

DISEASE CONTROL IN THE HRZ

- MANAGING FUNGICIDE RESISTANCE RISK

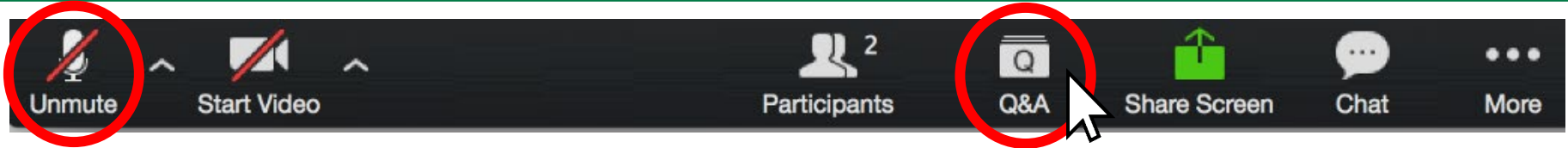
Nick Poole, FAR Australia



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CORPORATION

Housekeeping / Ground Rules

AUSTRALIAN
FUNGICIDE RESISTANCE
EXTENSION NETWORK



- Everyone should automatically be muted. Please keep on mute.
- To ask a question:
 - Go to the Q&A window in the bottom of your screen.
 - Click on Q&A, open the window and enter your question.
 - Your question will then be posted ready to be answered. You can also tick “send anonymously” if you don’t want your name attached to your question.
- In the unlikely event of webinar hacking, the webinar will be immediately shut down and a new webinar link will be sent to you via email within 10 minutes.
- Please be kind 😊

How to Q&A

Q&A

Open (2) Answered (0) Dismissed (0)

Jack Barker 2:43:31 PM
When is the next webinar?
👍 1 Answer live **Type answer**

Eren Yaeger 2:42:44 PM
When are office hours?
👍 Answer live **Type answer**


Zoom Webinar

Speaker View

Participants (4)
Panelists (4) Attendees (0)
KI Kylie Ireland (Me)
A AgCommunicators (Host)
Angela van de Wouw
BP Bridget Penna

Recording

Net form net blotch



Q&A

You asked: 18:03
What happens when I raise my hand?

Molly Parker answered: 18:04
I can take you off of mute.

Please input your question

Send Anonymously **Send**

Mute Stop Video Participants (4) **Q&A** Chat Share Screen Record Leave

To: All panelists
Type message here...

Australian Fungicide Resistance Extension Network



Regionally specific resources and training to help growers and advisors understand the status, risks and management of fungicide resistance in Australian grains.

Develop and deliver:

- Fungicide resistance management guide
- Workshops, info sessions & webinars
- Factsheets, updates & email alerts

 grdc.com.au/afren  @theGRDC

 afren@curtin.edu.au  #AFREN

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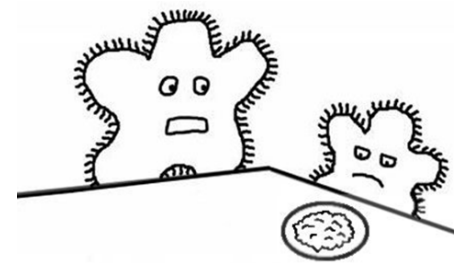
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Why are HRZ growers on the frontline with fungicide resistance?

1. Put simply we use more fungicides!
2. The typically longer growing season in the HRZ confers large benefits in terms of productivity **but typically requires more fungicide applications to control disease compared to the main Australia grain belt.**
3. More fungicides applications inevitably results in greater resistance risk **(more selection pressure).**
4. A number of the prevalent disease pathogens in the HRZ have started to acquire **resistance and reduced sensitivity!**

Fungicide Resistance – what's the risk?

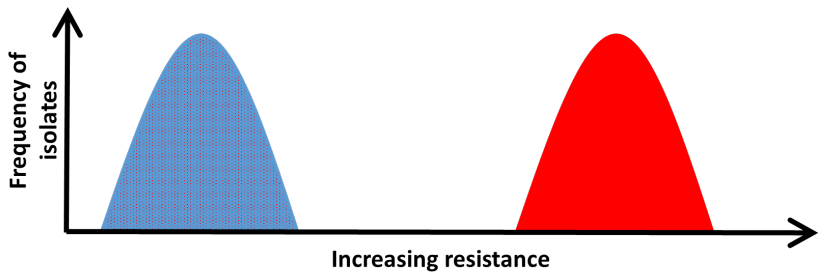
- Higher disease pressure in HRZ = higher chance of fungicide resistance
- Risk of fungicide resistance greatest when:
 - Pathogen = polycyclic with short latent period, sexual reproduction, high spore production
e.g. Powdery Mildew
 - Fungicide = single mode of action used repeatedly
 - Host = susceptible variety
- Good agronomic practices & selection of less susceptible varieties can reduce your risk considerably



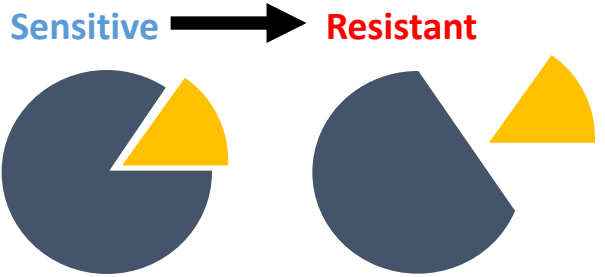
"But Timmy, you've to eat your fungicides or you'll never become resistant"

Development of Fungicide Resistance

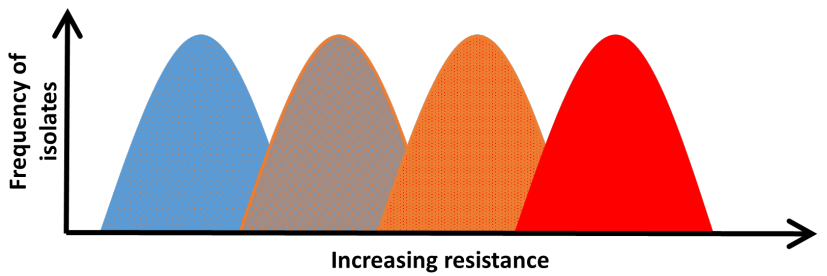
“Single-step” - e.g. Group 11 fungicides



