Dothistroma needle blight

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Dothistroma - Current Knowledge

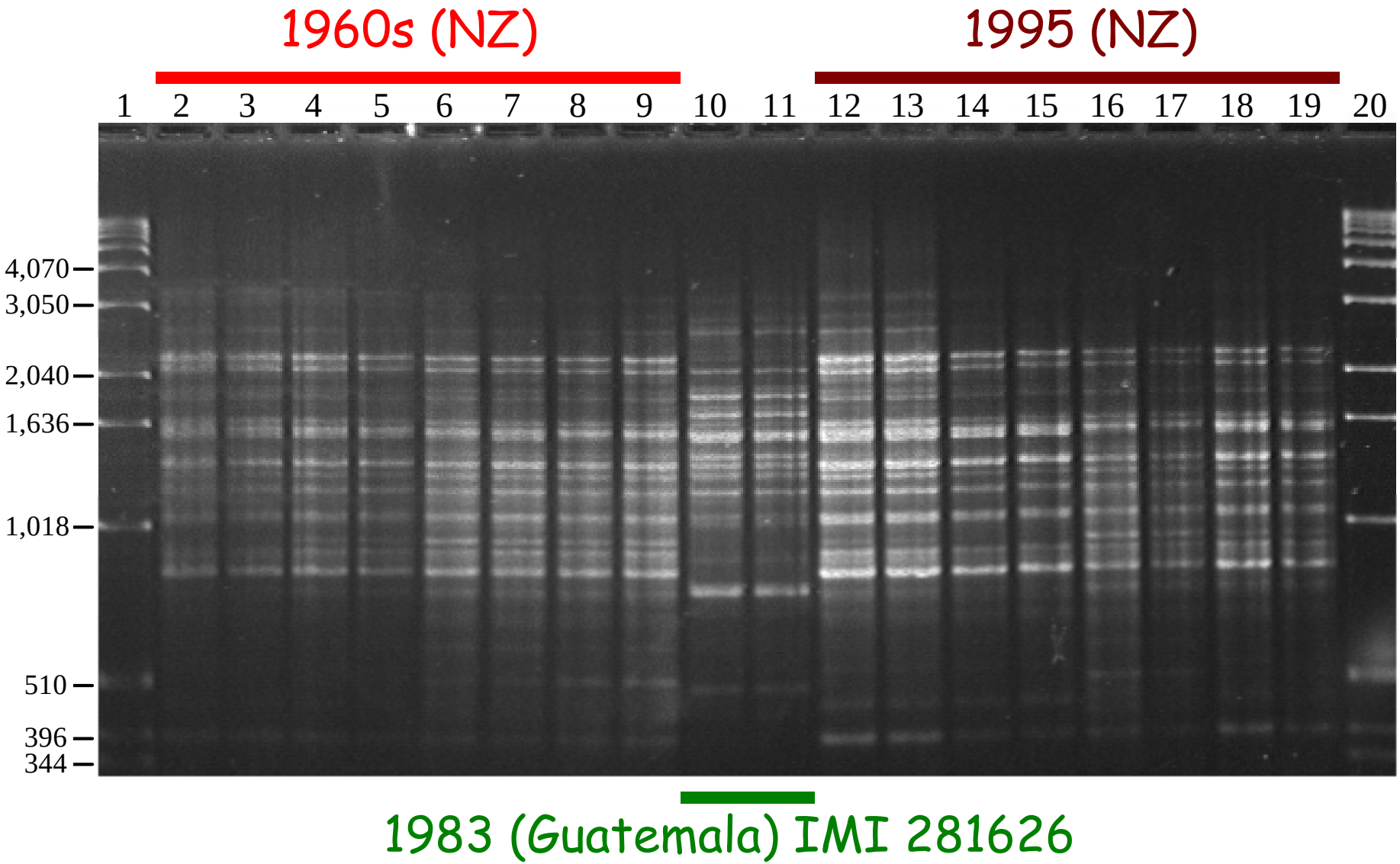
New Zealand

Survey published in 1999* suggests a clonal isolate of *Dothistroma pini* in NZ

All 'Dothistroma Resistant' (DR) breeds tested against this clone

*Hirst P., Richardson T., Carson S.D. and Bradshaw R.E. (1999) *Dothistroma pini* genetic diversity is low in New Zealand. NZ Journal of Forestry Science **29**: 459-472

