FAR AUSTRALIA FIELD DAY

INCREASING PRODUCTIVITY & PROFITABILITY

Friday 10th October 2025

FAR Australia Victoria Crop Technology Centre 2025

SOWING THE SEED FOR A BRIGHTER FUTURE

Thank you to our host farmers: Austinmere Pty Ltd, the Peel Family and Travis Everett

VISITOR INFORMATION

We trust that you will enjoy your day with us at our Victoria HRZ Crop Technology Centre Field Day. Your health and safety are paramount, therefore whilst on the property we ask that you both read and follow this information notice.

HEALTH & SAFETY

- All visitors are requested to follow instructions from FAR Australia staff at all times.
- All visitors to the site are requested to stay within the public areas and not to cross into any roped off areas.
- All visitors are requested to report any hazards noted directly to a member of FAR Australia staff.

FARM BIOSECURITY

- Please be considerate of farm biosecurity. Please do not walk into farm crops without permission. Please consider whether footwear and/or clothing have previously been worn in crops suffering from soil borne or foliar diseases.

FIRST AID

- We have a number of First Aiders on site. Should you require any assistance, please ask a member of FAR Australia staff.

LITTER

- Litter bins are located around the site for your use; we ask that you dispose of all litter considerately.

VEHICLES

- Vehicles will not be permitted outside of the designated car parking areas. Please ensure that your vehicle is parked within the designated area(s).

SMOKING

- There is No Smoking permitted inside any farm shed, marquee or gazebo.

Thank you for your cooperation, enjoy your day.

INCREASING PRODUCTIVITY AND PROFITABILITY IN THE SOUTHERN VICTORIA HRZ

FEATURING FAR Australia INDUSTRY INNOVATIONS

On behalf of myself and the FAR Australia team, I am delighted to welcome you to our 2025 VIC Crop Technology Centre (HRZ) Field Day featuring both Industry Innovations and GRDC investments.

Industry Innovations (II) is a FAR Australia initiative which continues to engage with industry to provide innovative research solutions which are helping to create a more productive, profitable and sustainable future for the Australian grains industry. With our Crop Technology Centres (CTCs) operating nationally across the growing regions of Australia, we provide the perfect platform to showcase new industry innovations, whether it be new crops, cultivars, agrichemicals, fertilisers or Ag technologies or GRDC levy investments. More information on our Industry Innovations initiatives is available in the booklet.

Today will provide you with a unique 'seeing is believing' opportunity to experience the latest innovations in cereal germplasm, agronomy, crop physiology and agrichemical usage. You can witness first-hand the impact of innovative treatments and techniques on enhancing crop performance and profitability.

Event Highlights:

- Topics for this High Rainfall Zone (HRZ) site and others FAR Crop Technology Centres in the national network will be featured.
- An opportunity to engage with one of the country's foremost root disease experts Dr Steven Simpfendorfer talking about root disease control in the context of our rotations and management strategies.
- Our knowledge and insights have been vastly improved by the seasonal climate updates given by our second guest speaker Dale Grey. This is a great opportunity to get a grain-fill climate update from one of the best communicators in the business.
- With wheat and barley what closure of the yield gap does our fungicides offer in southern Vic compared to other parts of the country.
- Benchmarking agronomics and profitability in the southern Victorian HRZ – what can we take away from the first year of the GRDC Hyper Profitable Crop (HPC) results generated in 2024. Ashley Amourgis and Ben Jones lead the discussion.
- Most of all we want to share your insights from growers to advisers and researchers.

To make the programme as diverse as possible, I would like to thank all our speakers who have helped to put today's programme together; in particular our keynote speakers Dr Steven Simpfendorfer (NSW DPIRD) and Dale Grey (Ag Vic).

Putting together a quality Crop Technology Centre takes a fair amount of planning so a very big thanks to our host farmers here at Austinmere the Peel Family (in particular Ewen Peel and Travis Everett) for their tremendous practical support given to the FAR Australia team.

Finally, I would like to thank the industry for investing in our research programme this season, in particular GRDC, key agrichemical manufacturers and plant breeders under our Industry Innovations portfolio.

Should you require any assistance today, please don't hesitate to contact a FAR Australia staff member. We hope you find the day informative, and as a result, take away something new which can be implemented in your own farming business.

Nick Poole Managing Director
FAR Australia

westernAG
The Best in Agronomic Advice

KNOWLEDGE
INNOVATION
RELIABILITY
COMMITMENT

A family owned Australian business

20 YEARS 2005-2025

Our Services

- Agronomic & Livestock Management Advice
- Farm Production Planning and Management
- Seed and Fertiliser Supply
- Crop and Pasture Protection Products
- Animal Health and Nutrition
- General Merchandise

Office Locations:
Derrinallum, Ballarat, Bannockburn, Benalla, Bordertown, Goroke, Hamilton, Horsham, Huntley, Kaniva, Kyneton, Millicent, Naracoorte, Nhill, Seymour, Willaura.

Head Office
Address: 145 Vite Vite Road, Derrinallum, Vic, 3325
Phone: 03 5597 6622
www.westernag.com.au

MORNING TIMETABLE

VIC HRZ CROP TECHNOLOGY CENTRE FIELD DAY
FRIDAY 10th OCTOBER 2025

In-field presentations at Grain legume research site	**10:00**	**10:15**	**10:30**	**11:00**	**11:45**	**12:15**	**12:30**
Welcome and introductions ***Nick Poole - Managing Director, FAR Australia*** ***Leigh Vial, FAR Australia director and board member*** *Outline of the programme for the day.*	**Coffee and introductions**						
Dale Grey - Seasonal Risk Agronomist ***Agriculture Victoria (DEECA) –*** *In season climate update.*	**1**					**Travel to cereal research site**	**Lunch and refreshments**
Aaron Vague, Ben Morris, & Nick Poole FAR Australia ***Faba bean agronomy - insight into a decade of faba bean research at FAR Australia, is there more potential for Lentils to cover a wider geographic footprint*** *Aaron Vague leads discussions with colleagues*	**2**						
Canola disease update, Nick Poole, FAR Australia *Canola is a hugely important crop for the HRZ. Nick looks at the latest disease management and fungicide resistance data produced by Marcroft Consulting along with the FAR Australia GEN trial in canola.*	**3**						
In-field presentations		**10.15**	**10:30**	**11:15**	**11:00**	**12:15**	**12:30**


Canola Site
Morning Sessions
From 11:00am
Pulse Site
From Winchelsea
From Inverleigh
Peels Rd
Welcome and
Introductions
From 10:00am
Afternoon Sessions
From 1:30pm
Cereal Site
VICTORIA CROP
TECHNOLOGY
CENTRE
FAR
AUSTRALIA

BIOLOGICAL BENCHMARKING- FIRST IN ITS FIELD

This initiative allows biological products to be evaluated under identical field conditions to synthetic standards, accelerating industry understanding and adoption of effective biological solutions.