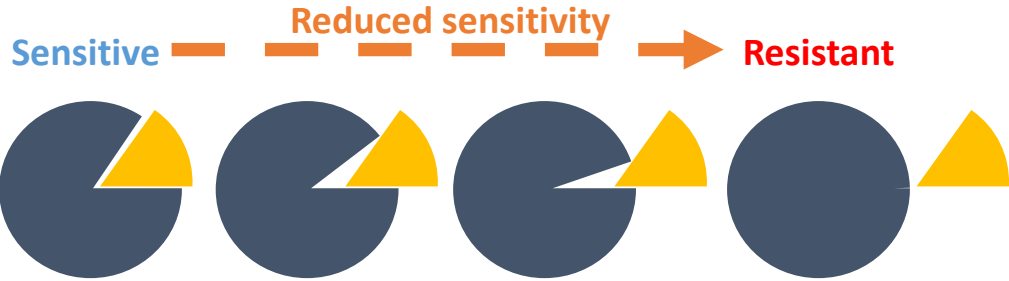
Single target site mutation



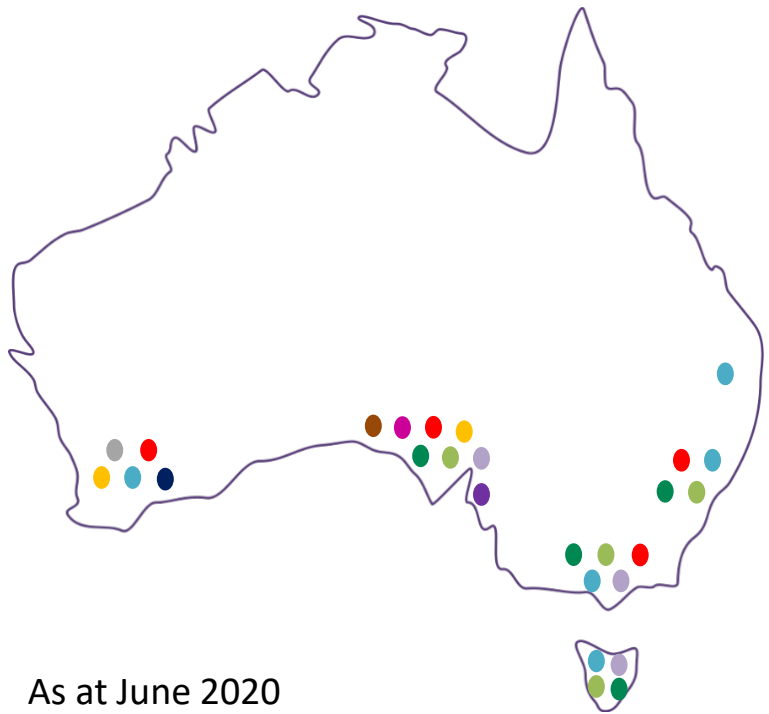
“Multi-step” - e.g. Group 3 fungicides



Accumulation of target site mutations



Fungicide resistance in Australian grains crops



As at June 2020

NB. Dots point to state only, not area where resistance was discovered.

Disease and fungicide group

- L, RS, R ● Barley Powdery Mildew – Group 3 (DMI)
- L, RS, R ● Barley Net Form Net Blotch – Group 3
- L, R ● Barley Net Form Net Blotch – Group 7 (SDHIs)
- RS, R ● Barley Spot Form of Net Blotch – Group 3
- RS ● Wheat Powdery Mildew – Group 3
- L, R ● Wheat Powdery Mildew – Group 11 (strobilurins)
- RS ● Wheat Septoria tritici Blotch – Group 3
- L ● Canola Blackleg – Group 2 (MAP-kinase)
- RS ● Canola Blackleg – Group 3
- L ● Ascochyta Blight of Lentil – Group 1 (MBC)
- L ● Botrytis Grey Mould of Chickpea – Group 1

L = Lab detection RS = Reduced sensitivity R = Resistant

Fungicide management decisions in the face of “resistance”

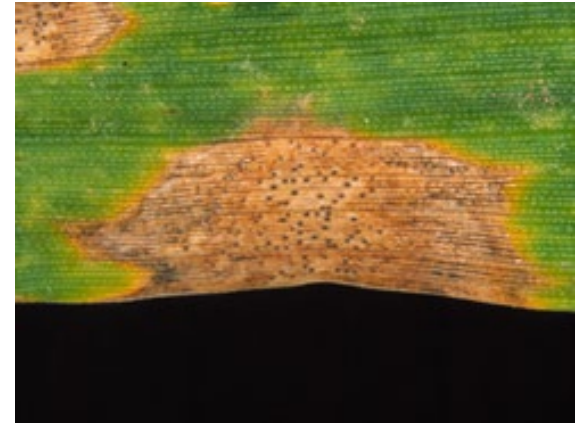
More evidence of fungicide resistance and reduced sensitivity has emerged in these three common diseases over the last 5 years.



