

COMBATING RED NEEDLE CAST

Identifying resistance to *Phytophthora* diseases in radiata pine.

HEALTHY TREES, HEALTHY FUTURE

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 the tree.
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.



Red needle cast lesions and banding on radiata pine needles.



Red needle cast sporangia.

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 agathadicida*), 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.

Scion has been allocated \$10 million funding from MBIE over the next six years, 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.

Scion is 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.

ABOUT SCION

Scion is a Crown Research Institute that specialises in research, science and technology development for the forestry, wood product and wood-derived materials and other biomaterial sectors. Scion's purpose is to create economic value and contribute to beneficial environmental and social outcomes for New Zealand.

We offer research and development services across the entire forestry value chain, including forest and climate change, forest health and biosecurity, rural fire research, forest management and tree improvement.



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.

Programme leader: Dr Nari Williams, Forest Pathologist for Forest Protection, Scion.

Healthy trees, healthy future

Enabling technologies to combat *Phytophthora* diseases

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