Bio-Protection CoRE - FRST Programme

Forestry Project

FBRC Presentation

Rotorua – 28th Feb 2005

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Bio-Protection

Forest Project - Dr Robert Hill ($577K)

‘Enhancing *Pinus radiata* health and vigour using beneficial microbes and natural products’

Bio-Protection

Forestry Research Team

Dr Robert Hill	Biodiscovery
Mr Danilo Paderes	Biodiscovery/P.F.Olsen
Prof Alison Stewart	Lincoln University
Dr Eirian Jones	Lincoln University
Dr Sarah Dodd	Crop & Food
Ms Margaret Dick	Forest Research
Dr Tony Reglinski	HortResearch
Mr Mike Spiers	HortResearch
Dr Nick Gould	HortResearch
Dr Travis Glare	AgResearch
Dr Steve Reay	Silver Bullet Forestry
Bill Dyck	Bill Dyck Ltd
Dr Wei-Young Wang	PF Olsen Ltd
Dr Rebecca Ganley	FR/CoRE
Mr Rhys Minchon	MSc, Lincoln University
Ms Katrin Walbert	PhD, FR/Lincoln University

Bio-Protection

Research Projects

- Enhancing *Pinus radiata* health using *Trichoderma* bio-inoculants and elicitors
- Wound protection using beneficial microbes
- Mycorrhizal diversity in forest nurseries and plantation sites
- Development of *Armillaria* molecular probe
- Biocontrol of bark beetle

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Trichoderma

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Commercial successes

Trichodry 6S

Vegevax

DRH

Sentinel

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Enhancing *Pinus radiata* health using *Trichoderma*

Robert Hill, Alison Stewart, Eirian Jones,
Wei-Young Wang, Danilo Paderes

BioDiscovery

Trichoderma projects

- Demonstrate enhanced seedling/propagule health
- Improve plant health and vigour in transition from tissue culture to nursery
- Enhance tree health and vigour in nursery beds
- Validate superior performance of nursery enhanced stock in NZ forest plantation sites

Evaluation of *Trichoderma* treatments

- 10 *Trichoderma* treatments selected for PF Olsen and Company Ltd- Forenza containerised nursery seedling trial
- 2 different mixtures of 6 *Trichoderma* isolates
- 8 single *Trichoderma* isolates
- Untreated control
- >7000 *Pinus radiata* seedling trees from nursery trial planted on 2 forest sites (Kaingaroa and Kinleith) with a history of severe *Armillaria* infection