Net Form Net Blotch (NFNB)
Yorke Peninsula, SA
SDHI resistance 2019
(Curtin University)



Wheat Powdery Mildew – Vic, SA, Tas
Resistant QoI (strobilurin) WPM mutant
now widespread in eastern states
(Curtin University)

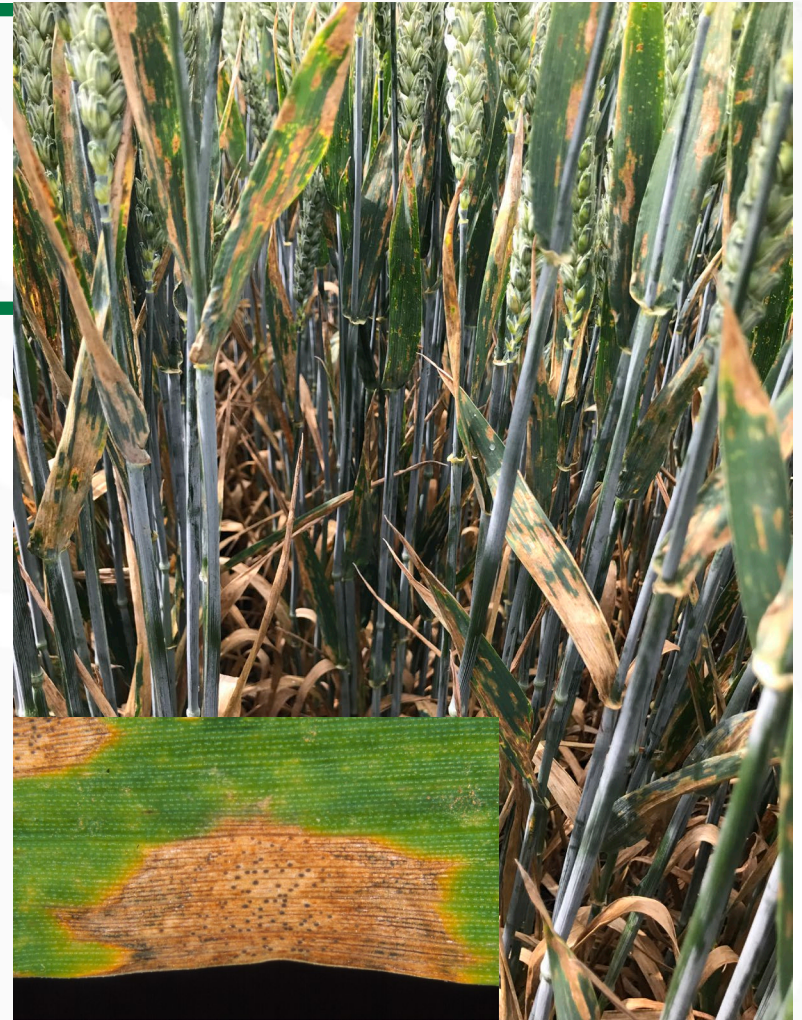


Septoria tritici Blotch (STB)
Reduced sensitivity to DMI triazoles
confirmed
(NSW DPI)

Septoria tritici blotch (STB) – major constraint to wheat productivity in the HRZ

Why is it problematic?

- Not as easily controlled as rusts!
- Continues to spread, even into MRZ & LRZ
- Long latent period disguises development
- Lack of genetic resistance in popular cultivars
- Pathogen associated with increasing resistance issues in Australia and globally



Poor genetic resistance to *Septoria tritici* blotch in SA & VIC

SA Variety Ratings (Source: NVT/SARDI)

DS Bennett	MSS
Manning	MR
RGT Accroc	MS
RGT Calabro	MR/MS
SQP Revenue	S
Kord CL Plus	MS
Mace	S
Razor CL Plus	SVS
Rockstar	MSS
Scepter	S
Sheriff CL Plus	S
Trojan	MS
Vixen	S
Wyalkatchem	S

VIC Variety Ratings (Source: NVT/Ag VIC)

Beaufort	S
DS Bennett	MSS
Manning	MR/MS
RGT Accroc	MS
RGT Calabro	MR/MS
SQP Revenue	S
Scepter	S
Trojan	MS

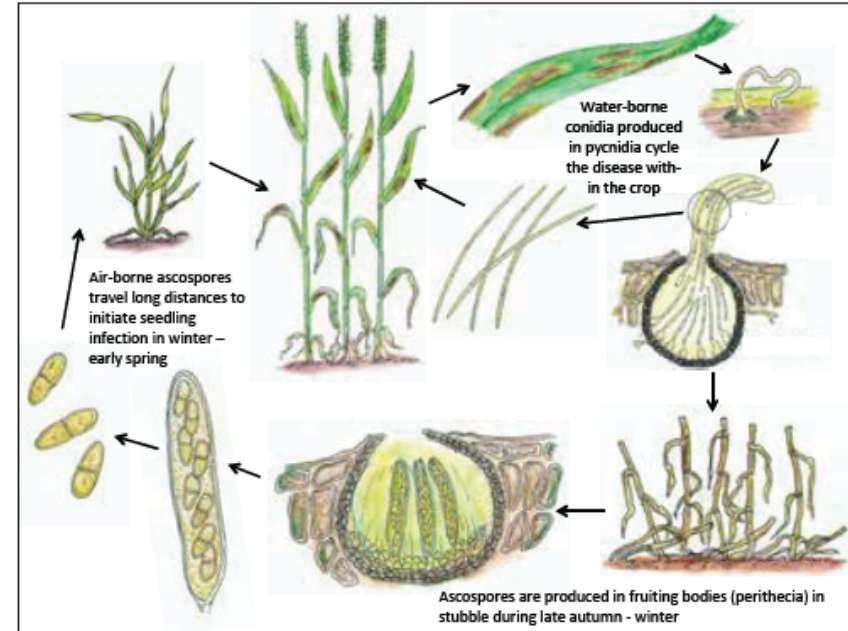
N.B. All cultivars featured in the 2020 Victorian sowing guide indicate ratings of MR/MS or poorer.

- MS confers advantages over S, particularly if suitable for early sowing.

Septoria tritici blotch (STB) – what makes it tick?

1. First phase of infection from stubble is by airborne ascospores (long distance).
2. Second phase of infection is rain splashed conidia up the crop canopy (short distance).
3. After early spring little or no infection from sources outside of the paddock (different to rusts).

The life cycle of *Zymoseptoria tritici* (STB)



©PLANTwise 2014.

Dry weather is the best fungicide for this disease!