Industry Innovations
leading the way to a brighter grains industry

BIOLOGICAL BENCHMARKING
an independent biological evaluation network

Biological Benchmarking, developed by FAR Australia, is a brand-new initiative launching in 2025 to independently evaluate biological crop protection and productivity-enhancing products under Australian conditions. As interest in sustainable farming practices grows, so too does the demand for reliable data on the performance of these products. This initiative aims to provide side-by-side comparisons of new biological options against conventional synthetic controls to support confident decision-making by growers and advisers.

It is:

- **independent**
- **scientifically robust and replicated**
- **aligned with real-world agronomic practice**
- **focused on productivity, sustainability, and profitability**
- **With FAR Australia funded control treatments**

Collaborating Industry Stakeholders

This program is designed for biological product developers, distributors, agronomists, private consultants, and farming groups seeking to better understand the performance and positioning of biological products and demonstrate them to the wider industry.

With increased availability and global interest in biological inputs—from microbial inoculants to plant defense stimulants and biopesticides—there is a growing need for rigorous testing. The Biological Benchmarking series will provide that platform, offering clarity and confidence in a rapidly evolving product space.

Protecting and feeding faba beans during the critical period

Aaron Vague[1], Nick Poole[1], Darcy Warren[1]
[1] Field Applied Research (FAR) Australia

Key point summary

- From 2015-2024, the FAR Australia faba bean research program has produced a fungicide response in only 50% of the years.
- In the responsive years disease control is pivotal in the period just after the start of flowering (1-3 weeks), when seed number and yield formation is being determined.
- In a low-moderate chocolate spot severity season SW Victoria (2024) there was adequate control and a yield benefit from a two-spray conventional strategy.
- Although the dry season in 2024 made additional phosphorus uneconomic, there were alterations in plant architecture with an additional 50 kg/ha P showing a trend of increased branching, plant height, and podding; and statistically significant effects on 100 seed weight, dry matter, and grain yield

Background

FAR Australia collaborates in two Grains Research & Development Corporation (GRDC) funded projects; "Development and extension to close the economic yield gap and maximise farming systems benefits from grain legume production" investment (DJP2105-006RTX) and "Epidemiology, economic thresholds and management of Ascochyta blight and Botrytis diseases in lentil and faba bean" (DJP2304-004RTX). As part of these GRDC Southern region grain legume projects we are targeting 6-8t/ha dryland yields in Gnarwarre with an objective of greater understanding the physiological and pathological constraints of integrated disease management of faba beans.

Over the last decade the most prevalent disease has been Chocolate spot caused by the pathogen *Botrytis fabae*. This disease is particularly prevalent after crop canopy closure, in line with an increase in humidity (commonly quoted as >70%). The disease has a temperature range of approximately 15 – 28°C with a more rapid spread with warmer temperature within this range. Infection can occur on many parts of the plant including flowers, leaves, stems and pods. Without a truly resistant germplasm there needs to be a disease control strategy in high-risk scenarios; for example, proximity to badly infected stubbles from the season before.

How do we make fungicide decision when we only achieve a yield response in 50% of years?

From 2015-2024 the FAR Australia faba bean research program has produced a fungicide response in only 50% of the years (Figure 1). Considering the enduring label of faba beans as "failure beans" is often closely associated with their propensity to have high yield losses associated with disease, it is somewhat unfounded in the data. Yet fear of a bad disease year perpetuates into every season and often chemical inputs are applied regardless of the amount of disease present. The reality is that a dry spring can act as a very good fungicide.

Protecting and feeding faba beans during the critical period

Aaron Vague[1], Nick Poole[1], Darcy Warren[1]
[1] Field Applied Research (FAR) Australia

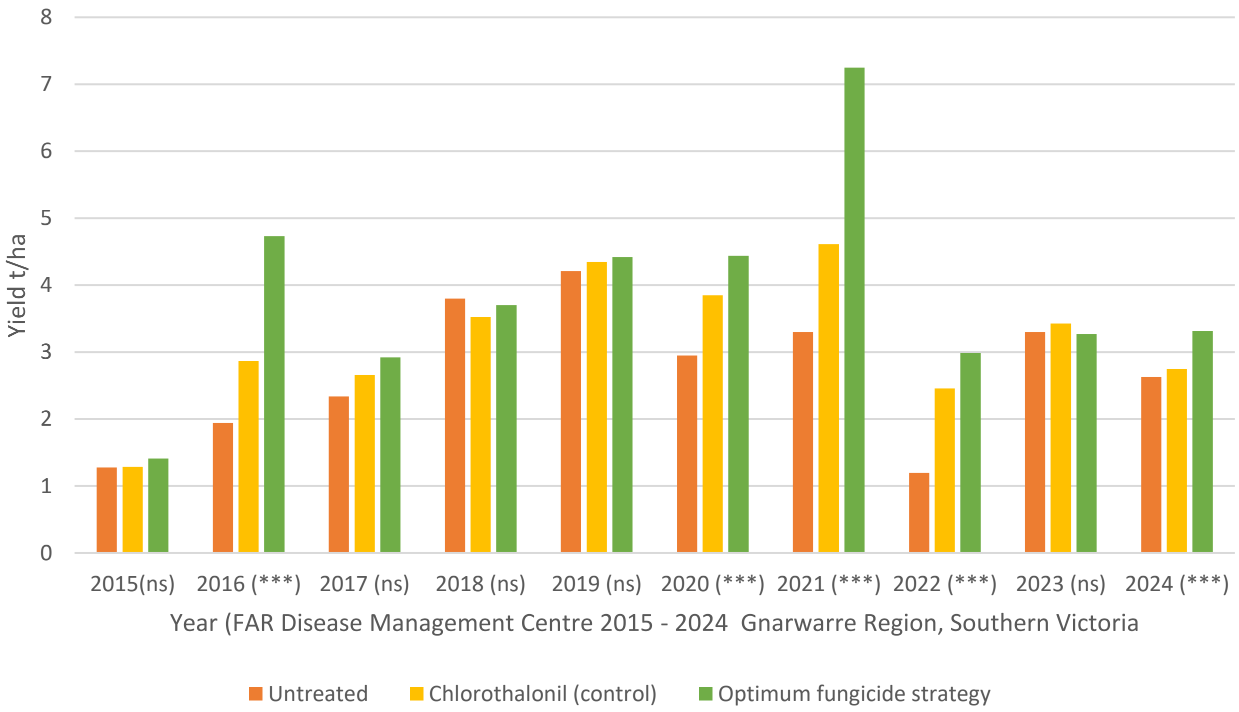

Figure 1. Yield response (t/ha) to fungicide (chlorothalonil control & best treatment in trial each applied as 2 spray approach) in faba beans 2015 – 2024 – Gnarwarre, Southern Victoria HRZ. *** - Statically significant yield response

When should we apply fungicides in the canopy to offer the greatest return on yield? Whilst we know a reasonable amount about the disease and the conditions for infection, we probably know less about exactly which parts of the plant are most important to protect from disease in comparison to wheat and barley. The "critical period" for faba bean development when seed number and yield formation is being determined is the period just after flowering (1-3 weeks) (Fakir 1997; Biswas et al. 2005; Mondal 2007).

