



Landcare Research
Manaaki Whenua

Plant & Food
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Grape Powdery Mildew

The sexual stage in NZ

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Landcare Research

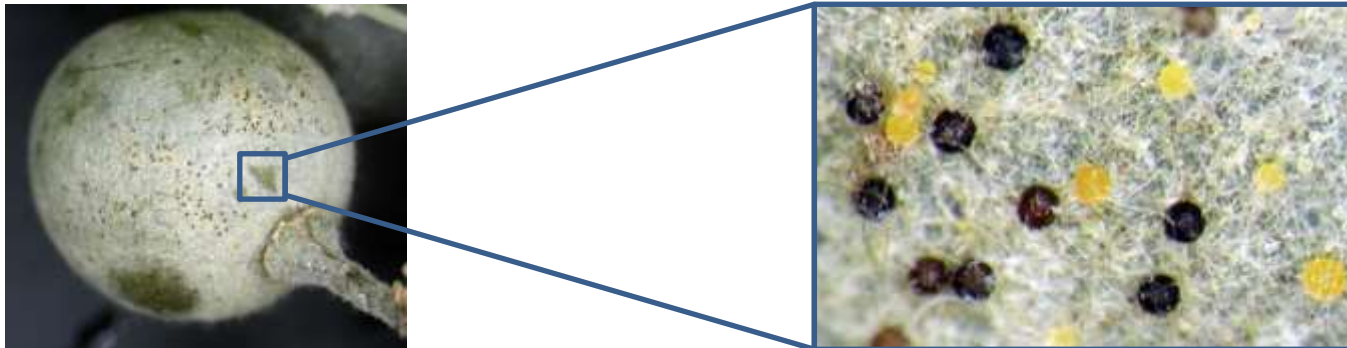
Andrew Coleman, MPI

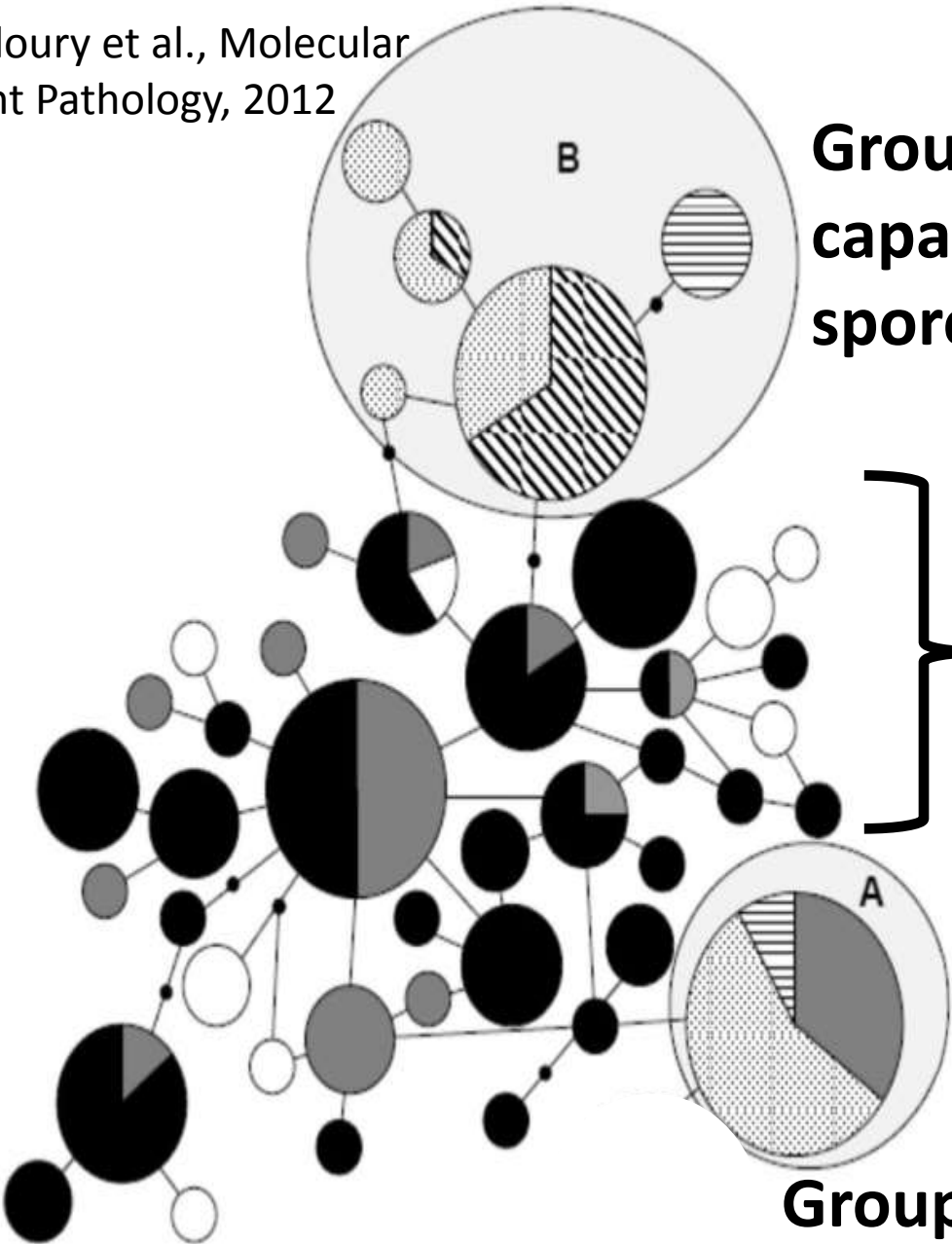
What lessons can we take ...