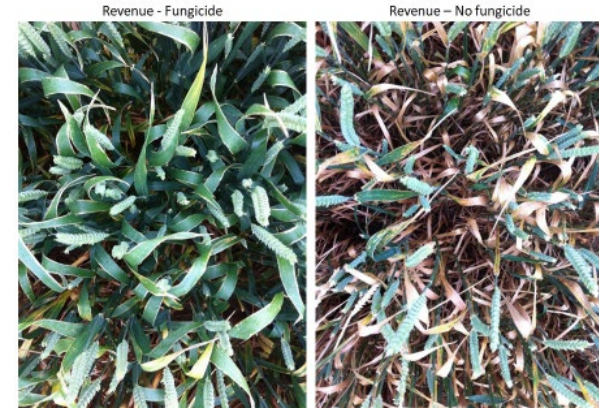
BEWARE! Long latent period makes STB difficult to control

- Long latent period (250°C days or 14 – 42 days) **disguises** disease advance. Optimum development temperature 15-20°C
- STB infection in spring the crop appears to grow away from the disease, when clean leaves are already infected.

Use knowledge of thermal time for leaf emergence to better manage STB

- Wheat leaf takes approximately 110-120°C days (Cd)
- Therefore, during stem elongation (as the top three leaves emerge) if conditions are conducive → STB will be approximately two clean leaves below the newest emerging leaf.

Zymoseptoria tritici (Septoria tritici blotch, STB)

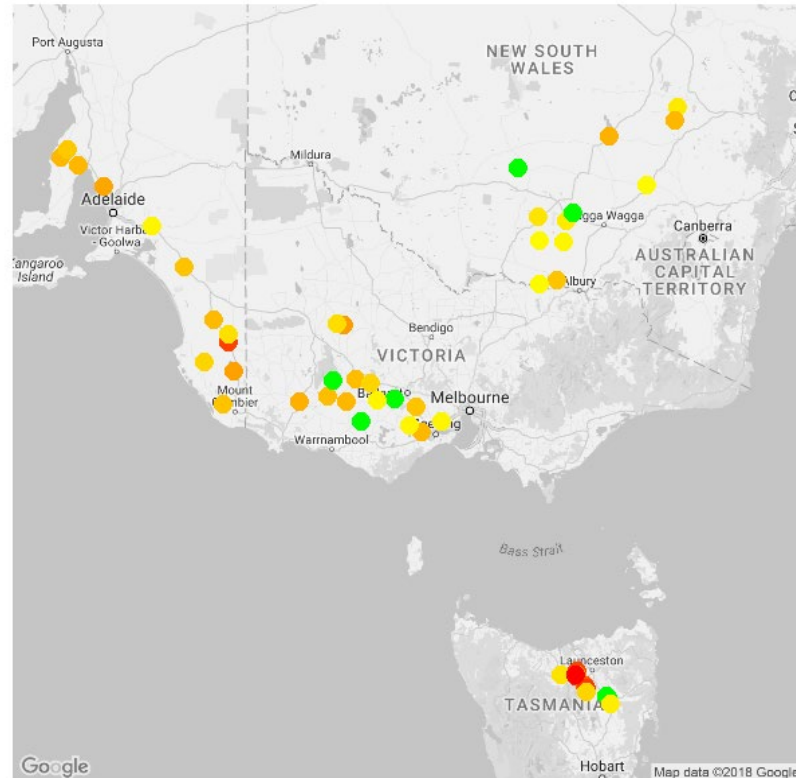


Septoria tritici blotch – Fungicide Resistance Survey 2017



Department of
Primary Industries

- Wide distribution of a **Cyp51** mutation (**isoform 11**) has led to a significant loss of sensitivity to some DMIs
- No changes in the sensitivity to strobilurins or SDHIs reported as yet (but high risk of development)

