported species of mycorrhizal fungi were found: *Inocybe sidonia*, *Pseudotomentella* sp., *Pseudotomentella tristis*, *Rhizopogon pseudoroseolus*, *Rhizopogon luteorubescens*, *Tomentella* sp. and *Wilcoxina mikolae*. Reassessment, using molecular methods, of the identity of three previously reported mycorrhizal species, *Laccaria laccata*, *Tricholoma pessundatum* and *Hebeloma crustuliniforme*, did not confirm the specific names. It is proposed that they should be changed to *Laccaria proxima*, *Tricholoma* sp. and *Hebeloma* sp.

Molecular methods do have limitations including the availability of sequence data. Despite this, application of molecular techniques has increased the number of identified mycorrhizal associates of *P. radiata* from 17 species to 28 species.

A paper on this has just been published recently. It can be retrieved through <http://www.springerlink.com/content/p3q7126227000784/> or by contacting the author at [Katrin.Walbert@scionresearch.com](mailto:Katrin.Walbert@scionresearch.com)

Katrin Walbert



Above: Fruit bodies of *Laccaria proxima*

### NOTE FROM THE EDITOR

The editor wishes to remind readers that short notes on topical issues concerning forest health are welcomed. This includes discussion of or other points of view of any topic appearing in FH News.

### NEW RECORDS

We are no longer publishing details of new records. For further information on results of MAFBNZ funded programmes see MAFBNZ's Biosecurity magazine (<http://www.biosecurity.govt.nz/publications/biosecurity-magazine/index.htm>) where information on new biosecurity identifications is regularly published.

John Bain