

Healthy trees, healthy future

Enabling technologies to combat *Phytophthora* diseases



Phytophthora is a genus of soil or air 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.

Five of New Zealand's main exports (forestry, apples, kiwifruit, grapes and avocados) generate 15% of the country's export earnings. Protecting these primary industries from new, emerging and established *Phytophthora* related diseases is imperative for the country's economy now and into the future. Without proactive intervention against such diseases, the Government's aim to increase export earnings to 40% of GDP by 2025, is at risk along with the health of New Zealand's indigenous and urban forest resources.

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 to address the biosecurity threat of *Phytophthora* species to New Zealand's forestry, agriculture and natural ecosystems.

Identifying resistance to a range of pathogens

Three major *Phytophthora* diseases currently affect New Zealand's primary industries and conservation estates:

- Red needle cast (caused by *Phytophthora pluvialis*), a new disease of radiata pine, can result in serious losses on some sites.
- Crown rot (caused by *Phytophthora cactorum*) causes significant ongoing root damage and apple tree loss.
- Kauri dieback (*Phytophthora agathidicida*) poses a serious threat to our indigenous kauri with a wide range of social, aesthetic, cultural and environmental impacts.

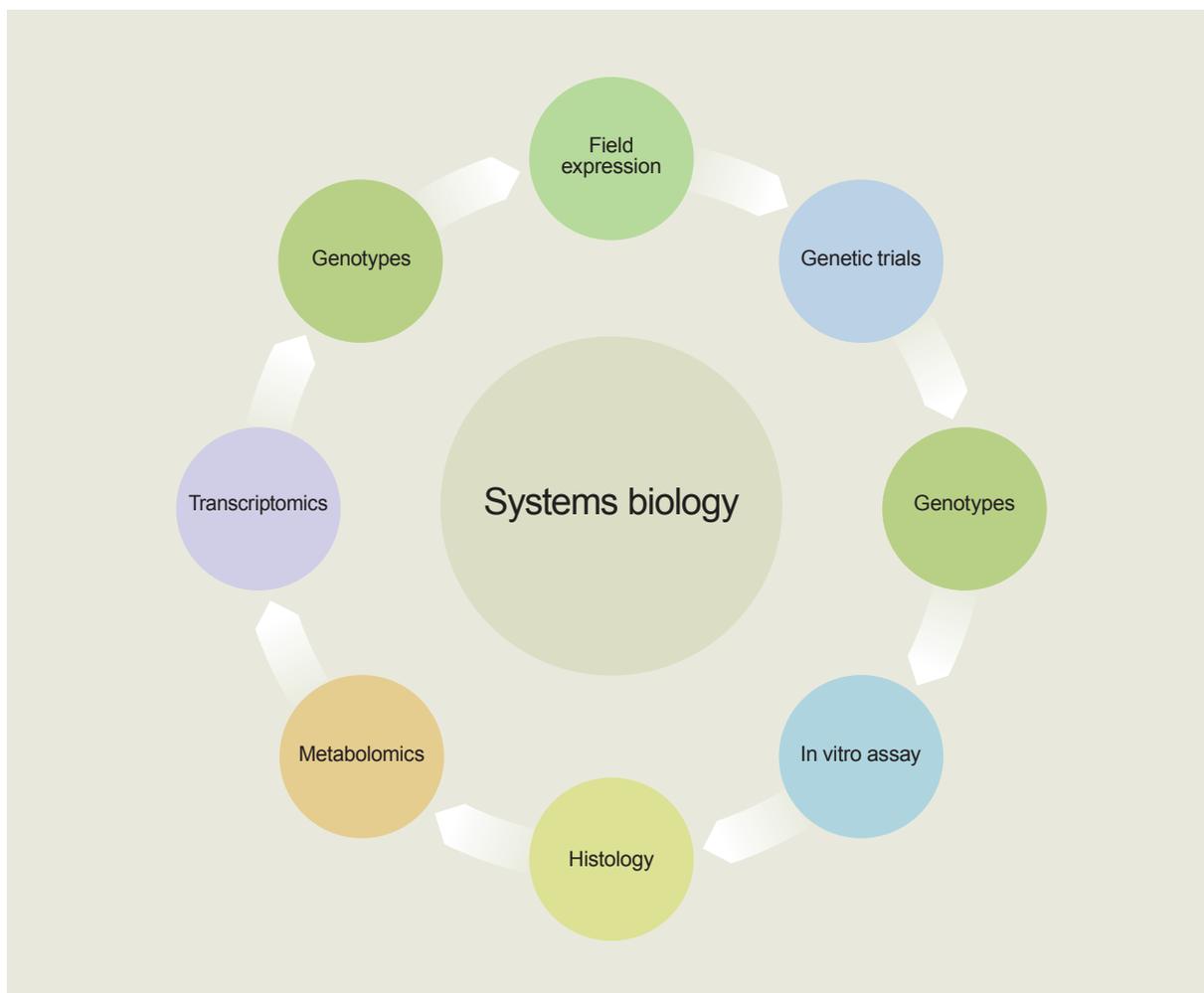
Scion is taking a genus-wide approach to disease breeding, management and research, building on our existing programmes for red needle cast, kauri dieback and other *Phytophthora* species.

Applying a systems biology approach

Host species will be screened and selected for pathogen resistance. We are applying a systems biology approach of detailing the host-pathogen interaction. This characterisation will employ state-of-the-art genetic and metabolic analyses to better understand the mechanisms of disease resistance, which will accelerate future screening programmes against a range of pathogens in

each host and the establishment of disease controls. It will also aid the development of breeding programmes for resistance against a broad range of *Phytophthora* species.

Eight *Phytophthora* species have been selected for this multi-pathogen-host model that straddle the forestry and horticulture industries, and natural and urban estates. Of the three host species targeted, red needle cast of radiata pine will be our first priority with a focus on protecting the forestry industry.



Project collaborators

The project encompasses Scion's Forest Protection, Forest Genetics and Biotransformation teams.

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 for 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.

A plant pathologist specialising in *Phytophthora* species, Nari's research has involved the management of *Phytophthora* diseases within native forests and included epidemiological, diagnostic, containment and eradication projects and community engagement. Since joining Scion, Nari has applied this experience into the epidemiology and management of red needle cast.

To learn more about the various projects in the programme:

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