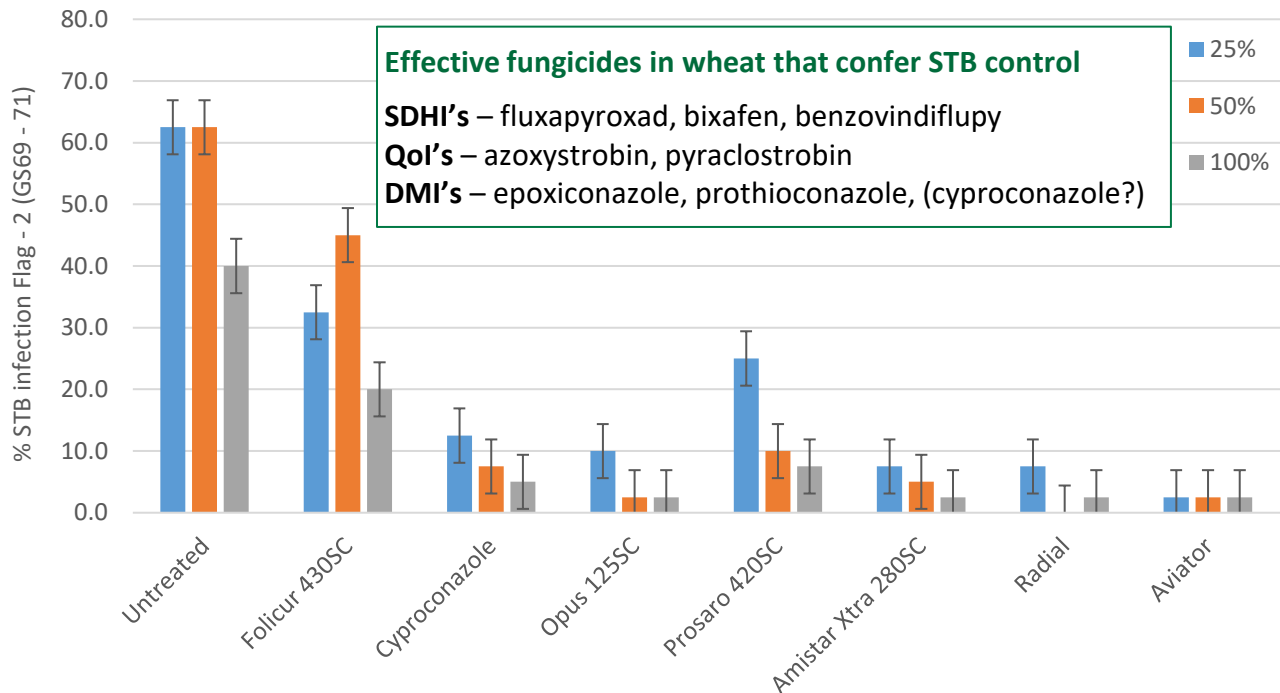


Acknowledgements: Andrew Milgate



Fungicide Performance: not all Group 3 DMIs affected equally

Fungicide performance in wheat at different dose rates (% of full)
Gnarwarre, Victoria (HRZ) 2018



Product and rate (2 spray GS31 & GS39)

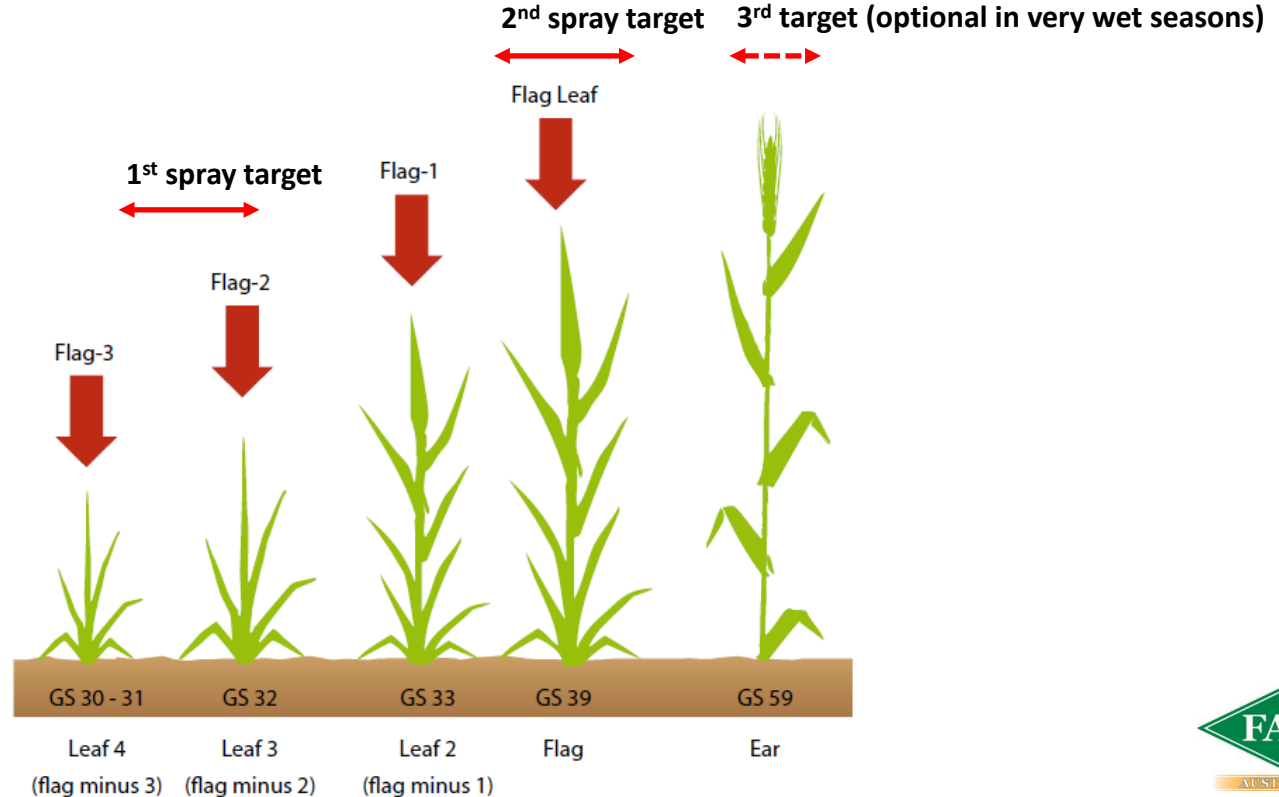
* Aviator Xpro applied 60%, 80% and 100% dose

Site with diagnosed strains of STB showing reduced sensitivity to fungicides

Treatments applied twice for experimental purposes



HRZ approach to STB control in wheat - Look to protect the money leaves before they become infected!



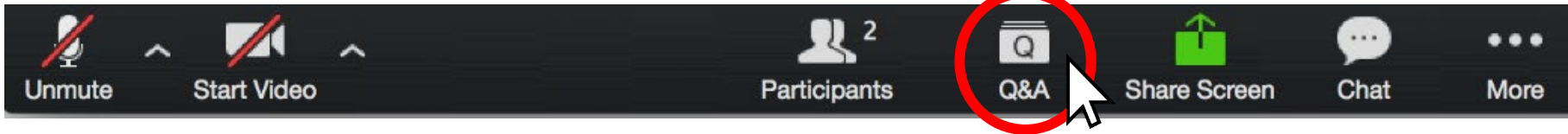
Anti-resistance measures to adopt when using fungicides

- Only spray if necessary – **limit applications**
- Avoid using the same fungicide active ingredient more than once in a growing season.
- If you can, use fungicide mixtures, preferably formulated with more than one Mode of Action, especially if disease pressure is high.
- Rotate Group 3 DMI fungicide actives where more than one is required in a growing season.
- Try to avoid using Group 7 SDHI* and Group 11 QoI fungicide actives more than once in a growing season.

