forest health news

ensis

No. 178, October/November 2007 **ISSN 1175-9755**

MYCORRHIZAS AND SEEDLINGS

The majority of plants are dependent on a symbiotic relationship with soil fungi called "mycorrhizas", which enables an increased uptake of nutrients and water and may protect the plant from pathogens. Plant health therefore increases, and the fungus in turn receives carbon from its host. There are several different types of mycorrhizal association. The symbiotic type found on our important plantation trees *Pinus radiata* and *Pseudotsuga menziesii* is called "ectomycorrhiza" (ECM); in this type the fungus grows around the root tips and forms a visible covering called a mantle (Figure 1). A PhD study at Ensis, Rotorua, investigated the ECM communities associated with *P. radiata* at Te Ngae Nursery, Rotorua, and in stands of several ages in Kaingaroa Forest in 2005 and 2006, with a special focus on the actual fungi colonising root tips. Part of this study investigated the fate and survival rate of fungal species colonising seedlings in the nursery in the first years after planting on a clearcut site. It is known that clearcutting reduces ECM diversity as it removes the host and hence the carbon source for the fungus. Furthermore this forestry practice alters the soil conditions, removes the organic layer through the clearcutting, and turns the site into a harsh environment for re-establishment. Mycorrhizal colonisation is imperative for the establishment of *P. radiata* as the tree is unable to grow without the fungal symbiosis; after planting it is even more important to have strong mycorrhizal development to facilitate the establishment of the seedlings.

Figure 1: Mycorrhizal mantle of *Rhizopogon rubescens* on *Pinus radiata* root tip

The species found in the nursery were *Rhizopogon rubescens*, *Hebeloma* sp. (Figure 2), *Tuber* sp., and *Wilcoxina mikolae*. Seedlings were planted on a clearcut site in Kaingaroa Forest and ECM on the seedlings were assessed on a monthly basis for a year. In addition, a 2- and a 7-year-old plantation were assessed. The study found that all nursery ECM were still present and dominant during the first year after planting. A few non-nursery ECM species were found on the root tips after 1 year, but these were of only minor incidence. The species *R. rubescens* (Figure 1) was dominant in the nursery and for the first year after planting. In a study in Spain on the differential responses of certain fungal species to environmental factors and their role in the mycorrhization of *P. radiata* seedlings (Duñabeitia *et al*. 2004), *R. rubescens* was found to be the most beneficial species for *P. radiata* seedlings in terms of colonisation, growth promotion, and tolerance to adverse environmental conditions. This makes it a desirable species to have on nursery seedlings. The ECM species composition was significantly different in the 7-year-old plantation and non-nursery species dominated. Compared to overseas studies we found this changeover in species was later and it took longer for new fungal species to colonise the root tips.

Figure 2: *Rhizopogon rubescens* (left) and *Hebeloma* sp. (right) fruiting bodies

The overall ECM diversity on New Zealand's plantation species is low compared to overseas native forests and plantations, and diversity is even lower in the clearcut environment (Jones *et al*. 2003). The current study has shown that it takes more than 3 years after planting for ECM fungi from nearby plantation forests to establish themselves as successful colonisers on the young trees. The colonisation by forest ECM was slower than reported in other studies (Dahlberg & Stenström 1991; Menkis *et al*. 2007). This finding implies that it is important to have ECM species from the nursery present on the root tips when the seedlings are planted in order to bridge the gap until the forest ECM colonise the root tips and take over the important role of nutrient and water uptake.

Viable inoculum for the nursery fungi is also present in the soil surrounding the roots and it is recommended that not all of the nursery soil should be removed from the seedling to ensure the colonisation of seedling roots by the ECM fungi at planting.

Dahlberg, A.; Stenström, E. 1991: Dynamic changes in nursery and indigenous mycorrhiza of *Pinus sylvestris* planted out in forest and clearcuts. *Plant and Soil 136*: 73–86.

Duñabeitia, M.K.; Hormilla, S.; Garcia-Plaxaola, J.I.; Txarterina, K.; Arteche, U.; Becerril, J.M. 2004: Differential responses of three fungal species to environmental factors and their role in the mycorrhization of *Pinus radiata* D. Don. *Mycorrhiza 14*: 11–18.

Jones, M.D.; Durall, D.M.; Cairney, J.W.G. 2003: Ectomycorrhizal fungal communities in young forest stands regenerating after clearcut logging. *New Phytologist 157*: 399–422.