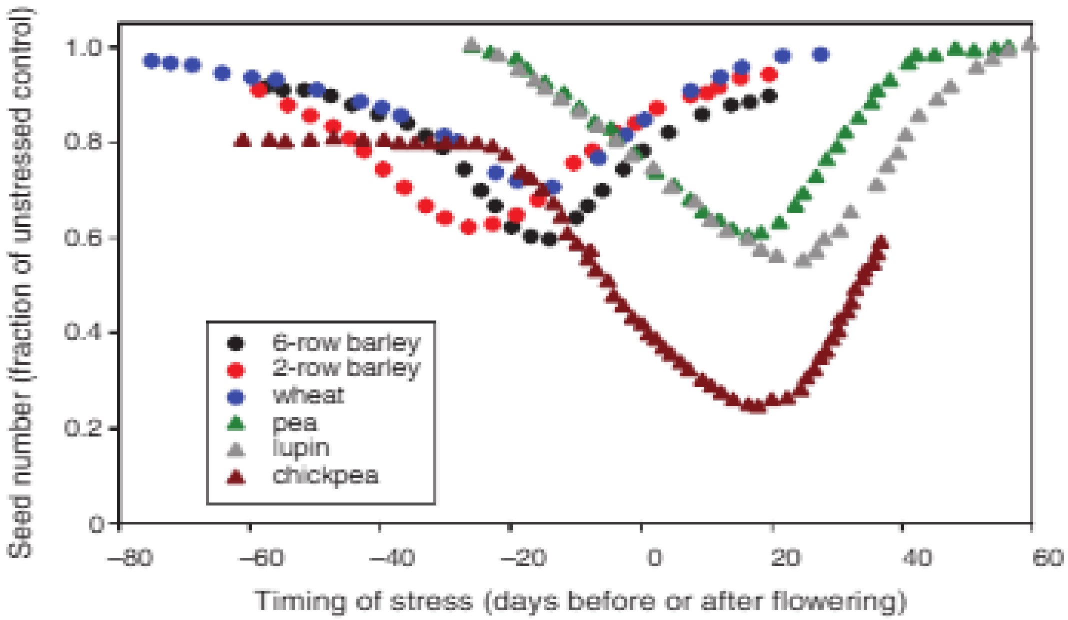

Figure 2. Critical period of seed number determination of winter cereals and pulses. V. Sadras and M. F. Dreccer (2015) Crop & Pasture Science 66(11):1137-1150

Protecting and feeding faba beans during the critical period

Aaron Vague[1], Nick Poole[1], Darcy Warren[1]
[1] Field Applied Research (FAR) Australia

Regarding applying a fungicide at a particular phenology stage, the evidence suggests that in a moderate disease year mid flowering (14 days after first flower) /early pod set are the most important fungicide timings (Table 1), with additional timings before and after dependent either on the season or specific pathogen issues. The importance of these key timings has been shown in trials where two spray approaches targeting these phenology stages have produced some of the best yields (average for both varieties).

Table 1. Influence of faba bean cultivar and disease management on grain yield (t/ha) at Gnarwarre 2024.

					Grain Yield (t/ha)					
Trt	4th node	**1st flower**	**1st flower +14 days**	**1st flower +28 days**	**PBA Amberly (MR)**		**PBA Bendoc (S)**		**Mean**	
1	---	---	---	---	3.24	-	2.83	-	3.03	**c**
2	---	---	---	Chlorothalonil +Carbendazim	3.33	-	3.07	-	3.20	**bc**
3	---	---	Chlorothalonil +Carbendazim	Chlorothalonil +Carbendazim	3.54	-	3.45	-	3.50	**a**
4	---	Mancozeb +Procymidone	Chlorothalonil +Carbendazim	Chlorothalonil +Carbendazim	3.43	-	3.34	-	3.38	**ab**
5	Tebuconazole	Mancozeb +Procymidone	Chlorothalonil +Carbendazim	Chlorothalonil +Carbendazim	3.41	-	2.95	-	3.18	**bc**
6	---	---	Miravis Star	---	3.26	-	3.35	-	3.30	**abc**
7	---	---	Miravis Star	Veritas	3.29	-	3.12	-	3.21	**bc**
8	Tebuconazole	Mancozeb	Miravis Star	Chlorothalonil +Carbendazim	3.35	-	2.88	-	3.11	**bc**
Mean					**3.35**	**-**	**3.12**	**-**		
Cultivar LSD p=0.05					0.27		**P val**		<0.001	
Fungicide Strategy LSD p=0.05					0.96		**P val**		ns	
Cultivar x Fungicide LSD p=0.05					0.38		**P val**		ns	

Tebuconazole applied at 145ml/ha, Mancozeb 750 at 2.00kg/ha, Procymidone 240g/ha, Chlorothalonil at 2.30L/ha, Carbendazim at 0.50L/ha, Miravis Star at 1/ha and Veritas at 0.75L/ha.

Thinking critically about the critical period with nutrition application.

Fact sheets describing the requirements for phosphorus in faba beans often vaguely suggest a figure such as "6kg/ha of phosphorus for every tonne of grain expected to be harvested". But like all management decisions with faba beans, realising these yield expectations with the challenges of the seasons can make upfront commitments difficult and costly. It is often overlooked how the timing and choice of applied nutrition effects the plant components that contribute to yield, that is to say – **how can we strategically apply nutrition to target and support the plant components that contribute to yield?**

Experiments in a below average rainfall year in 2024 demonstrate how additional phosphorus applied at sowing can set the plant up to target higher yield. Although the dry season in 2024 made the additional phosphorus uneconomic, there was an alteration in plant architecture with an additional 50 kg/ha P showing a trend of increased branching, plant height, and pods; and statistically significant effects on 100 seed weight, dry matter, and grain yield (table 2).

Furthermore, where additional nitrogen was applied without the extra P, there was either no or a negative effect on grain yield. But when applied with the additional P at sowing, 100 kg/ha N spread at the end of flowering yield higher than without any extra N.

Table 2. Influence of applied nutrition plant components and grain yield at harvest at Gnarwarre 2024.

Treatment		Branches (m2)		Plant height (cm)		Pods (m2)		100SW (g)		DM (t/ha)		YIELD t/ha	
1	Untreated	50.3	-	67.3	-	117.2	-	72.8	c	7.9	bc	3.58	de
2	100kg/ha N (sowing)	52.8	-	68.3	-	125.6	-	78.1	a	9.5	ab	3.53	e
3	100kg/ha N (start flower)	52.5	-	68.9	-	113.3	-	77.0	ab	7.0	c	3.76	cd
4	100kg/ha N (end of flower)	62.0	-	69.9	-	121.1	-	76.4	ab	9.5	ab	3.44	e
5	50kg/ha P (sowing)	50.8	-	71.7	-	121.1	-	78.0	a	8.4	bc	3.86	bc
6	50P (sowing) + 100N (sowing)	58.8	-	72.6	-	121.1	-	78.3	a	9.5	ab	4.02	ab
7	50P (sowing) + 100N (flower)	66.0	-	73.4	-	118.9	-	77.4	ab	10.6	a	4.01	ab
8	50P (sowing)+ 100N (end flower)	62.0	-	75.7	-	151.1	-	74.5	bc	9.8	ab	4.17	a
Grand Mean		56.9		71.0		123.7		3.3		9.0		3.80	
LSD P=.05		12.5		5.9		22.8		3.0		2.1		0.22	
Treatment Prob(F)		0.099		0.096		0.071		0.026		0.045		<0.001	
CV												3.92	

22 kg/ha P (100 kg MAP) applied in furrow under all treatments before addition nutrition was added as per treatment list.