- control at the border is not perfect - new pathogens do still enter NZ
- managing biosecurity at the species level is not always appropriate

Grape Powdery Mildew - *Erysiphe necator*

- present in New Zealand over 100 years
- until recently known only in the asexual form ...
- sexual state discovered in Hawke's Bay in 2013 (Peter Wood, Plant and Food Research)
- **discovery of sexual state coincided with anecdotal reports of increase in disease**
 - overseas reports of a difference in pathogenicity between sexual and asexual populations
 - gathered base line data on NZ genetic diversity



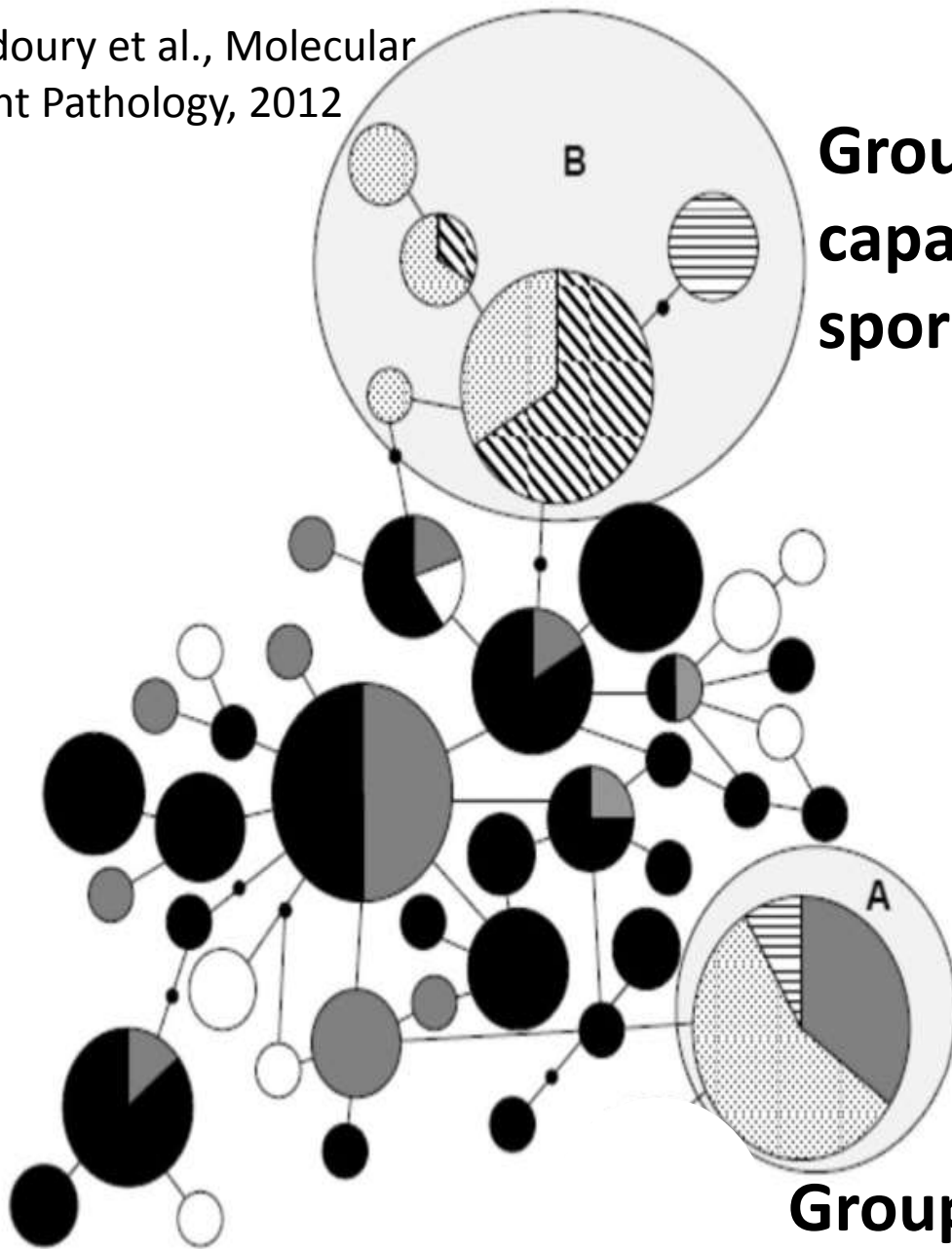


Group B – on cultivated grapes capable of forming sexual spores with right mating types

On wild grape species in USA, genetically diverse

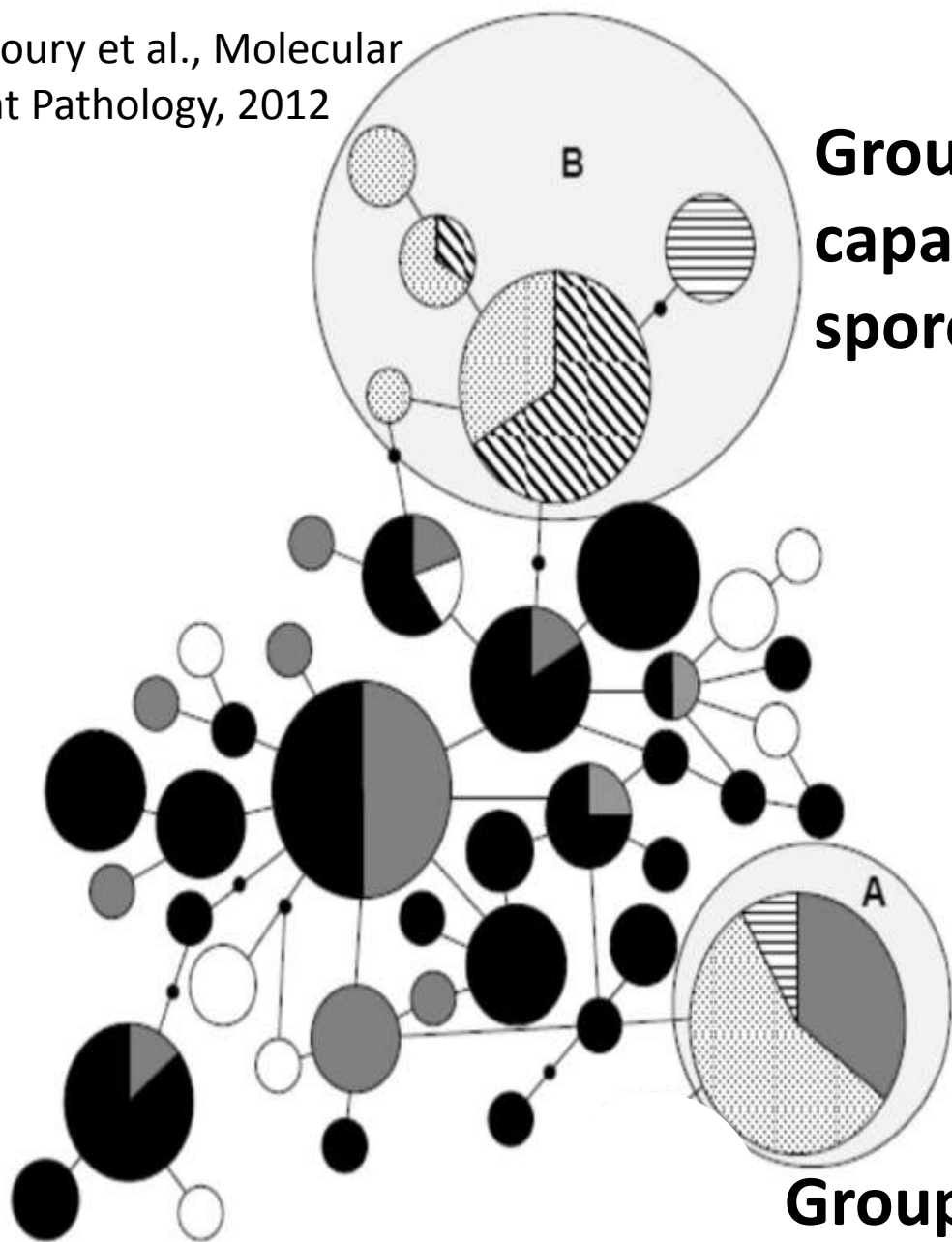
Group A – on cultivated grapes asexual spores only

