Genetic variation in *Phytophthora cinnamomi* isolated from Fraser fir in western North Carolina

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Abstract. Fraser fir (*Abies fraseri* [Pursh] Poir.) Christmas tree production is an economically important industry to the mountainous western region of North Carolina generating over $US 100 million in annual sales. Root rot disease caused by *Phytophthora cinnamomi* Rands. limits or prevents Fraser fir production on many sites of this region. Genomic DNA was extracted from 34 single zoospore cultures of *P. cinnamomi* and 1 culture of *P. dreschsleri* Tucker isolated from Fraser fir Christmas trees from 5 different counties. DNA fingerprints of these isolates were developed by amplified fragment length polymorphism (AFLP) technique using five primer pair combinations (*EcoR* I-AC with *Mse* I-AG, -CG, -GG-, -CT and -CA). Genetic similarity estimates and cluster analyses were used to group individual *P. cinnamomi* isolates and sub-populations

The use of mulches as a method of controlling *Phytophthora cinnamomi* in avocados

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Abstract. Phytophthora cinnamomi is a major pathogen of avocado trees grown commercially in New Zealand. It attacks the feeder roots that lie near the surface in the topsoil and litter layers. Soil microorganisms may have an important role in controlling *P. cinnamomi* (1). The application in avocado orchards of different mulches and composted materials has been reported to be disease suppressive by contributing to a proliferation and presence of controlling microorganisms with appropriate biological activity, although the mechanisms by which this occurs are not well understood. A study is being conducted into the effects of various organic mulches on the incidence of Phytophthora root rot on six-year-old plantings of Hass avocados in an orchard under certified organic management in the Bay of Plenty, New Zealand. Four different mulches have been applied and compared to a control without mulch on a total of 91 trees. Changes to various parameters of tree health are being monitored. In addition to assessing tree responses, an understanding of possible mechanisms of disease suppression is being sought with using molecular and biochemical methods as well as traditional culturing techniques.

1. You MP, Sivasithamparam K (1994) Hydrolysis of FDA in an avocado plantation suppressive to *P. cinnamomi* and its relationship with certain biotic and abiotic factors. *Soil Biology and Biochemistry* **26,** 1355-1361.

A new *Phytophthora* infects several plant species and causes extensive mortality of three tree species in coastal woodlands in California

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Abstract. Since 1994, epidemic level mortality of *Lithocarpus densiflorus*, *Quercus agrifolia*, and *Q. kelloggii* has been reported in a 300 km long stretch within the coastal region of central California. A causal agent was unknown until June 2000, when we isolated a *Phytophthora* sp. from cankers on diseased trees. The morphology and the ITS DNA sequence of the isolated pathogen match a newly described species from ornamental rhododendrons in Europe. Cankers are usually initiated at the basal part of the tree, but do not enlarge below the soil line. On the other hand, the pathogen can be frequently isolated from aerial cankers up to 20 m from the soil line. The pathogenicity of the new *Phytophthora* was confirmed through inoculation experiments on seedlings, saplings, and mature trees of *Q. agrifolia* and *L. densiflorus*. In addition to *Quercus* and *Lithocarpus* spp., the pathogen has also been found infecting ornamental *Rhododendron* spp., native huckleberry (*Vaccinium ovatum*), California bay laurel (*Umbellularia californica*) and Pacific madrone (*Arbutus menziesii*). On these additional hosts, the pathogen appears to cause a foliar blight often leading to a twig and branch dieback. While these hosts may not necessarily succumb to the disease, they are an important source of inoculum.

The decline of Australian mammals: Implications for ecosystem function in *Phytophthora* affected communities

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Abstract. Phytophthora cinnamomi has major effects on floristics and structure in native sclerophyll vegetation in Australia and recent studies have shown that *P. cinnamomi* can also alter the diversity and abundance of small mammals within affected areas. Overseas research has found that vertebrate fauna can influence a number of key ecosystem processes. This paper reviews some of the evidence for similar effects in Australia and examines the implications of a decline in vertebrate fauna for ecosystem function in *Phytophthora* affected communities.

The effects of digging on ecosystem function is demonstrated by studies of the Woylie (*Bettongia penicillata*) in Australia. Woylies forage for the underground fruiting bodies of ectomycorrhizal fungi and create up to 110 diggings per night. At this rate individual Woylies can disturb in excess of 5.5 tonnes of soil annually. Experiments using simulated woylie diggings show that they reduce soil water repellency, affect the availability of nutrients and alter the particle size distribution of the soil. These studies also show that a decline in their population results in a loss of this digging activity and suggests any large scale disturbance that alters the guild of fauna within an ecosystem may alter functional processes as well.

In experiments currently being initiated, the changes in functional processes due to altered fauna guilds will be examined in *Phytophthora* affected communities in southern Australia. It will provide a detailed examination of soil disturbance (biopedturbation) by a suite of digging species as they forage for the fruiting bodies of underground fungi (mycophagy). These fungi (ectomycorrhizae) play a vital role in the supply of nutrients to plants. However, there is little information on the impact of *Phytophthora* on the production of fruiting bodies, or the effects on vertebrate foraging and soil disturbance. Nectar resources and vertebrate pollination will also be measured.