Acknowledgements
FAR Australia gratefully acknowledges the investment support of the GRDC in order to generate this research, project partners and the host farmers Duncan Campbell, Travis Everett, and Ewen Peel in SW Vic.

Contact details:

Aaron Vague, FAR Australia
Business Address: Shed 2/63 Holder Road Bannockburn VIC 3331
Ph: 0409 573 704
Email: aaron.vague@faraustralia.com.au

Fungicide strategies for crown canker and UCI of blackleg

Steve Marcroft and Angela Van de Wouw – Marcroft Consulting & University of Melbourne

When considering disease control in the higher rainfall zones in spring 2025 you need to be aware of blackleg, sclerotinia and alternaria. It is almost certain that all of these diseases will be present in 2025. Although most applications will have already been made previously the only control option come spring is fungicides ***but remember that fungicides always control disease, but disease does not always cause yield loss.*** Given the fungicide resistance issues that are now occurring in VIC, NSW & WA (DMI resistance) and in SA (DMI and SDHI resistance) it is imperative to not use fungicides when the risk of yield loss is low – we want to keep the fungicides for when we really need them.

Is my crop at high risk?

Blackleg:

Blackleg crown canker may cause yield losses; you can determine if it did cause yield loss by cutting plants at the crown immediately after swathing or once seed colour change begins to occur. If plants have more than 30% crown discolouration, then yield loss is likely. However, in the spring there is nothing that you can do to reduce crown canker. Consider management options for your 2026 crop - see the 2025 blackleg management guide and BlacklegCM App.

Blackleg Upper Canopy Infection (UCI) is the same disease and same process as blackleg crown canker but instead of the fungus infecting leaves and growing into the crown, causing a crown canker, UCI blackleg infects the flowers and grows into the branches and upper stem causing blackened pith in the upper parts of the plant. UCI blackleg occurs when the plants commence flowering in early to late winter, this is due to two reasons. Firstly, blackleg being a fungus requires wet conditions for the spores to be released from canola stubble but also prolonged plant wetness for the spores to germinate on the plant, grow and cause an infection. Hence, cool wet conditions associated with late winter are more conducive to disease rather than warmer drying conditions of spring. Secondly, UCI blackleg also requires enough time before harvest to infect the plant, grow into the vascular tissue and cause significant necrosis. Infections that occur closer to harvest do not have enough time to cause yield loss.

UCI in 2025 is definitely a potential issue if your crops commenced flowering in July and most likely an issue if they commenced flowering in the first half of August. Later flowering can still cause UCI, but these crops are a low risk of yield loss.

If my crops flowered before August 15, should I apply a fungicide?

1. Disease pressure

   In addition to date to 1st flower, disease pressure is also critical. Distance to last year's canola stubble (less than 500m is greater risk), rotation length i.e., is the crop sown into 2-year-old stubble and a wet spring, all increase the risk of yield loss. Disease pressure can be determined by looking for leaf lesions on the younger leaves, lesions take approximately 14-21 days to develop so lots of new lesions at 1st flower will indicate that the conditions of the previous month have been conducive for disease. If these conditions continue during the early bloom period than it is likely that blackleg UCI could be an issue.

2. Cultivar resistance

   All cultivars are classified for UCI blackleg ratings.

Fungicide strategies for crown canker and UCI of blackleg

Steve Marcroft and Angela Van de Wouw – Marcroft Consulting & University of Melbourne

Scenario 1

Crop germinated early, commenced flowering in late July, sown adjacent to 2024 canola stubble and into 2023 canola stubble, has lots of leaf lesions and the cultivar is a MR UCI rating.

= apply a 10-30% bloom fungicide application, could easily get a 10% yield return. In this scenario if your cultivar was UCI rating R or has no leaf lesions then there is no risk of yield loss.

Scenario 2

Crop germinated early, commenced flowering in late July, sown 500m from 2024 canola stubble in a 4 year rotation, has a few leaf lesions and the cultivar is a MR UCI rating.

= In this situation yield loss is a lot less likely. If it has been continuously wet during the commencement to the 1st flower growth stage, then yield loss is potentially around 5% but if it was dry during early flowering then a yield return from fungicide application is unlikely. In this scenario if your cultivar was UCI rating MRMS or MS then a yield return from a fungicide application is higher.

Scenario 3

Crop germinated on time, commenced flowering on 7th August, sown adjacent to 2024 canola stubble into 2023 canola stubble, has lots of leaf lesions and the cultivar is a MR UCI rating.

= In this scenario yield loss potential is most likely less than 10% but will be driven by rainfall during flowering. If flowering commenced after 15th August then return from fungicide application is unlikely.

What is the cultivar blackleg rating on my farm?

Blackleg populations overcome genetic cultivar resistance and blackleg populations are different in different regions and on individual farms. Simply put, blackleg populations will evolve in response to the resistance of the cultivar you have been growing on your farm. If you sow a new cultivar its blackleg rating will likely be as advertised in the blackleg management guide. If you have sown the same cultivar for more than 3 years, then the rating of your cultivar may be reduced i.e., if it was a MR when 1st grown it may now behave as a MRMS (3 years later) on your farm. This blackleg evolution however is highly driven by disease pressure; regions that grow 2 crops of canola over 3 years and with high rainfall will result in blackleg populations evolving quickly. Moderate rainfall regions with less intensive canola tend to maintain their genetic resistance ratings.

The best way to determine loss of resistance is to monitor the amount of crown canker and UCI at the end of year. You can check the current blackleg management guide for the latest regional resistance group knowledge, if the resistance group is coloured green, it should be effective in your region. However, you can check the status on your farm by looking for leaf lesions. If the major gene resistance is effective (has not been overcome) there will be few if any blackleg leaf lesions (plants are immune).

If you do not have effective major gene resistance in your cultivar (most cultivars), simply use the blackleg rating. To confirm that your cultivar has not eroded in resistance it is highly advised to cut the plant crown (see the blackleg management guide for details). If blackleg levels are low then continue current practices, if blackleg is increasing over time it is suggested to change cultivars.

Fungicide strategies for crown canker and UCI of blackleg

Steve Marcroft and Angela Van de Wouw – Marcroft Consulting & University of Melbourne

Upper Canopy Infection levels can also be determined at plant maturity (commencement of seed colour change) by observing darkened branches and darkened pith (see the blackleg management guide for photos of crown canker and UCI).

The GRDC/DPIRD Apps BlacklegCM and UCI BlacklegCM are very useful aids to determine if fungicide application is like to provide an economic return. It is not preferable to have completely clean crops, low level of disease will not cause yield loss and will reduce the likelihood of fungicide resistance occurring – the aim it is increase yield not to grow the cleanest crop.