** SDHI's that are applied as foliar sprays and/or seed treatments with foliar activity e.g. fluxapyroxad seed treatment*

1. Mutations in the Septoria tritici blotch (STB) pathogen could reduce fungicide performance in the field (e.g. tebuconazole, propiconazole) and may effect triazole DMI activity differentially.
2. Use an Integrated Disease Management (IDM) approach where cultivar resistance and cultural control is combined with fungicides for control of STB.
3. Key timings for controlling STB: the start of stem elongation (GS30-32), followed by a flag leaf emergence spray (GS39).
4. The second timing is an important follow up timing in the HRZ, particularly when the period between the first and second spray timing is wet.

Keep the questions coming!



To ask a question:

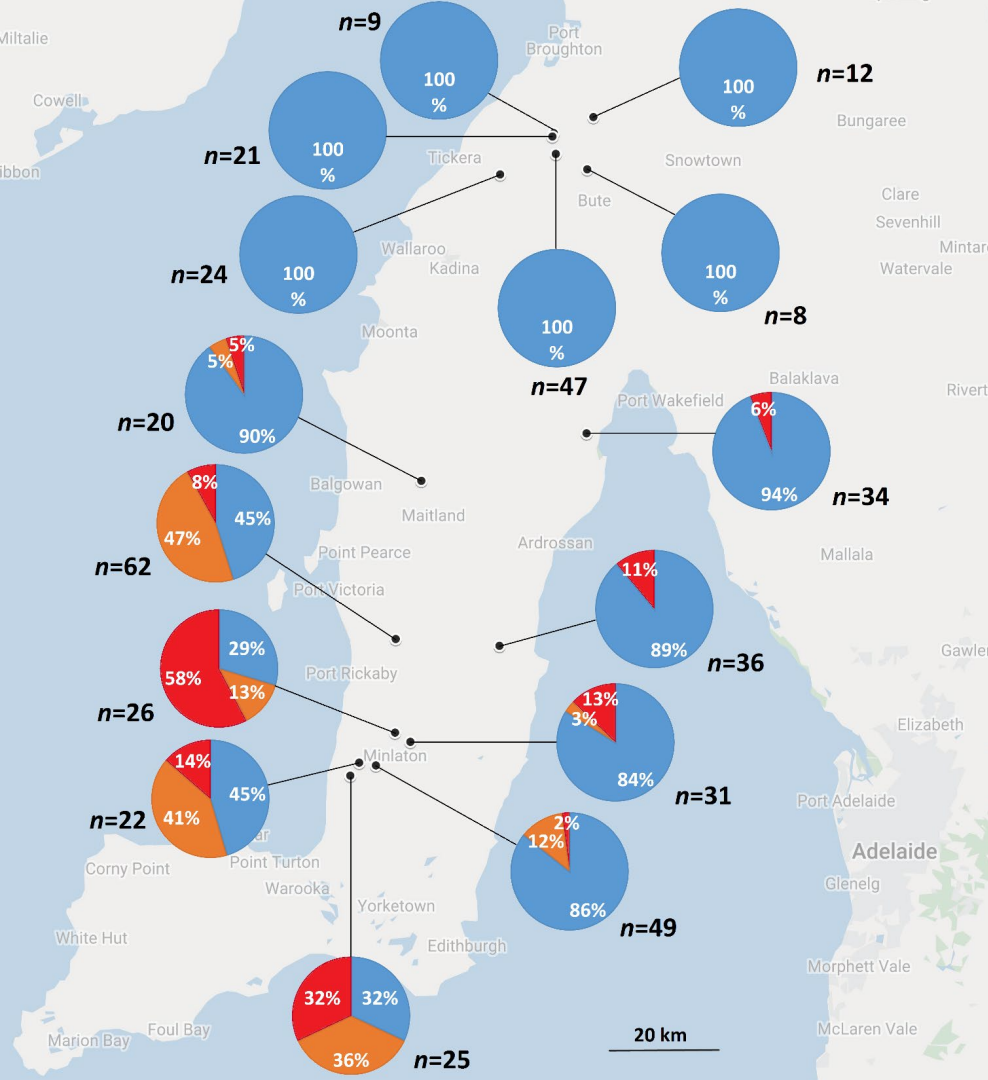
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Net form net blotch (NFNB) – Minlaton, SA



Variety: Spartacus CL

Fungicide: Systiva
(fluxapyroxad)



