



Session Three Pest Disease Control Strategies, Integrated Production Systems and the Impact on Market Access

New Zealand and Australia Avocado Grower's Conference'05 20-22 September 2005 Tauranga, New Zealand New control strategies for *Phytophthora* root rot

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Phytophthora cinnamomi

- Wide host range
- Causal pathogen of root rot
- Invades feeder root system
- Survives in soil
- Wet soils exacerbate disease
- Cellulose in cell walls





Phytophthora management

- Site selection and preparation
- ANVAS disease free nursery trees
- Tolerant rootstocks (eg 'Velvick')
- Phosphorous acid
- Cultural practices mulch animal manure calcium



Phytophthora research

- phosphorous acid application strategies
- field tolerance in rootstocks
 - evaluation of plant activators



Phosphorous acid

•systemic in avocado tree

•inhibits growth of *P.cinnamomi*

•stimulates plant defence mechanisms







Tanoaks killed by Phytophthora ramorum





Pentra-Bark[™] used in USA as an effective application method

- Bark penetrating surfactant
- Trunk spray with phos acid vs trunk injection with phos acid



Effect of trunk injection or trunk spray on feeder root mass four months after treatment (Hampton)

Application method	Mean root mass ¹
Trunk injection ²	2.1 a
Bark spray ³	2.9 b
р	0.004
lsd	0.44

- 1. 1 = roots sparse, few roots, 2 = roots present, network not developed, 3 = roots abundant, network developed
- 2. Injection 20% phosphonate
- 3. Sprays 50% phosphonate (20% soln) + 50% water + 2.5% by volume Pentrabark





Injected tree





Bark spray tree



P levels in leaves and roots after trunk injection and bark spray (Hampton 2005)



Assessment time



Health improvement in Hass trees severely Affected by *Phytophthora* root rot (Duranbah)

Treatment	Improvement in tree health (%)
Untreated	0
Trunk injection	15.8
Basal trunk spray	12.2



Tolerant rootstocks







Severity of root rot in a given field will depend upon:

- •level of tolerance in the rootstock
- •quantity and distribution of inoculum in soil
- •soil moisture
- •soil temperature
- •soil type
- •soil organic matter levels





Rootstocks 'Velvick', 'Anderson 10', 'Anderson 8'





Rootstocks 'Anderson 8', 'Anderson 10', 'Velvick'



Tolerance to *P. cinnamomi* in 18-month-old Hass grafted to three rootstocks planted in infested soil (Hampton)

		Mean tree health 0-10	
R	ootstock	low disease pressure	high disease pressure
'Velvick'	(West Indian race)	1.3	6.6
'Anderson 10)' (Guatemalan race)	5.8	7.2
'Anderson 8'	(Guatemalan race)	5.9	7.3

0 = healthy10 = dead







'Reed' control



'A10' control



'A10' 1cm trim



'Reed' 1cm trim







'A10' tap root trim

'Reed' tap root trim



Rootstock Tolerance

Ability to regenerate feeder roots

Response to phosphorous acid

Defence compounds -phenolics, glucanases, dienes



Evaluation of plant activators



Silicon formulation treatment





Epicormic bud growth





Effect of potassium silicate injections on tree health in *Phytophthora* affected trees

Treatment	Mean tree health improvement (%)
Control	-3.6 a
Potassium silicate injection	+31.1 b



Effect of potassium silicate and phosphorous acid treatments on root tip health and tree health of 'Reed' avocado seedlings inoculated with *P. cinnamomi* in growth cabinet (May/June 2005)

Treatment	Healthy root tips (%)	Seedling health (1-5)
Control	0.3 a	4.2 b
Silicon drench	0.0 a	4.2 b
Phosphonate drench	67.5 b	1.7 a
Phosphonate + Silicon drench	67.5 b	1.8 a
р	<0.001	<0.001
Isd	10.53	0.527

0 = healthy



'Reed' seedlings



Un-inoculated control

Si 200ppm + Phos acid 20%

Phos acid 20%

Si 200ppm

Control



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