Trichoderma vs Armillaria

PF Olsen FORENZA Nursery

PF Olsen FORENZA Nursery

Kinleith Forest Trial Site

Kinleith Forest Trial Site

Kaingaroa Forest Trial Site

BioDiscovery

Kaingaroa Forest Trial Site

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Trial Results – 3 months

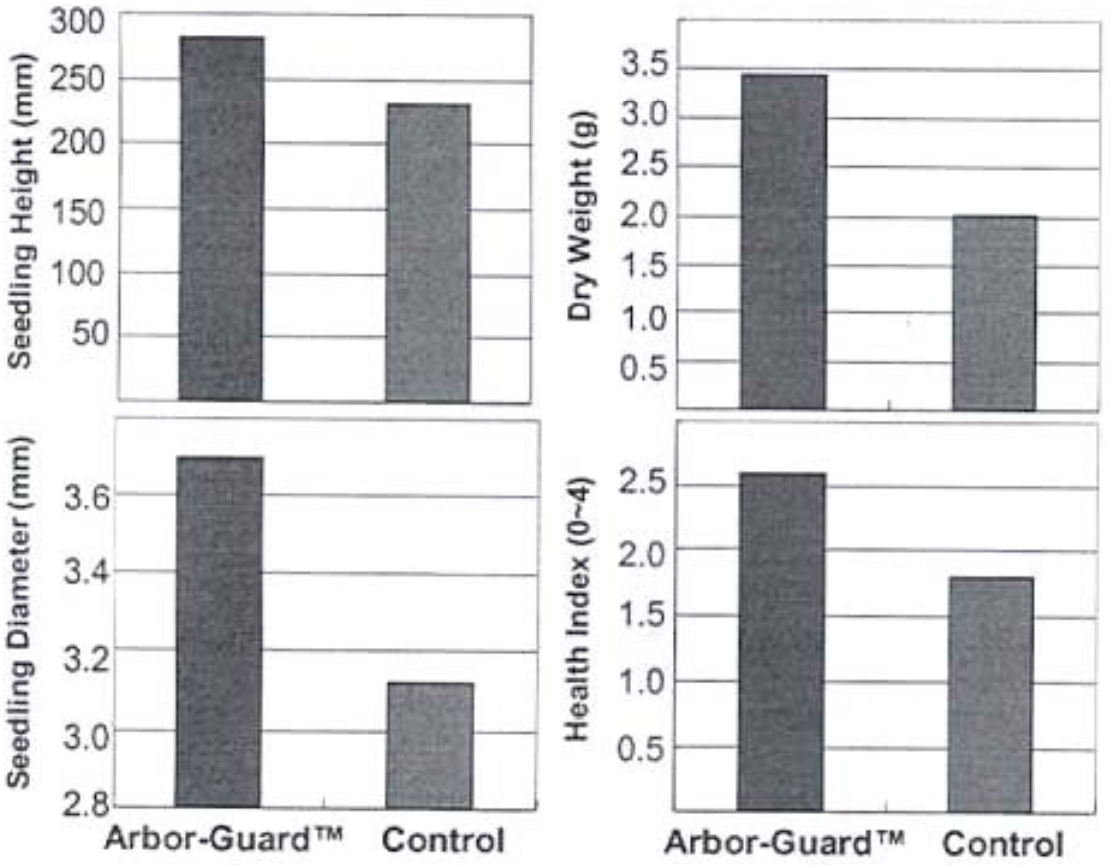

Figure 1. Effects on seedling growth, 3 months after germination.

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Trial Results – 14 months

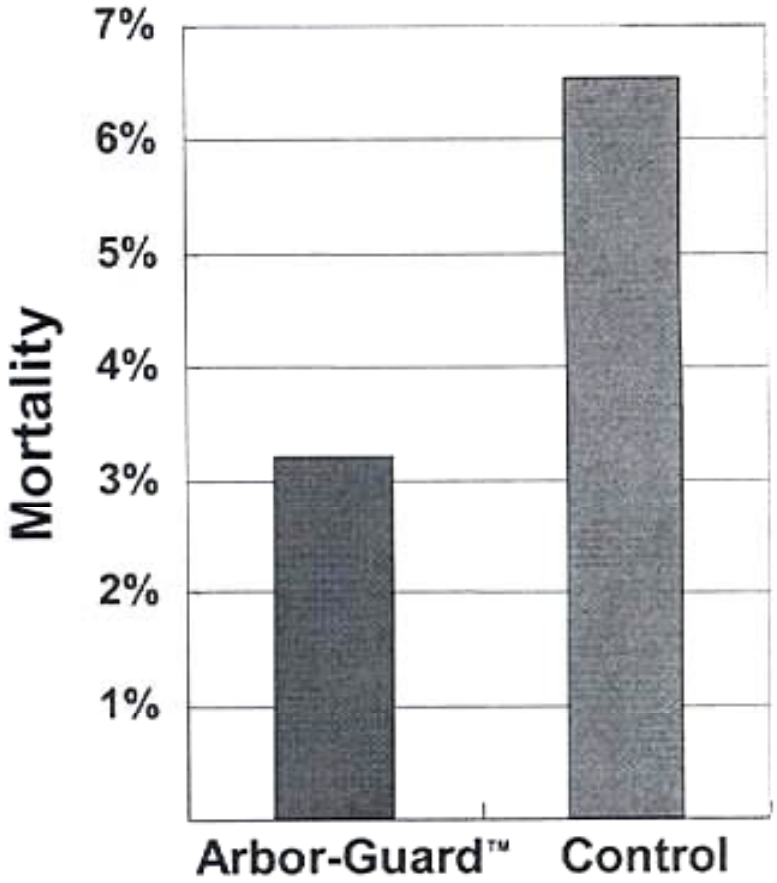

Figure 2. Effects on tree Mortality, 14 months after planting.