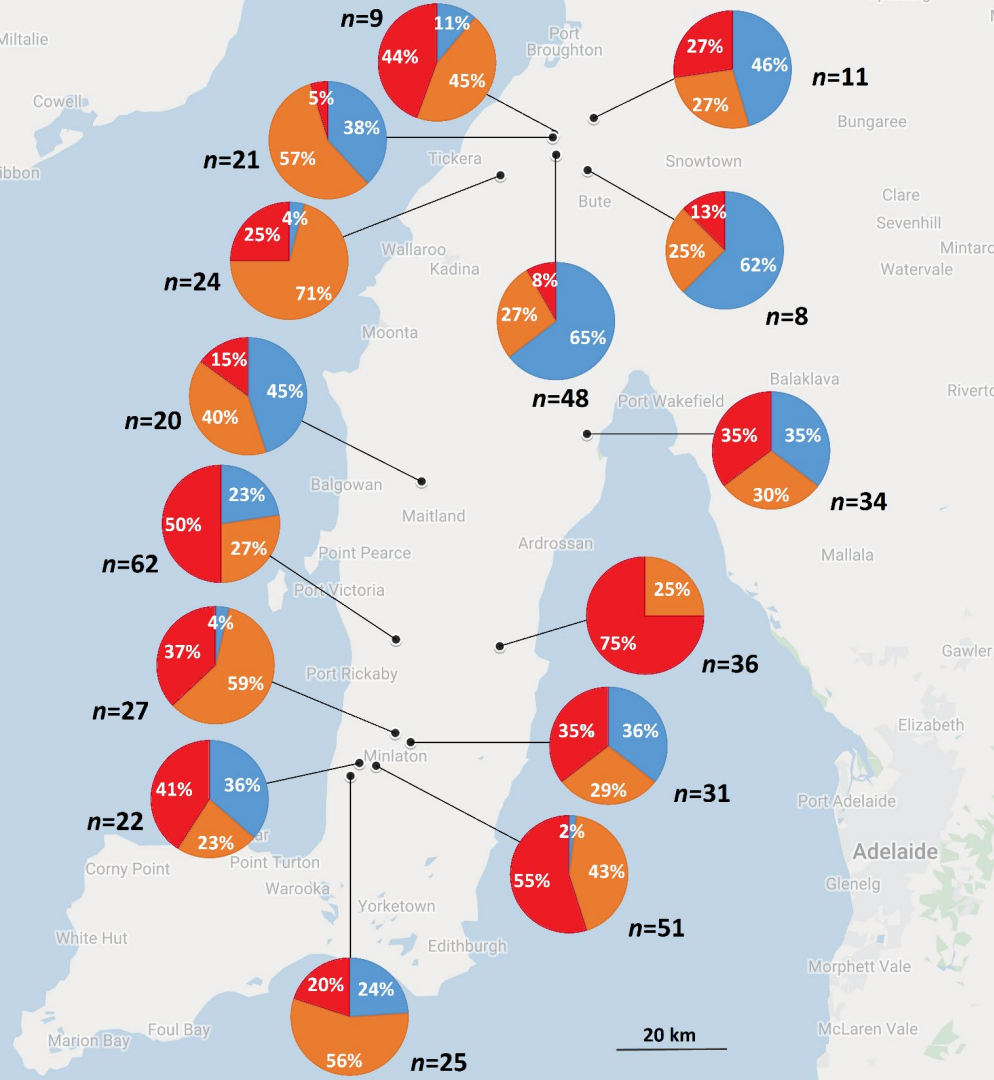
SDHI - Fluxapyroxad

■ Sensitive	< 5 µg/mL	78.2 %
■ Reduced sensitivity [†]	5 µg/mL	11.7 %
■ Resistant [‡]	10 µg/mL	10.1 %
		n = 427

[†] Sensitivity level equivalent to *SdhD*-D145G

[‡] Sensitivity level equivalent to *SdhC*-H134R

As at February 2020



DMI - Tebuconazole

■ Sensitive	< 15 µg/mL	26.3 %
■ Reduced sensitivity [†]	15 µg/mL	37.6 %
■ Resistant [‡]	50 µg/mL	36.1 %
		n = 429

[†] Sensitivity level equivalent to F489L (*Ptt* or *Ptm*) or Indel (*Ptm*)

[‡] Sensitivity level equivalent to F489L+Indel (*Ptm*) or F489L+CNV (*Ptt*)

As at February 2020



Dual Resistance to DMIs & SDHIs

- 20 % of all 'isolates' ($n=86$) show at least reduced sensitivity to both tebuconazole (growth at rates of $\geq 15\mu\text{g}/\text{mL}$) and fluxapyroxad (growth at rates of $\geq 5\mu\text{g}/\text{mL}$)
- 4.2 % of all 'isolates' ($n=18$) are highly resistant to both tebuconazole (growth at $50\mu\text{g}/\text{mL}$) and fluxapyroxad (growth at $10\mu\text{g}/\text{mL}$)

- No suggestion at this stage that NFNB resistance to SDHI fungicides is widespread outside of South Australia.
 - However, other cases of the same mutations outside of Yorke Peninsula should make us aware that it could develop further.
 - If you suspect that you have an issue with poor performance where an SDHI has been used (e.g. Systiva seed treatment, Aviator Xpro foliar) consult with your adviser and....
- **Please share your experiences & connect with your local state pathologist to send in samples**

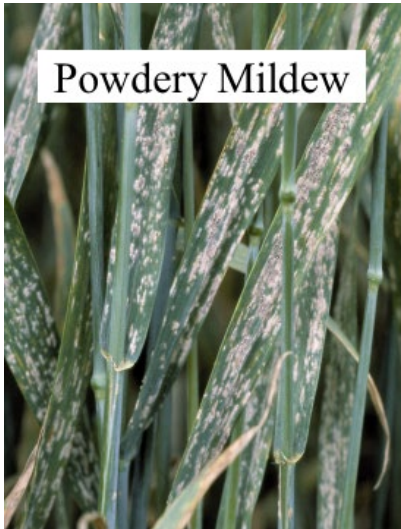


Mechanisms of fungicide resistance

Case Study: Net blotches + Group 3 (DMI/azole) fungicides

- 1. Target site mutation
- *and*
- 2. Target site overexpression
- 3. Increased copy number of target gene
- 4. Detoxification of the fungicide
- 5. Exclusion or expulsion of the fungicide

