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# Fungicide tolerance in Australian populations of *Leptosphaeria maculans* – An update

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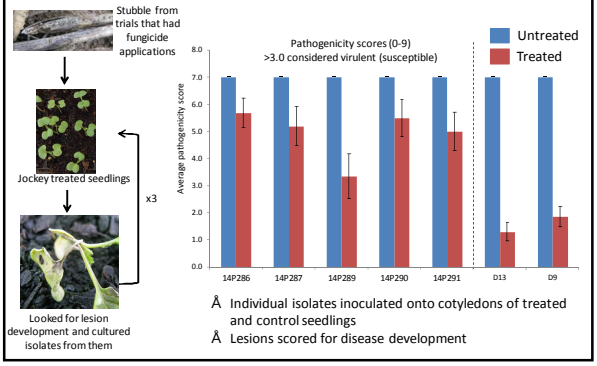
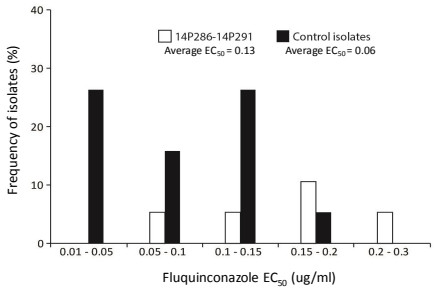
## Fluquinconazole tolerance identified in Australia in 2014




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

## *in vitro* assays with fluquinconazole show average $EC_{50}$ for fungicide-tolerant isolates are significantly higher than the control isolates

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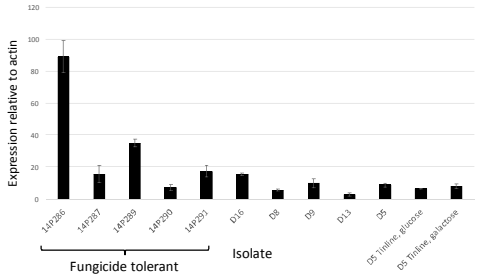
## No mutations detected within the *Cyp51* gene in the fungicide-tolerant isolates

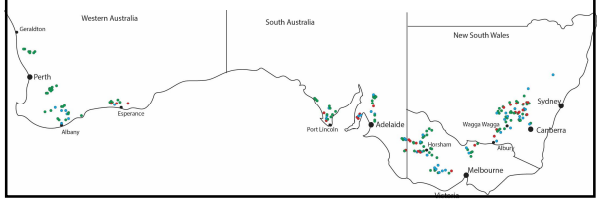
- Cyp51 gene sequenced from fluquinconazole tolerant isolates and control isolates
  - No mutations detected
- Expression of Cyp51 examined *in planta* fluquinconazole tolerant isolates and control isolates

## Expression differences detected but not consistent with increased tolerance phenotype




## 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



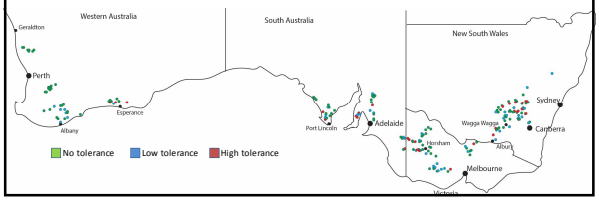
- Stubble used to inoculate seedlings treated with jockey.
- Two punnets with no fungicide as control (circled in red)

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

No 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) |



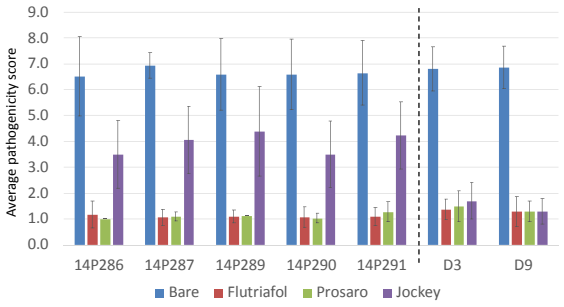

## Screening for tolerance to DMIs

- Industry reliant on fungicides to maintain current intensity and production
- Fungicides available:
  - Seed dressing (Fluquinconazole - Jockey)
  - Fungicide amended fertilizer (Flutriafol – Impact in Furrow)
  - Foliar application (Tebuconazole and Prothioconazole - Prosaro)
  - All DMI class of fungicides
- Do we have cross tolerance/resistance to these other fungicides?
  - Developed *in planta* screen to look at cross tolerance

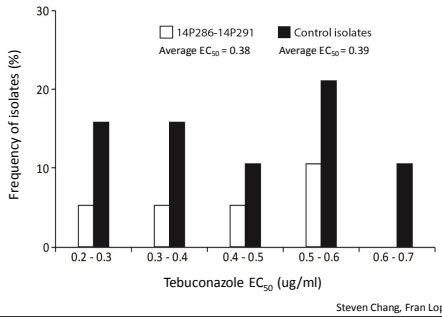
## *in planta* screen for Flutriafol and Tebuconazole/Prothioconazole tolerance

- Seedlings of cultivar Westar grown in punnets were sprayed with flutriafol or Tebuconazole/Prothioconazole as per registered rates
- Seedlings allowed to dry overnight
- Cotyledons wounded and inoculated as per standard inoculations.
- Disease progression assessed at 21 dpi

## No cross tolerance observed for fluquinconazole-tolerant isolates




## No significant differences were observed for the isolates in the presence of tebuconazole

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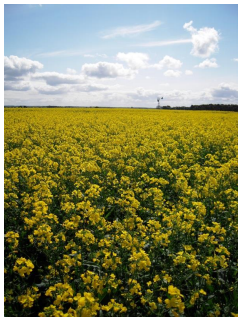
## Industry implications

- No cross tolerance between Jockey (fluquinconazole) and Impact-in-furrow (flutriafol) or Prosaro (Tebuconazole/Prothioconazole)
- Tolerance (insensitivity) not resistance?
  - Have mapping population to look at inheritance of the tolerance
- First time such a survey has been done
  - Do not know if this tolerance has always been present, is increasing or decreasing

## Industry 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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