Dothistroma pini genetic diversity is low in NZ

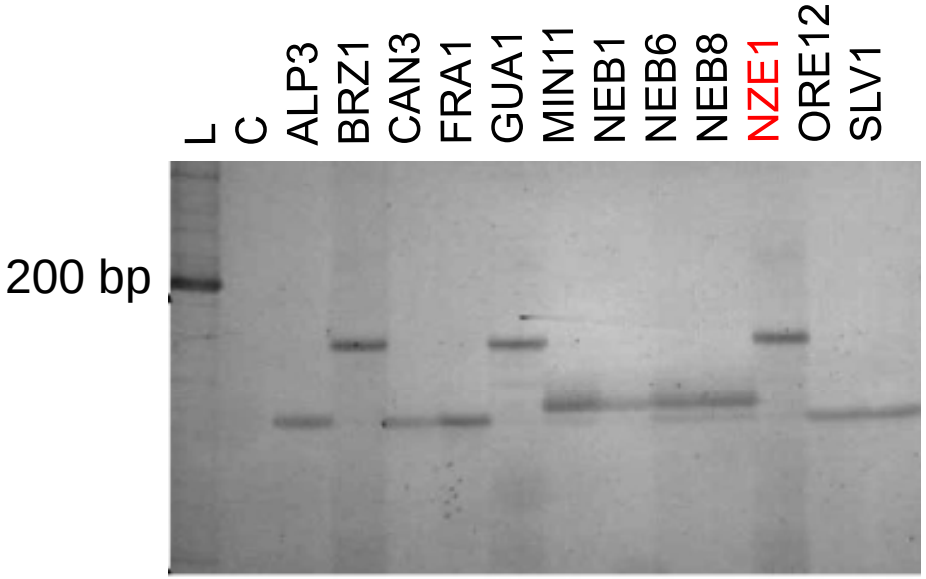


RAPD reactions carried out in duplicate [NZ J For Sci (1999) 29:459]

Dothistroma - Current Knowledge

Overseas isolates

- Are genetically distinct from NZ isolates



New Zealand
Brazil
Guatemala
German Alps
Canada
France
Oregon USA
Slovakia
Minnesota USA
Nebraska USA

Microsatellite markers distinuish *D. pini* strains

Ganley & Bradshaw (2001)
Mycol Res 105:1075

Dothistroma pini - Current Knowledge

Overseas isolates

- Genetically distinct from NZ isolates
- Evidence for a second species (D. pini/D. septosporum)
- Sexual stage in some countries (= genetic recombination)

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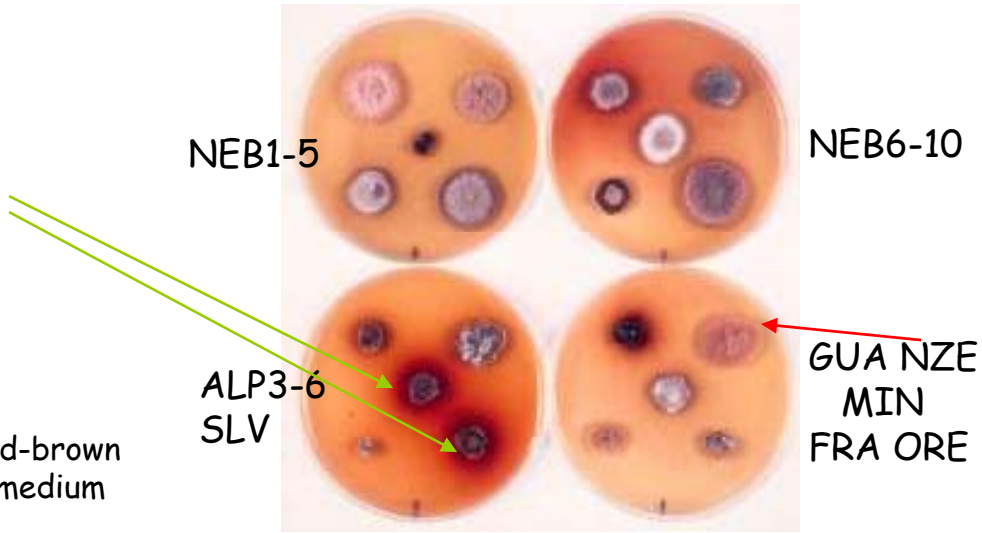

