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marcroft GRAINS PATHOLOGY

THE UNIVERSITY OF MELBOURNE

Tolerance to fluquinconazole identified in *Leptosphaeria maculans* populations surveyed across Australia

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Controlling Blackleg disease

- Cultural Practices
  - Crop rotation
  - Avoidance of last years stubble
- Breeding for resistance
  - Almost all Australian cultivars contain major gene resistance
  - Resistance is often overcome due to evolutionary potential of pathogen
- Fungicide use

Fungicide options for control of Blackleg disease

- Fungicides available:
  - Seed dressing (Fluquinconazole - Jockey)
  - Fungicide amended fertilizer (Flutriafol – Impact in Furrow)
  - Foliar application (Tebuconazole and Prothioconazole - Prosaro)
- All DMI class of fungicides

Fungicide use in Australia

- Jockey (Fluquinconazole)
  - Wide spread use for more than ten years
  - Extremely cheap so used as an insurance by growers
- Impact (Flutriafol)
  - Used since the 1980s but expensive at the time
  - In the last ten years usage has increased as now very cheap and can be purchased already applied to the fertiliser
- Prosaro (Tebuconazole and Prothioconazole)
  - Introduced 2011
  - First in-crop control option
  - Expensive
  - Still determining when the farmer gets an economic return

Screening for tolerance to DMIs

- Industry reliant on fungicides to maintain current intensity and production
- All fungicides from same group – do we have tolerance/resistance?
- Developed *in planta* screen to look at tolerance to fluquinconazole (seed dressing)

Ascospore shower technique was used to identify potential fungicide tolerant isolates

Stubble from trials that had fungicide applications

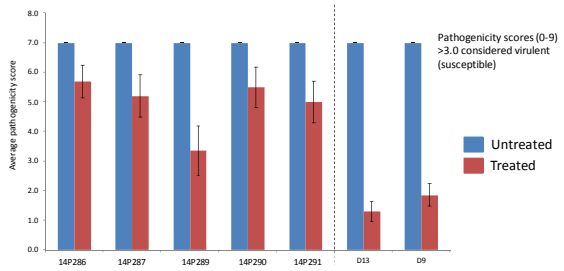
Jockey treated seedlings

Looked for lesion development and cultured isolates from them

x3

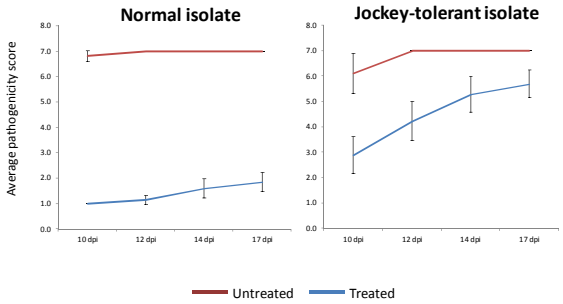
- Using stubble (ascospore shower) allows population to be screened rather than single isolates
- In 2014, limited screen carried out on **8 populations** from our fungicide trial sites
- Identified single population with increased tolerance
- Cultured isolates from this population

Identified five isolates with increased tolerance to fluqinconazole



- Individual isolates inoculated onto cotyledons of treated and control seedlings
- Lesions scored for disease development

Growth on Jockey treated plants slower than control plants for tolerant isolates

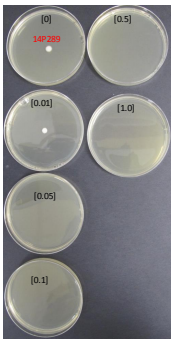


Increased tolerance carries through to 3rd leaf stage and stem canker formation

	Pathogenicity scores (0-9)						Internal infection (%)	
	1st leaf		2nd leaf		3rd leaf		Stem	
Isolate	Bare	Jockey	Bare	Jockey	Bare	Jockey	Bare	Jockey
14P286	6.4	5.6	6.5	5.9	6.3	4.3	100	73
14P287	5.0	5.6	5.0	6.0	4.5	4.4	100	92
14P289	4.8	5.6	4.5	6.3	3.0	4.4	100	81
14P290	6.3	5.4	5.5	4.9	3.3	3.5	100	81
14P291	7.0	6.6	6.9	6.5	5.4	5.9	100	59
D13	5.9	1.9	5.8	1.8	3.1	1.3	100	37

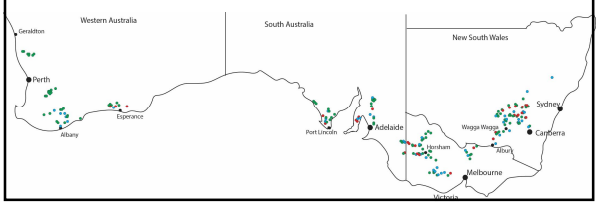
No correlation with *in vitro* assay

- Sent isolates to Steven Chang and Fran Lopez for *in vitro* screening
- No tolerance detected
- Possible reasons
  - Tolerance is conferred by gene expressed only in planta?
  - Caveat: minimal growth on control plate



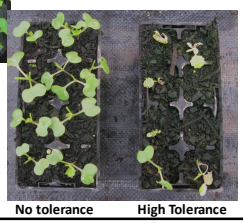
Survey of Australian populations

- GRDC funded a survey of 200 paddocks from across Australia
- Samples submitted by agronomists and farmers
- Samples from a range of cultivars and fungicide regimes



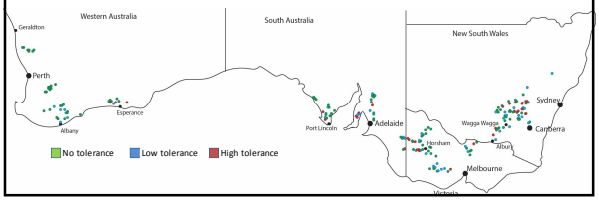
- Stubble used to inoculate seedlings treated with jockey.
- Two punnets with no fungicide as control (circled in red)

- Counted number of cotyledons with lesions and determined percentage of infected seedlings
- Designated populations:
  - no tolerance
  - low tolerance
  - high tolerance



No correlation between tolerance and fungicide use, cultivar or location

State	# samples submitted	% of population (# isolates) No tolerance	Low tolerance	Tolerance
VIC	50	60 (30)	26 (13)	14 (7)
SA	42	60 (25)	23 (10)	17 (7)
NSW	66	54 (36)	26 (17)	20 (13)
WA	42	76 (32)	17 (7)	7 (3)
Total	200	62 (123)	23 (47)	15 (30)



Industry implications

- First time such a survey has been done
  - Do not know if this tolerance has always been present, is increasing or decreasing
- Tolerance (insensitivity) not resistance?
  - Have mapping population to look at inheritance of the tolerance
- Do not know if there is cross tolerance to other fungicides
  - Designing *in planta* experiments to test this (pending approval of variation request)

Recommendations

- Try to reduce reliance on fungicides:
  - Cultivar resistance rating
  - Avoid previous year's stubble
  - Blackleg resistance groups
- Is still effective in 85% of paddocks.

Acknowledgements

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