Menkis, A.; Vasiliauskas, R.; Taylor, A.F.; Stenlid, J.; Finlay, R.D. 2007: Afforestation of abandoned farmland with conifer seedlings inoculated with three ectomycorrhizal fungi — impact of plant performance and ectomycorrhizal community. *Mycorrhiza 17*: 337–348

Katrin Walbert

*Newsletter of the **Ensis Forest Biosecurity and Protection Unit**, and the **Forest Health Reference Laboratory** (incorporating the Forest Research Mycological Herbarium (NZFRI-M), the Forest Research Culture Collection (NZFS), and the National Forest Insect Collection (FRNZ). Edited by John Bain, New Zealand Forest Research Institute Ltd, Private Bag 3020, Rotorua. <john.bain@ensisjv.com> Web site < http://www.ensisjv.com/biosecurity >*

CSIRO SCION THE JOINT FORCES OF CSIRO & SCION

PHYTOPHTHORA DISEASES OF TREES

Phytophthora spp. are some of the most invasive plant pathogens known world-wide. Several are of global importance as they have been widely dispersed by trade and other human-assisted mechanisms. Some species have very broad host ranges including both woody (conifers and angiosperms) and herbaceous plants, and are capable of causing multiple symptoms. As they are serious agricultural pathogens, as well as affecting native ecosystems, they are of concern to regulatory agencies, such as the New Zealand Ministry of Agriculture and Forestry (MAF).

From a forest perspective, several new species of *Phytophthora* that damage trees have been recognised and described, including: *P. ramorum* (the cause of sudden oak death), *P. kernoviae* (causing cankers and death of European beech in southern England), and *P. alni* (killing alder across the UK and Europe). In 2007, two new *Phytophthora* diseases of conifers were described. *Phytophthora austrocedrae* is a new species isolated from necrotic lesions of stem and roots of *Austrocedrus chilensis* in forest areas in southern Argentina and it is believed to be the cause of extensive mortality of this native cypress. Its origin is unknown but researchers report that they consider that it has been introduced. In Chile, a foliage disease of *Pinus radiata* caused by a new-to-science *Phytophthora* is typified by the relatively rapid death of needles and subsequent defoliation of trees. Newly planted seedlings and naturally regenerated plants often die in the first year of growth.

Because of the cryptic nature of many *Phytophthora* infections, and difficulties encountered with culturing and growing members of this genus, it has taken several years of concentrated research effort in both Argentina and Chile to isolate and identify the pathogenic agents responsible for these diseases. These two cases illustrate some of the problems associated with identifying *Phytophthora* spp. as the cause of disease. Although *Phytophthora* spp. are aggressive pathogens they are also seasonally active, delicate, ephemeral organisms that are quickly replaced in host tissues by other fungi and by bacteria. Even when successfully isolated into pure culture they may be difficult to identify to species as their spore structures (needed for identification) can be difficult to obtain and there is considerable overlap between species. The molecular era holds the promise of substantially easing the problems of disease diagnosis of cryptic origin.

Phytophthora diseases have become so important in forest ecosystems that IUFRO (International Union of Forestry Research Organisations) has allocated a research working party (7.02.09) solely to the topic of "Phytophthoras in Forests and Natural Ecosystems". This group, which meets every 2–3 years, held its fourth meeting in August 2007 in Monterey, California. Ensis Forest Biosecurity & Protection was represented at the meeting by Tod Ramsfield, who has expertise in the molecular identification tools that are increasingly been used to help find and identify these elusive pathogens, and Margaret Dick who studies the morphological and growth characteristics (still a vital component of the identification procedure). New Zealand had further representation at the research working party with George Gill (Senior Advisor, Incursion and Surveillance) from MAF Biosecurity NZ, and Ross Beever and Nick Waipara from Landcare Research. Tod, Margaret, and Ross co-authored two verbal presentations at the meeting, one on *P. kernoviae* in New Zealand, and one on a putative *Phytophthora* disease of kauri.

The next meeting of IUFRO Working Party 7.02.09 "Phytophthoras in Forests and Natural Ecosystems" will be held in New Zealand in 2010. The meeting will be jointly organised by Scion and Landcare Research and considerable interest has already been expressed by overseas *Phytophthora* researchers.

Margaret Dick and Tod Ramsfield

NEW RECORDS

New host record for New Zealand – Insect: *Platypus apicalis* (Platypodidae); Region: Hawke's Bay; Host: *Acacia dealbata*; Coll: B Rogan, 20/09/2007; Ident: J Bain, 02/10/2007; Comments: This native pinhole borer has been recorded from quite a range of native and exotic hosts.

