



Combating red needle cast

Identifying resistance to
Phytophthora diseases in radiata
pine.



Red needle cast lesions and banding on radiata pine needles.

Phytophthora is a group of soil, air or water borne plant pathogens that pose major challenges to global biosecurity. *Phytophthora* pathogens affect an increasingly broad range of hosts worldwide that, with the rapid movement of organic material between countries, has escalated the proliferation of diseases they cause.

Scion's *Phytophthora* research programme focuses on three diseases that are seriously impacting our primary industries and conservation estates: red needle cast, kauri dieback and crown rot in apples.

Red needle cast

Red needle cast (caused by *Phytophthora pluvialis*) is a new disease of radiata pine that can cause significant losses on some sites. The pathogen infects needles of radiata pine, causing them to turn a reddish-brown colour and fall from the trees.

Resistance to red needle cast appears to be a heritable trait, which is likely to provide a long-term solution to the disease.

Research questions

- What makes *Phytophthora* species such successful pathogens?
- Can we identify and select for broad resistance to *Phytophthora*?
- Enabling Technology - can we develop a method that is applicable to disease management of other systems?

Research objectives

1. To develop a technology platform, using both traditional and modern technologies, that will enable the characterisation of host-pathogen interactions from the molecular level through to tree scale.
2. To apply the knowledge gained from this enabling technology platform to breed for broad resistance against *Phytophthora* in trees, improve disease management and develop targeted diagnostic tools.

Benefits to industry

- Increased annual productivity through the deployment of resistant genotypes in high risk areas.
- Improved chemical control using phosphite.
- Genus-wide strategies for managing *Phytophthora* diseases in preparedness for future disease incursions.
- Diagnostic assays developed for use in local and national diagnostic and quarantine programmes.

Identifying resistance to *Phytophthora*

In addition to red needle cast, there are two other major *Phytophthora* diseases in New Zealand:

- Kauri dieback (caused by *Phytophthora agathidicida*), a disease that poses a serious threat to our indigenous kauri.
- Crown rot (caused by *Phytophthora cactorum*) causes significant ongoing root damage and apple tree loss.

We are taking a *Phytophthora*-wide approach to disease breeding, management and research, building on our existing programmes for red needle cast, kauri dieback and other *Phytophthora* species.

Scion has been allocated \$10 million funding from MBIE over the next six years (2013-2019), with significant co-funding from sector groups, to lead a collaborative research programme addressing the biosecurity threat of *Phytophthora* species to New Zealand's forestry, agriculture and natural ecosystems.

Project collaborators

The project is led by Scion's Forest Protection team and encompasses a range of disciplines across the organisation.

National collaborators: Landcare Research, Plant & Food Research, local Māori groups, Massey University, Auckland University of Technology (AUT) and the University of Auckland.

International collaborators: Murdoch University, Australia; the University of British Columbia, Canada; Oregon State University, USA; and the University of Exeter, England.

Co-funders: Ministry of Business, Innovation and Employment, Forest Growers Levy Trust, Radiata Pine Breeding Company, Kauri Dieback Programme.

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About Scion

Scion is the Crown research institute that specialises in research, science and technology development for forestry, wood and wood-derived materials, and other bio-material sectors.

Scion's purpose is to create economic value across the entire forestry value chain, and contribute to beneficial environmental and social outcomes for New Zealand.