Dothistromin toxin is the red-brown pigment secreted into the medium

Dothistroma pini - Current Knowledge

Overseas isolates

- Genetically distinct from NZ isolates
- Evidence for a second species (D. pini/D. septosporum)
- Sexual stage in some countries (= genetic recombination)
- Increased toxin production in some isolates
- Increased incidence in the Northern hemisphere

Table 1. Some new outbreaks/increased incidence of *Dothistroma* needle blight recorded in the Northern hemisphere since 1992.

Country/region	*Pinus* species	Distribution notes	Reference
Poland	*P. nigra*	First record in Poland	KOWALSKI and JANKOWIAK 1998
Germany	*P. mugo*	Outbreak in native ranges at altitudes between 1200 & 1600m	PEHL and BUTIN 1992; MASCHNING and PEHL 1994
Portugal	*P. pinaster* *P. pinea* *P. radiata*	First record of teleomorph	FONSECA 1998
Hungary	*P. nigra*	Epidemics throughout the country	KOLTAY 2001
France	*P. nigra* var *laricio*	Considerable foliage damage	LANDMANN 2000
England	*P. nigra* var *laricio*	Greatly increased incidence	EVANS and WEBBER 2002
Canada	*P. contorta*	High incidence and mortality in northwest British Columbia	WESTFALL 2002; WOODS 2003
Montana USA	*P. flexilis* *P. albicaulis*	First report on limber and whitebark pine in native ranges.	TAYLOR and WALLA 1999
Vermont USA	*P. nigra,* *P. mugo,* *P. ponderosa*	First report in New England	PFISTER et al. 2000

Bradshaw, R.E. (2004) Dothistroma (red-band) needle blight of pines and the dothistromin toxin: a review. Forest Pathology 34: 163-185.

Example:

Sediesh Creek, BC, Canada
August 2004

Natural stand with

55-60 yr old lodgepole pines.

High mortality due to
Dothistroma pini.

Dothistroma - Knowledge Gaps

1. Are there overseas isolates (or species) of Dothistroma that are more virulent than NZ isolates?

2. If so, could the NZ 'Dothistroma Resistant' breeds cope with an incursion?

3. Is dothistromin a pathogenicity or virulence factor (a possible target for disease control??)

1. Are there overseas isolates of Dothistroma that are more virulent than NZ isolates?

What needs to be done?

→ Compare NZ and overseas isolates

Genetic variability

- update and upgrade previous surveys to
  - include broader geographical coverage
  - determine genetic potential for increased virulence

Virulence

- develop a lab-based screening system
  - test overseas isolates in containment

2. If there are more virulent isolates overseas, could the NZ 'Dothistroma Resistant' breeds cope with an incursion?

What needs to be done?

→ Screen NZ DR breeds

- In containment, screen with overseas isolates of *Dothistroma*
- Use the Lincoln Bio-Protection Biotron to test older trees
- Incorporate routine screening for DR to overseas isolates into tree breeding programmes
- Screen new outbreaks of Dothistroma to check for incursions

3. Is dothistromin a pathogenicity or virulence factor? (a possible target for disease control??)

What needs to be done?

→ Evaluate the role of dothistromin toxin

- Toxin-deficient mutants have been made in the lab at Massey University by disruption of toxin genes
- Mutants will be tested for pathogenicity in containment
- If an effect on pathogenicity or virulence is seen, then look for correlations between dothistromin production and virulence (e.g. with overseas isolates).