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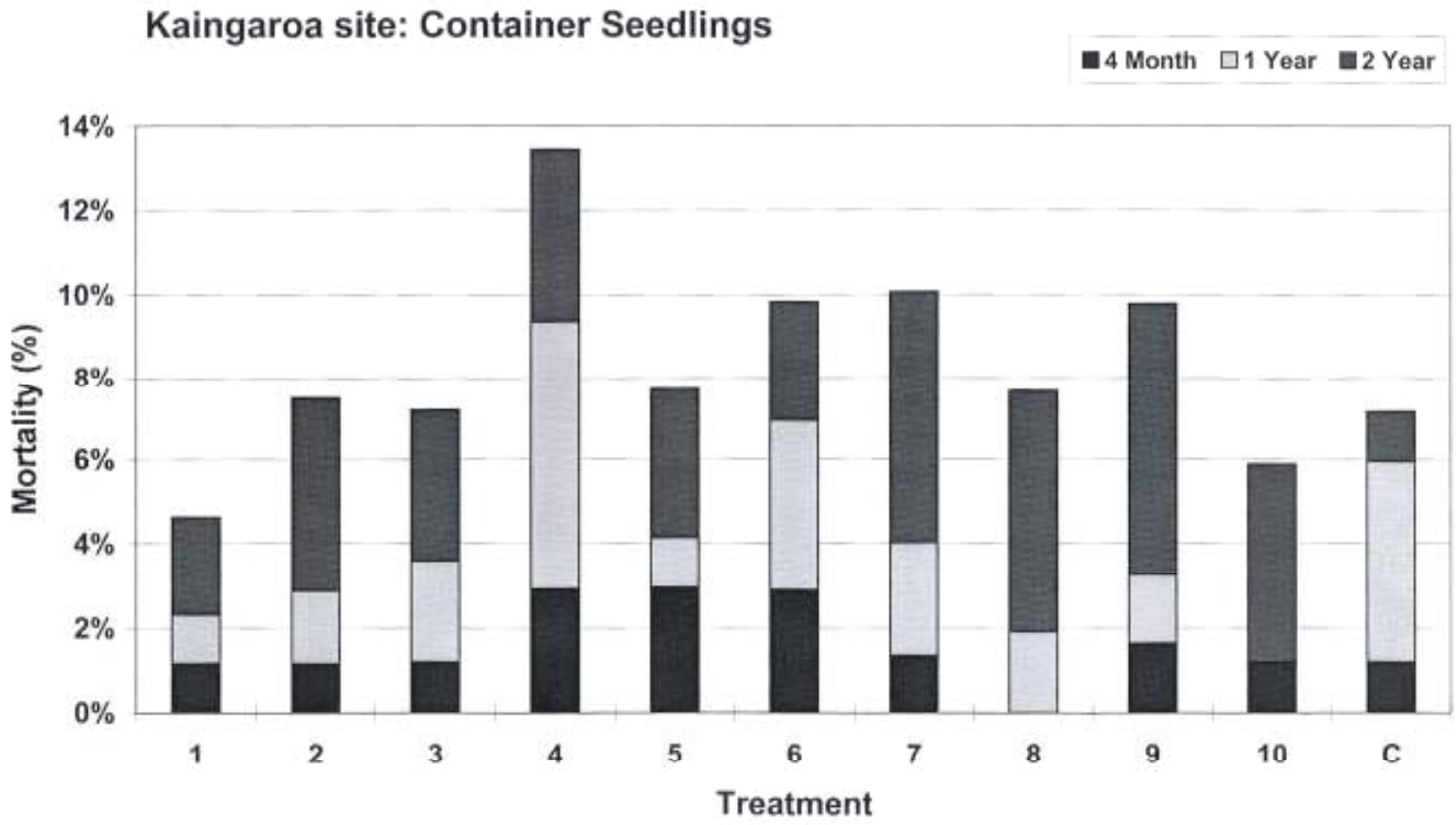
Kaingaroa trial – 2 years



ARBOR-GUARD™ Technology Results

- The best *Trichoderma* treatment (mixture 1) improved growth (height, stem diameter and dry weight) and health of pine seedlings in the forest nursery and provided a significant level of protection against *Armillaria* in the field.