<u>Sclerotinia</u>

Sclerotinia is a complex disease. That is, it is almost impossible to predict how much yield loss will occur. Sclerotinia across a region will be more severe in years with wet springs, tight canola rotations, rotations with double broadleaf crops and early flowering. Many crops in southern HRZ regions will fit this description in 2025. However, individual crops within the same region and seemingly identical conditions will get very different levels of disease severity. Within the same region some crops should be sprayed with a fungicide, and some should not - but it may be impossible to determine at the time of fungicide application.

Consequently, the best determination is for the grower to know the history of individual paddocks. If yearly scouting identifies paddocks that have a past history of sclerotinia and the same paddock has the high risk indicators as described above, a fungicide should be applied. It is more likely that you will have paddocks that have never had sclerotinia issues. The ScerotiniaM App is an excellent spray decision tool.

<u>Alternaria</u>

Alternaria is a superficial disease of canola, simply causing lesions and can occur on all plant parts. When alternaria causes lesions on pods these lesions can cause the pods to prematurely shatter. The shattering will cause yield losses, we have measured up to 20% yield loss in the worst-case scenarios.

Alternaria occurs as a result of sustained rainfall during the podding growth stage. Alternaria lesions are incredibly diverse from distinct round lesions to entire pods turning black, to many pinpoint lesions and all combinations. Unfortunately, there are no management practices to control alternaria.

Fungicide resistance considerations

With the continual use of fungicides comes the increased risk of resistance to fungicides. In recent years there has been an increasing reliance on fungicides to control blackleg disease, with some growers using fungicides as an insurance policy rather than when needed.

We have been screening for fungicide resistance towards the commercial fungicides each year since 2018. Resistance to Group 3 fungicides was first detected in 2015 and has been increasing since, with high levels of resistance to Jockey, Prosaro and Proviso found in every state in 2023 and 2024. The resistance to the DMI (Group 3) fungicides is an incomplete resistance whereby the isolates have an increased tolerance to the fungicide. This means that the fungicides do still have some efficacy towards these resistant isolates, but not the same level of control as the susceptible isolates. Despite this high level of resistance, we have yet to hear of any Group 3 fungicide field failure. This may be because the Group 3 fungicides are still providing some level of control or that high use of the Group 7 fungicides is hiding the loss of efficacy.

Fungicide strategies for crown canker and UCI of blackleg

Steve Marcroft and Angela Van de Wouw – Marcroft Consulting & University of Melbourne

For the first time, resistance to Group 7 fungicides has been detected in blackleg disease. In 2024, several populations collected from the Eyre Peninsular showed high levels of disease on Saltro- and iLeVo-treated plants, suggesting the presence of resistance. Isolates were collected from these stubbles and the presence of highly resistant isolates was confirmed. *In vitro* tests showed the isolates have Resistance Factors (RFs) of 42–270 towards pydiflumetofen and 18–109 towards fluopyram. When inoculated onto seedlings, these isolates caused the same level of disease on Saltro and iLeVo treatments as the untreated, meaning the fungicides were rendered completely ineffective. All the populations where Group 7 resistance has been confirmed are located on the Eyre Peninsula (EP) of South Australia. Out of the 41 populations from the EP, two had high resistance, three moderate, nine low and the remaining 27 had no resistance. Resistance was not detected in any other regions. Fifty populations from the EP were also screened in 2022 and no Group 7 resistance was detected in that year, indicating that this resistance has evolved very recently. Current experiments are underway to determine whether these resistant isolates are leading to field failure on farm.

In 2025, 260 populations are being screened representing all the major canola growing regions. Preliminary results suggest that no resistance is present in any other region except the Eyre Peninsular. Preliminary analysis of on-farm fungicide practices suggests that early foliar applications (2-8 leaf) are a driving factor in the evolution of fungicide resistance.

Recommendations for the management of fungicide resistance

- Do not use fungicides as an insurance!
- In locations where resistance has been detected, avoid SDHI chemistries where possible.
- Avoid 2-8 leaf early foliar applications where possible.
- Plants can tolerate up to 30% infection before yield loss. Remember that fungicides always control disease but don't always provide yield returns.
- Where possible, use other management strategies to minimise disease pressure, such as selecting cultivars with high blackleg rating or isolation of 500m from last year's stubble. Refer to blackleg management guide/BlacklegCM app for further information.
- Select adequate genetic resistance for your regions to reduce reliance on fungicides for controlling blackleg disease.
- If fungicides are required, minimise the number of applications. For example, if sowing early, avoid using a 4–6 leaf foliar spray for crown canker. If sowing late, may require 4–8 leaf foliar spray for crown canker but could avoid 30% bloom for upper canopy infection.
- If putting on multiple applications in a season, rotate chemical groups as well as specific actives, where possible.
- If applying fungicides for Sclerotinia, be aware that these sprays will also put selection pressure on the blackleg pathogen, even if you aren't targeting to control blackleg.
- Monitor crops to ensure fungicides are working efficiently. Potentially leave unsprayed strips for comparison. Report any potential field failures to Alec McCallum or Dr Angela Van de Wouw (apvdw2@unimelb.edu.au).
- see also: CropLife resistance management strategies https://www.croplife.org.au/resources/programs/resistance-management/canola-blackleg/

Is There More Potential for Lentils to Cover a Wider Geographic Footprint?

Opportunities and Challenges from the Perspective of Breeding and Agronomy

Sam Holmes – Central AG Solutions

1. Why Lentils Became a Major Crop in Australia

- **High profitability:** Lentils are the most profitable break crop in many regions, with gross margins often exceeding cereals. Strong export demand from India, Bangladesh, Sri Lanka and the Middle East has supported high and relatively stable prices.
- **Relative advantage over other pulses:** Unlike faba beans, which rely heavily on Egypt and the domestic market, lentils have a diverse global buyer base. Using a six-year rolling average (decile 5), lentils have traded $280/t above faba beans, giving them a buffer of ~600 kg/ha in yield before financial returns are equivalent. Lentis also have higher price potential than faba beans.
- **Rotational benefits**: Lentils help break cereal disease cycles, improve subsoil moisture carryover particularly in relation to canola, and contribute to nitrogen supply. They also provide alternative herbicide options for weed control.

2. What is Holding Lentils Back?

- **Soil constraints:** Lentils prefer neutral–alkaline soils. Acidic soils (pHCaCl <5.5-6.0), waterlogging, and high boron or salinity reduce yield substantially.
- **Management risks:** Sensitivity to herbicide residues (e.g. Group 4 - clopyralid), harvest losses if delayed, high fire risk, and pests like Etiella.
- **Disease pressure:** Ascochyta and grey mould remain threats, though often less severe than in faba beans.
- **Capital Investment:** Infrastructure such as stone rollers, flex draper front for harvest, Air-Reels for low biomass lentils. Marketing and delivery options. Grain cleaning infrastructure in the region.