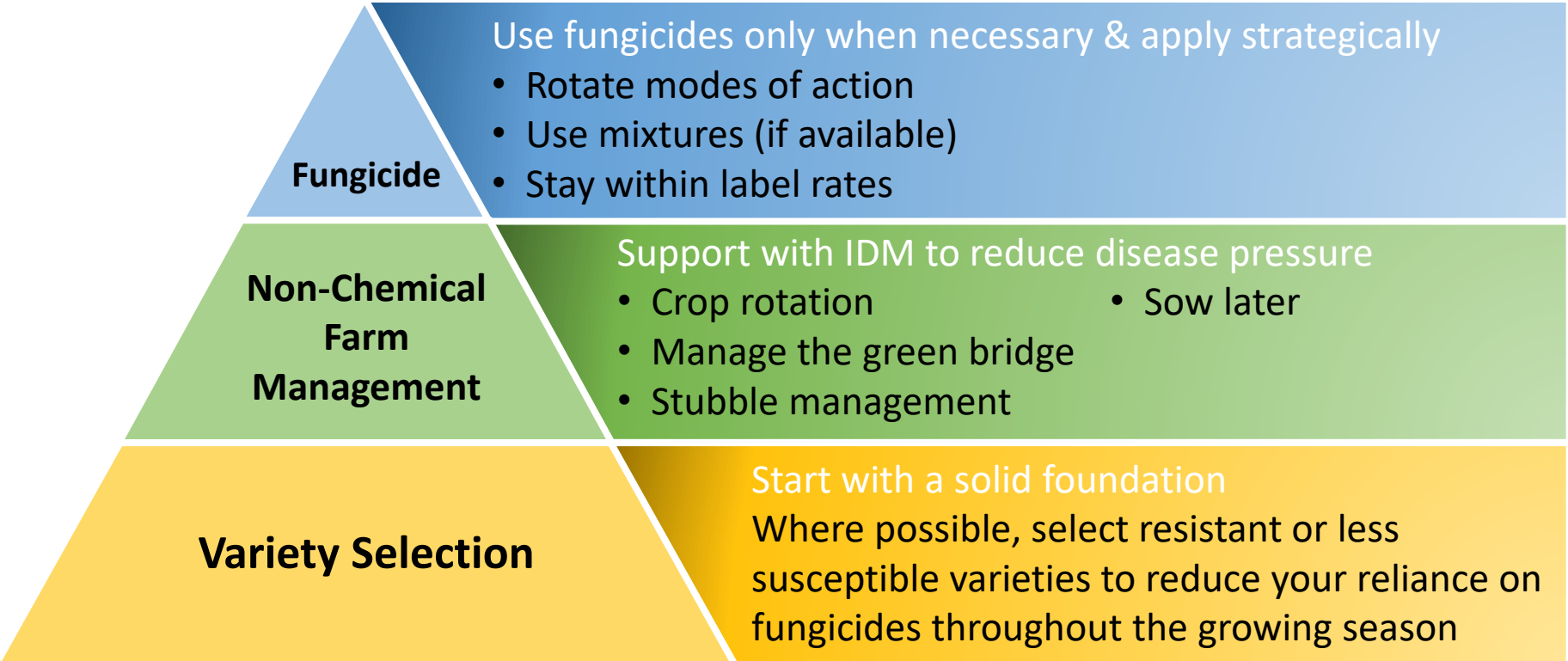
Wheat Powdery mildew (WPM): Qol (group 11 – strobilurins) resistance confirmed in SA, Victoria and Tasmania



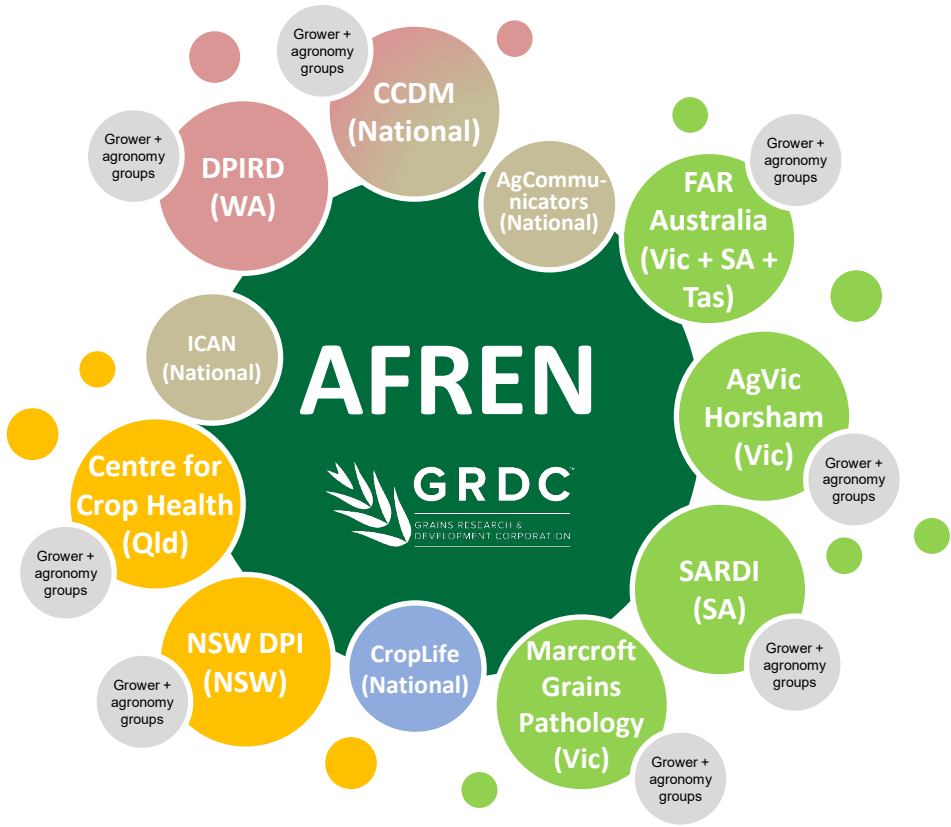
What does it mean for management?

- This resistance mutation (G143A) has spread quickly if susceptible cultivars are grown in at risk regions
 - e.g. parts of SA currently
- Means that strobilurin (Qol) component of product mixtures will be dependent on triazole element for control of WPM
- Alternate triazoles - do not use the same active ingredient repeatedly to control WPM (or any other disease)

Fungicide Resistance Management



Australian Fungicide Resistance Extension Network



Acknowledgements

Tracey Wylie & Kat Fuhrmann – FAR Australia

Fran Lopez & Kylie Ireland - CCDM

Grains Research and Development Corporation (GRDC)

A Level 4, East Building, 4 National Circuit, Barton, ACT 2600

Australia

P PO Box 5367 Kingston, ACT 2604 Australia

T +61 2 6166 4500

F +61 2 6166 4599

www.grdc.com.au

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Fungicide resistance management guide

Workshops, info sessions & webinars

Factsheets, updates & email alerts

- Vic – TBD
- WA – TBD
- Canola, SA & NSW/QLD online



Nick Poole

03 5265 1290; Nick.poole@faraustralia.com.au



If you suspect fungicide resistance, let us know what's happening & help us sample!