**Group B – on cultivated grapes
capable of forming sexual
spores with right mating types**



**Group A – on cultivated grapes
asexual spores only**

Group B – on cultivated grapes
capable of forming sexual
spores with right mating types



- higher pathogenicity
- more likely to develop fungicide resistance

Group A – on cultivated grapes
asexual spores only

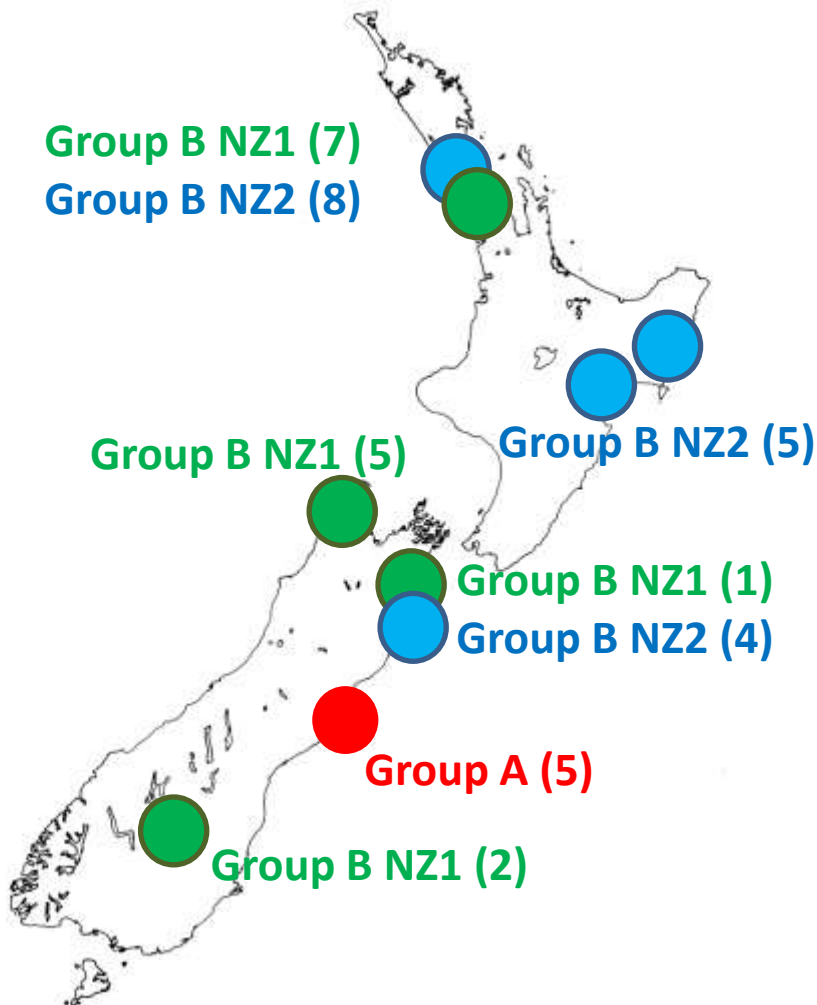
Genetic characterisation

Erysiphe necator in New Zealand

- Only 37 isolates
 - commercial vineyards Auckland, Hawke's Bay, Gisborne, Nelson, Marlborough and Otago
 - Backyard garden vines Canterbury
- both Group A and Group B populations, but only Group B detected in vineyards
- two Group B haplotypes
 - only one forming sexual spores?
 - Based on mating type gene ratios