- The mortality of ARBOR-GUARD™ seedlings was reduced by over one-third of the non-protected controls 2 years after planting.

Research in progress

FRST and FBRC funded components

- Establish minimum effective rate of *Trichoderma* inoculum needed for optimum results
- Determine most effective mode of application of *Trichoderma* (delivery system)
- Evaluate timing and frequency of *Trichoderma* application to optimise results

Research in progress

TIF funded expert fellow – Danilo Paderes

- Develop an inexpensive, rapid and reliable routine count system to quantify *Trichoderma* to provide client quality assurance
- Develop DNA-based fingerprinting specific to the most effective *Trichoderma* isolates for IP protection and product quality control

Enhancing *Pinus radiata* health with beneficial micro-organisms and elicitors

Tony Reglinski, Mike Spiers, Joe Taylor
& Nick Gould

HortResearch

Research strategy

Beneficial micro-organisms

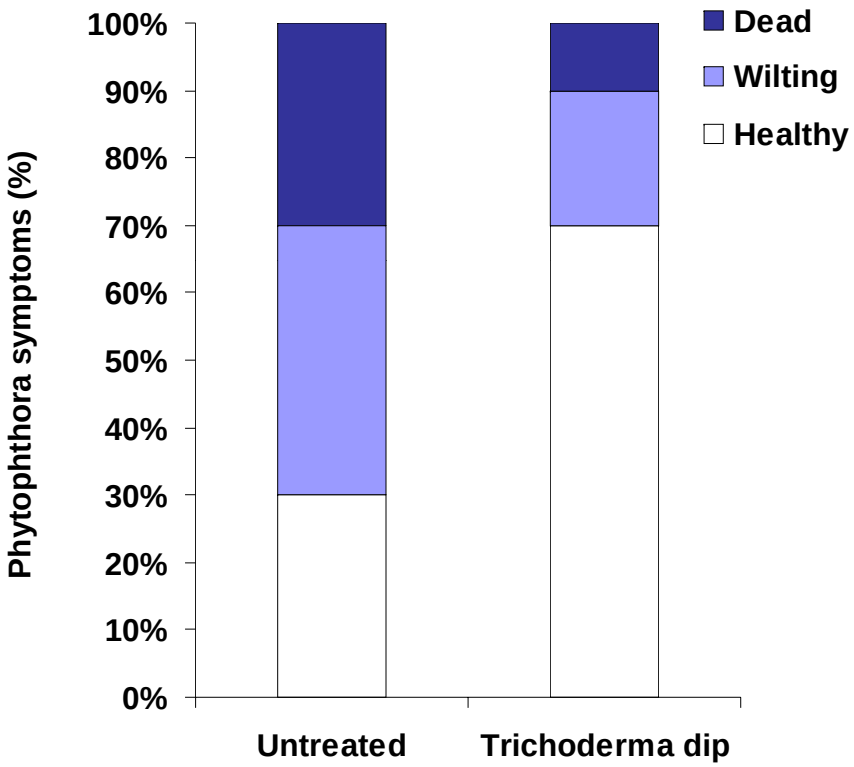
- non-pathogenic microbes that naturally suppress pathogens through competition for nutrients, parasitism, and antibiosis
- in some cases plant growth is also stimulated

Elicitors

- naturally occurring chemical compounds that trigger inducible plant defences
- elicitor-treated plants respond more rapidly and intensely to attempted infection
- induced resistance is non-specific and can be local or systemic

HortResearch

Using a *Trichoderma* root dip to protect bare rooted seedlings against *Phytophthora*



- The experiment was carried out on 1-year old bare rooted GF-plus plants.
- Roots were wounded and then immersed in a *Trichoderma* suspension immediately before transplanting into *Phytophthora* infested media.
- Symptoms were recorded 6 weeks later.

HortResearch

Where to from here?

- ARBOR-GUARD™ is a commercial product available through P.F.Olsen & Co Ltd.
- Renegotiation of milestones for years 3-4 of FRST programme
- Refinement of commercial product for improved performance
- Development of new bio-inoculant and elicitor technologies

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