New host record for New Zealand – Insect: *Liothula omnivora* (Psychidae); Region: Mid Canterbury; Host: *Podocarpus salignus*; Coll: J Bartram, 31/10/2007; Ident: J Bain, 06/11/2007; Comments: This native bag moth has been recorded from a wide range of native and exotic trees and shrubs.

New host record for New Zealand – Insect: *Icerya purchasi* (Margarodidae); Region: Wellington; Host: *Acacia floribunda*; Coll: J Bartram, 31/10/2007; Ident: J Bain, 07/11/2007; Comments: This Australian sap sucker was first recorded in New Zealand in 1879. It has quite a wide host range.

New host record for New Zealand – Insect: *Oemona hirta* (Cerambycidae); Region: Mid Canterbury; Host: *Brachyglottis greyi*; Coll: B Rogan, 31/10/2007; Ident: J Bain, 12/11/2007; Comments: This native long horn beetle has a very wide host range.

New host record for New Zealand – Insect: *Hemiberlesia lataniae* (Diaspididae); Region: Auckland; Host: *Libertia ixioides*; Coll: C Inglis, 02/11/2007; Ident: R Henderson, 12/11/2007; Comments: This cosmopolitan, polyphagous armoured scale insect was first recorded in New Zealand in 1979 at Kerikeri. It is now found throughout the North Island. This is the first record from the Iridaceae in New Zealand although it has been recorded from this family overseas.

New host record for New Zealand – Insect: *Saissetia oleae* (Coccidae); Region: Auckland; Host: *Drosanthemum floribundum*; Coll: C Inglis, 02/11/2007; Ident: R Henderson, 12/11/2007; Comments: This cosmopolitan scale insect was first recorded in New Zealand in 1885 and is found throughout most of the country. It has a very wide host range.

New host record for New Zealand – Insect: *Eriococcus coriaceus* (Eriococcidae); Region: Mid Canterbury; Host: *Eucalyptus polyanthemos*; Coll: J Bartram, 01/11/2007; Ident: J Bain, 09/11/2007; Comments: This Australian species was first found in New Zealand in 1900 at Timaru. It is now widespread and has been recorded from about 25 species of Eucalyptus in New Zealand.

New host record for New Zealand – Insect: *Aspidiotus nerii* (Diaspdidae); Region: Mid Canterbury; Host: *Arbutus* sp.? *menziesii*; Coll: B Doherty, 31/10/2007; Ident: R Henderson, 23/11/2007; Comments: This cosmopolitan species has a very wide host range. It has been recorded from *Arbutus* overseas.

New host record for New Zealand – Insect: *Psepholax macleayi* (Curculionidae); Region: Wellington; Host: *Acer pseudoplatanus*; Coll: B Rogan, 21/1012007; Ident: J Bain, 27/11/2007; Comments: This native species has been recorded boring in the wood, both dead and alive, of a large number of plants.

New distribution record for New Zealand – Fungus: *Phomopsis abdita*; Region: Wellington; Host: *Melia azedarach*; Coll: B Rogan, 19/11/2007; Ident: M Dick, 26/11/2007; Comments: This fungus causes branch dieback of *Melia* and has previously been recorded from Auckland and the Bay of Plenty.

New distribution record for New Zealand – Fungus: *Elsinoë mattirolianum*; Region: Mid Canterbury; Host: *Arbutus* sp.? *menziesii*; Coll: B Doherty, 31/10/2007; Ident: R Ganley, 16/11/2007; Comments: This species causes leaf spots on the host and has previously been collected from *Arbutus* sp. in Southland.

New distribution record for New Zealand – Fungus: *Aulographina eucalypti*; Region: Northland; Host: *Eucalyptus sphaerocarpa*; Coll: D Satchell, 27/11/2007; Ident: K Walbert, 30/11/2007; Comments: This fungus is a common leaf spot on a large number of *Eucalyptus* spp. in New Zealand. It has been known to cause severe defoliation some eucalypt plantation species here.

New host record and new distribution record for New Zealand – Fungus: *Discostroma callistemonis*; Region: Mid Canterbury; Host: *Callistemon comboyensis*; Coll: B Doherty, 01/11/2007; Ident: R Ganley, 23/11/2007; Comments: This fungus causes leaf necrosis and shoot dieback of the host.

John Bain

Printed by Scion Digital Print Centre, Rotorua (07-343-5711)