3. How Lentils Have Expanded Their Range

- **Breeding breakthroughs:**
    - **Herbicide tolerance:** XT varieties (e.g. Hurricane XT) opened up land and cropping intensity with the introduction of IMI herbicide tolerance, improving weed control.
    - Abiotic stress tolerance: Bolt (2012) improved boron and salinity tolerance: GIA Thunder is currently the most consistent high-yielding variety also with boron and salinity tolerance.
    - **Plant structure:** is critical for both soil type adaptation and harvestability. Greater biomass can lift yield potential but also increases disease risk and reduces light penetration for seed set. Shorter varieties improve airflow yet can compromise harvestability. The ideal plant achieves canopy closure and only begins to lodge at the end of podding - minimising harvest losses (e.g. pod drop from wind) while maintaining airflow to reduce disease. Achieving this balance is a major challenge for breeders, as variable spring conditions can dramatically influence plant growth. Consistency across environments remains the key trait.
    - **Vegetative Frost:** Tolerance varies by variety. Metro shows the strongest tolerance, followed by varieties with Jumbo2 backgrounds, then Thunder. Lightning and Terrier are more sensitive than Thunder, while Hurricane has poor tolerance and Sire the weakest of all.
    - **Metribuzin tolerance:** Grains Innovation Australia developed the world's first dual tolerant lentil, with tolerance to both metribuzin and IMI herbicides. Providing improved weed control and has also become a useful option for farmers that need to control XC canola in the rotation.
    - **Acidity:** GRDC pre-breeding program are evaluating genetics for improved low pH performance.

- **Agronomy advances and management tips:**
    - Early sowing and into standing stubble to optimise podding height and yield potential.
    - Ideally remove clopyralid out of the system. Regardless of label - recommend minimum of 36 months plant back before sowing lentils, potentially 24 months at low rates. Impact often affected by clopyralid on straw residues.
    - Hormone based herbicides during the summer can cause residue issues - be careful. Don't use hormone herbicides as spike for knockdown pre-seeding.
    - Reminder – lentils are not tolerant to Group 5 & 14 pre-emergent herbicides, they rely on soil separation for crop safety.
    - On-row sowing in saline soils can boost profits by $400/ha (SAGIT project CAS4822).
    - Fungicide options have significantly improved disease risk with extended length of protection.

Is There More Potential for Lentils to Cover a Wider Geographic Footprint?

Opportunities and Challenges from the Perspective of Breeding and Agronomy
Sam Holmes – Central AG Solutions

- Double knock desiccation helps control weeds pre-harvest.
- Lime and soil amelioration programs have extended lentils onto acid soils. Acid-tolerant rhizobia strains are adding further benefit (some benefit in pH5.5, need to achieve pH 6 before a significant benefit).
- Modern weed and disease control practices (Seed Terminators and wick wipers) help maintain clean paddocks and reduce resistance development.
    - Lentils are effective in double break with canola for reducing ryegrass.
- Acidity knowledge:
    - When soil pH drops below pH4.7 (CaCl2) Aluminium (Al) and Manganese (Mn) comes into solution and toxicity starts to occur affecting plant growth. These toxicities are creating the largest portion of yield loss from acidity in lentils. The Al/Mn toxicity occurs as they become too concentrated resulting in burning off of the roots preventing uptake of moisture and other nutrients.
    - Molybdenum (Mo) is essential for Rhizobium bacteria to fix nitrogen. Its availability is often limited in lentils grown on acidic soils. A SAGIT funded project (PIR121) showed that lentil tissue tests must record more than 0.1 mg/kg Mo to avoid yield loss.
- Tile drainage, land forming and stubble systems can improve the viability of lentils on waterlogged or saline land.
- Seed cleaning – gravity table is critical to reduce weed seed spread.
- Effective for a double break with canola – place lentils first in the rotation to prevent volunteer canola competition. If grown after canola - use Metro lentils and don't use clopyralid in the canola phase.

Image: courtesy of Andrew Harding (SARDI)
Lime applied at different rates to a soil with an initial pH of 4.5. Soil samples from each treatment were placed into pots for lentil growth. An additional treatment with elemental sulphur was used to reduce pH below the untreated control.
Treatments (left-right):
Pot 1: 6t/ha lime incorporated - pH 6.3,
Pot 2: 3t/ha lime incorporated - pH 6.1
Pot 3: 3t/ha broadcast lime - pH 4.7 and Al 2ppm
Pot 4: Untreated pH 4.5 and Al 3.7ppm
Pot 5: pH 4.0 and Al 13.7ppm.

Is There More Potential for Lentils to Cover a Wider Geographic Footprint?

Opportunities and Challenges from the Perspective of Breeding and Agronomy
Sam Holmes – Central AG Solutions

4. Keys to Making Lentils Work

- Start on the best paddocks to build grower confidence and reduce risk while management refinement occurs. Paddock selection is critical for early success.
- Timing is critical: sowing, fungicide applications, and harvest must be prioritised. Harvest timing is critical above all other crops.
- Consistency: skipping years risks missing high-profit seasons that drive long-term averages.
- Invest in infrastructure: stone rollers, flex-fronts.

5. Remaining Challenges

- **Soil Constraints -** expansion still limited without genetic improvements in acidity (particularly for acidity >10cm depth), boron, salinity and waterlogging.
- **Market volatility -** price volatility tied to Indian trade policy and Canadian production.
- **Management intensity -** harvest timing, fire risk, pest monitoring, future desiccation alternatives to paraquat.

Lentils will continue to spread onto new soils and regions in Australia. Breeding, agronomy and industry support have transformed them from a niche crop of the 1990s into Australia's most profitable pulse. The ceiling for further expansion is set not by demand—but by how far soils, acidity, and management systems can be improved to support reliable production.

MORNING TIMETABLE

VIC HRZ CROP TECHNOLOGY CENTRE FIELD DAY
FRIDAY 10th OCTOBER 2025

In-field presentations at Grain legume research site	10:00	10:15	10:30	11:00	11:45	12:15	12:30
Welcome and introductions ***Nick Poole - Managing Director, FAR Australia*** ***Leigh Vial, FAR Australia director and board member*** *Outline of the programme for the day.*	**Coffee and introductions**						
Dale Grey - Seasonal Risk Agronomist ***Agriculture Victoria (DEECA) –*** *In season climate update.*	**1**					**Travel to cereal research site**	**Lunch and refreshments**
Aaron Vague, Ben Morris, & Nick Poole FAR Australia ***Faba bean agronomy - insight into a decade of faba bean research at FAR Australia, is there more potential for Lentils to cover a wider geographic footprint*** *Aaron Vague leads discussions with colleagues*	**2**						
Canola disease update, Nick Poole, FAR Australia *Canola is a hugely important crop for the HRZ. Nick looks at the latest disease management and fungicide resistance data produced by Marcroft Consulting along with the FAR Australia GEN trial in canola.*	**3**						
In-field presentations		**10.15**	**10:30**	**11:15**	**11:00**	**12:15**	**12:30**