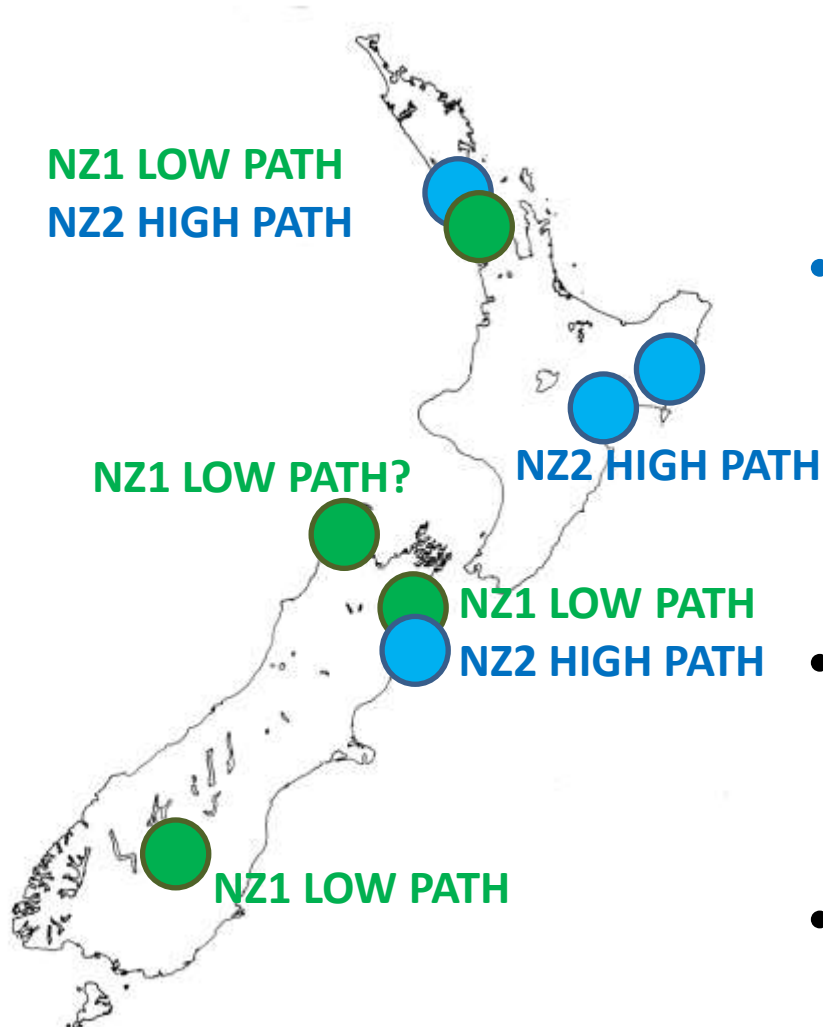
NZ samples – only 37 isolates

Number of isolates in brackets



- **Group A** (clonal, asexual) only on backyard vine
- Two **Group B** haplotypes, **NZ1 NZ2** – both widespread in commercial vineyards

Group B haplotypes correlate with disease level



- **Haplotype NZ1**
 - low disease
 - single mating type?; no sexual spores?
- **Haplotype NZ2**
 - high disease
 - both mating types; sexual state observed; regular sex likely
- Each vineyard or block sampled had only one haplotype
- Strong and local geographic structure to pathogenicity

“discovery of sexual state coincided with anecdotal reports of increase in disease”

- are these linked? maybe ...
- but, only a small number of isolates sampled:
 - Is the haplotype NZ1 versus NZ2 correlation with pathogenicity real?
 - Does a single haplotype always dominate at a single site?
 - Could there be seasonal differences in genotype?
- need answering ... more extensive survey needed

“discovery of sexual state coincided with anecdotal reports of increase in disease”

- maybe ...
- But, only a small number of isolates sampled:
 - Is the haplotype NZ1 versus NZ2 correlation with pathogenicity real?
 - Does a single haplotype always dominate at a single site?
 - Could there be seasonal differences in genotype?
- need answering ... more extensive survey needed
- Why do these need answering?
 - site based disease control recommendations for PM could potentially reduce levels of fungicide use
 - seasonal change may be a disease risk indicator

Possible to use seasonal changes as disease risk indicator?

- **Europe** (Montarry et al., European J Plant Path, 2009):
 - all vineyards dominated by Group B at harvest
 - early in season some of these vineyards had a proportion of Group A isolates
 - those vineyards with large group A population in spring had low disease at harvest

Possible to use seasonal changes as disease risk indicator?

- **Europe** (Montarry et al., European J Plant Path, 2009):
 - all vineyards dominated by Group B at harvest
 - often a shift from low path Group A to high path Group B through the growing season
 - those vineyards with large group A population in spring had low disease at harvest
- **New Zealand?**
 - **No early season samples**
 - same Group A to Group B shift?
 - shift from low pathogenicity to high pathogenicity Group B haplotypes?

Some answers are coming

- Plant & Food and Landcare MBIE core funding, additional 2015-2016 sampling will test:
 - relationship between haplotype and mating type
 - limited sampling from spring to test for seasonal change; search for early season Group A
- If more funding available we would:
 - confirm relationship between Group B NZ-1 and NZ-2 haplotypes and disease
 - properly understand variation across a season and its relationship to disease levels
 - confirm that there is consistently limited genetic diversity at a single site

Acknowledgements

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