AFTERNOON TIMETABLE

VIC HRZ CROP TECHNOLOGY CENTRE FIELD DAY
FRIDAY 10th OCTOBER 2025

In-field presentations at Cereal Research site	Station No.	1:30	2:00	2:30	3:00	3:30
Dr Steven Simpfendorfer, NSW DPIRD **Fusarium crown rot in central and southern cropping systems: it's all a numbers game.** *Steve looks at Fusarium crown rot (FCR) which remains a major constraint to winter cereal production*	5	1				
Darcy Warren, Nick Poole and Ben Morris, FAR Australia ***Making better decisions on disease management practices in wheat and barley*** *Nick, Darcy and Ben look at three key GRDC projects (RiskWise, IDM strategies for NFNB & Wheat Disease Management) that seek to use new technologies and decision support tools to make profitable and sustainable decisions with fungicides.*	6		1			Closing address and refreshments
Ashley Amourgis, SFS, and Ben Jones, FAR Australia ***Pushing potential profit? Benchmarks for agronomy and profit*** *The first year results our new GRDC Hyper Profitable Crops project are out. Ashley and Ben look at the analysis of agronomic and profitability benchmarking in the region.*	7			1		
FAR Australia team *The Gnarwarre team look at this year's* ***Germplasm trials for wheat & barley*** *- what have learnt so far in GEN (consistent variety performers, genetic resistance to disease & response to fungicide).*	8				1	
In-field presentations		1:30	2:00	2:30	3:00	3:30

Note we will only split into two groups if high numbers attend (otherwise we will run one group). 1

If we do split into groups we would ask that you stay in your allocated groups. Thank you for your cooperation.

AFTERNOON TIMETABLE MAP

GERMPLASM evaluation network

your trusted research partner for germplasm evaluation

FAR AUSTRALIA

CALLING ALL BREEDERS!
Would you like to expose your latest germplasm in GEN 2026?

Developing higher yielding crops through germplasm advances

Expanded Programme for 2025!

Now including milling oats plus and minus fungicide

An Industry Innovations (II) 2025 initiative

Industry Innovations
leading the way to a brighter grains industry

SOWING THE SEED FOR A BRIGHTER FUTURE

GERMPLASM EVALUATION NETWORK (GEN) - BACKGROUND

Hagley, TAS

Wallendbeen, NSW

Esperance, WA

FAR Australia has been working with breeders to bring new products to the Australian Grains industry since its inception in 2012. It is a trusted development partner for many breeders, assisting with bringing in new germplasm to the marketplace, whilst ensuring the correct management to fulfil the genetic yield potential.

Industry Collaborations

FAR Australia is once again partnering with industry to independently showcase ***germplasm*** performance in a series of high productivity ***evaluation*** trials across the country as part of its Industry Innovations (II) initiative.

To develop independent research results on profitable germplasm developments in wheat, barley, milling oats and canola, using specific research strategies designed by FAR Australia for the High and Medium Rainfall Zones of Australia.

Should you wish to invest into FAR Australia's Germplasm Evaluation Network, please contact Darcy Warren 0455 022 044 darcy.warren@faraustralia.com.au

This independent initiative delivers a coordinated and independent network of high productivity trials in wheat, barley and canola. The trials will be managed 'plus and minus' fungicide with control varieties provided by FAR Australia.

FUNGICIDE FINGERPRINTING
an independent fungicide evaluation network

Would you like to test your fungicide in 2026?

This independent initiative allows the industry to compare product applications and timings under identical conditions, assessing efficacy, yield response, and profitability. It helps generic manufacturers showcase their products and provides a platform for new actives to demonstrate improvements over existing standards. Resellers and consultants can also test fungicide strategies before recommending them to clients.

Fungicide Fingerprinting, developed by FAR Australia, was launched in 2021 and is the first coordinated and independent fungicide evaluation network in Australia. This initiative aims to generate an independent evaluation of existing and newly developed fungicide strategies to help growers and advisers make better decisions when managing disease. It is:

- independent
- accurate
- consistent in the approach to disease assessment
- within the label stipulations and AFREN compliant control framework

Collaborating Industry Stakeholders

This industry initiative is of benefit to agrichemical manufacturers involved in both new active and generic, fungicide resellers with agronomists in the field, private advisers and regional farming groups.

Purpose

To develop independent results on profitable, productive and sustainable approaches to disease management in wheat and barley using specific strategies devised by fungicide manufacturers, resellers consultants and FAR Australia for commonly occurring fungal pathogens in the HRZ of Australia.

MORNING TIMETABLE

VIC HRZ CROP TECHNOLOGY CENTRE FIELD DAY
FRIDAY 10th OCTOBER 2025

In-field presentations at Grain legume research site	10:00	10:15	10:30	11:00	11:45	12:15	12:30
Welcome and introductions ***Nick Poole - Managing Director, FAR Australia*** ***Leigh Vial, FAR Australia director and board member*** *Outline of the programme for the day.*	**Coffee and introductions**						
Dale Grey - Seasonal Risk Agronomist ***Agriculture Victoria (DEECA) –*** *In season climate update.*	**1**					**Travel to cereal research site**	**Lunch and refreshments**
Aaron Vague, Ben Morris, & Nick Poole FAR Australia ***Faba bean agronomy - insight into a decade of faba bean research at FAR Australia, is there more potential for Lentils to cover a wider geographic footprint*** *Aaron Vague leads discussions with colleagues*	**2**						
Canola disease update, Nick Poole, FAR Australia *Canola is a hugely important crop for the HRZ. Nick looks at the latest disease management and fungicide resistance data produced by Marcroft Consulting along with the FAR Australia GEN trial in canola.*	**3**						
In-field presentations		**10.15**	**10:30**	**11:15**	**11:00**	**12:15**	**12:30**

AFTERNOON TIMETABLE

VIC HRZ CROP TECHNOLOGY CENTRE FIELD DAY
FRIDAY 10th OCTOBER 2025

In-field presentations at Cereal Research site	Station No.	1:30	2:00	2:30	3:00	3:30
Dr Steven Simpfendorfer, NSW DPIRD **Fusarium crown rot in central and southern cropping systems: it's all a numbers game.** *Steve looks at Fusarium crown rot (FCR) which remains a major constraint to winter cereal production*	5	1				
Darcy Warren, Nick Poole and Ben Morris, FAR Australia ***Making better decisions on disease management practices in wheat and barley*** *Nick, Darcy and Ben look at three key GRDC projects (RiskWise, IDM strategies for NFNB & Wheat Disease Management) that seek to use new technologies and decision support tools to make profitable and sustainable decisions with fungicides.*	6		1			Closing address and refreshments
Ashley Amourgis, SFS, and Ben Jones, FAR Australia ***Pushing potential profit? Benchmarks for agronomy and profit*** *The first year results our new GRDC Hyper Profitable Crops project are out. Ashley and Ben look at the analysis of agronomic and profitability benchmarking in the region.*	7			1		
FAR Australia team *The Gnarwarre team look at this year's* ***Germplasm trials for wheat & barley*** *- what have learnt so far in GEN (consistent variety performers, genetic resistance to disease & response to fungicide).*	8				1	
In-field presentations		**1:30**	**2:00**	**2:30**	**3:00**	**3:30**

Note we will only split into two groups if high numbers attend (otherwise we will run one group). 1

If we do split into groups we would ask that you stay in your allocated groups. Thank you for your cooperation.

Fusarium crown rot in central and southern cropping systems: it's all a numbers game

Steven Simpfendorfer[1]

[1] NSW DPI Tamworth

Keywords

yield loss, crop rotation, canola, pulse, summer crop, double-break

GRDC codes

DPI2207-004RTX: Integrated management of Fusarium crown rot in Northern and Southern Regions

DPI2207-002RTX: Disease surveillance and related diagnostics for the Australian grains industry

Take home message

- Yield loss from Fusarium crown rot (FCR) is a function of the percentage of plants which get infected within a paddock
- The increased frequency of winter cereal crops within a rotation sequence elevated the probability of having much higher levels of FCR infection
- Rotation to non-host break crops such as canola and pulses does not fully eliminate FCR in all paddocks but considerably reduces the probability of having high levels of infection
- A two-year break may be required in paddocks with high FCR inoculum levels
- Rotation history remains a good indicator of likely FCR risk within individual paddocks but there is still some variability in actual levels of infection
- PreDicta®B or cereal stubble testing are useful tools to further refine crop rotation and other integrated disease management decisions to limit losses from FCR
- An integrated approach is required to reduce losses from FCR. There is no 'magic bullet'.

Background

Fusarium crown rot (FCR), caused predominantly by the fungus *Fusarium pseudograminearum* (*Fp*), remains a major constraint to winter cereal production across the central and northern NSW grain production region. FCR is also present in southern NSW but often goes unrecognised or can be misdiagnosed. The causal fungus is stubble-borne with inoculum surviving between seasons as mycelium (cottony-growth) inside retained winter cereal stubble and/or grass weed residues. Crop rotation to non-host break crops such as canola and pulses (e.g. chickpea, lupin or faba bean) remains a key management strategy for FCR. However, the process revolves around decomposition of *Fp* infected cereal stubble during these break crop and fallow phases which is in turn dependent on moisture availability and time. Consequently, the season in which a break crop is grown influences its effectiveness at facilitating decomposition of cereal stubble and reducing FCR inoculum levels. Conversely, recent research has highlighted when relative humidity is >92.5% that *Fp* can colonise vertically up retained standing cereal stubble in a process termed 'saprotrophic growth'. At 100% relative humidity this saprotrophic growth can occur at a maximum rate of 1 cm per day (Petronaitis *et al.,* 2020). The FCR fungus can therefore saprotrophically grow to the cut height of the cereal stubble under prolonged or accumulated periods of rainfall, effectively increasing inoculum loads. This can then result in FCR infected cereal stubble being spread out the back of the header during the harvest of lower stature break crops such as chickpeas, increasing FCR risk for the next cereal crop (Petronaitis *et al.,* 2022).

This dynamic between cereal stubble decomposition and saprotrophic growth appears to complicate the management of FCR within farming systems but what are paddocks across the region telling us?

What did we do?

Under a co-investment with GRDC, NSWDPI has been providing a free cereal stubble testing service to growers and advisors over the past two seasons. These samples were collected either during late grain filling or post-harvest from individual paddocks across central NSW, northern NSW and southern Qld, along with background information including the previous two crops within the rotation. Winter cereal stubble samples (bread wheat, durum, barley or oats) were trimmed and plated on laboratory media to determine the incidence of FCR based on distinctive growth of *Fp* in culture. Infection levels were then categorised as being either low (≤10% FCR), medium (11–25% FCR), high (26–50% FCR) or very high (≥51% FCR). This data provides an unbiased snapshot of FCR infection levels in winter cereal crops across the region under varying crop rotations over the last two seasons. But why is the level of FCR infection so important? It is simple, yield loss only occurs in cereal plants infected with FCR, with the actual extent of yield loss strongly dependent on the extent of moisture and temperature stress during grain filling. Growers may not have much influence over seasonal conditions and stress during this critical period, but they can influence the percentage of plants infected with FCR. Reduce FCR infection levels and you reduce the risk of yield loss by that same level. As a rough rule of thumb, 100% FCR infection can result in 80% yield loss in durum wheat, 60% in bread wheat and 40% in barley, if prolonged hot and dry conditions occur during grain filling. Granted that these are worst case scenario values from replicated and inoculated field trials across seasons, but even halving FCR infection levels to 50% reduces potential yield loss to 40% in durum, 30% in bread wheat and 20% in barley, if the spring conditions turn hot and dry.

What did we find?

Seasonal effects

In total, 718 winter cereal stubble samples were processed from the 2022 and 2023 harvest which consisted of 598 bread wheat, 62 barley and 58 durum wheat crops (data not shown). There were 249 cereal crops sampled in 2022 and 469 in 2023 (Figure 1). The levels of FCR infection have risen from 2022 to 2023, with the proportion of paddocks with very high levels (≥51% FCR) rising from 18% to 30%. Over the same period the proportion of paddocks with high levels of infection (26–50% FCR) have also risen from 20% in 2022 up to 30% in 2023 (Figure 1).

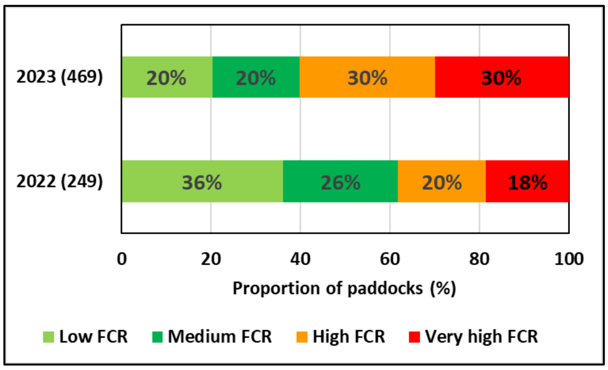

Figure 1. Proportion of winter cereal paddocks with varying levels of Fusarium crown rot (FCR) infection in 2022 and 2023.
Number in brackets (Y-axis) is the number of paddocks sampled in each year.
Low FCR = ≤10%, Medium FCR = 11–25%, High FCR = 26–50%, Very high FCR = ≥51%

FCR inoculum levels are a function of the percentage of plants infected and the quantity of stubble produced within a season. FCR infection is favoured by wet conditions which also generally increase biomass (i.e. stubble) production and yield of cereal crops. Consequently, larger inputs of FCR inoculum occur in wetter seasons such as 2021 and 2022 even though these conditions may not favour expression of FCR as whiteheads and yield loss from this disease. This data supports random crop disease surveys, conducted by NSWDPI with co-investment from GRDC, which have been showing a progressive build-up of FCR inoculum levels in this region from 2020 onwards. Milder temperatures and frequent rainfall during grain filling in 2021 and 2022 reduced FCR expression in these seasons. This was not the situation in 2023, with a return to warmer and drier conditions during spring which unfortunately also coincided with elevated FCR infection levels within central and northern cropping systems (Figure 1).

Sub-region levels of FCR

In total, 14 samples were from South Australia (SA), 14 from Victoria (Vic), 30 from south-west NSW (SWNSW), 43 from south-east NSW (SENSW), 131 from central-west NSW (CWNSW), 57 from central-east NSW (CENSW), 163 from north-west NSW (NWNSW), 173 from north-east NSW (NENSW) and 93 from southern Qld (SQld). FCR infection levels in the last two cereal crops have been highest in SQld, NWNSW and NENSW with the proportion of paddocks with very high levels (≥51% FCR) at 38%, 33% and 32%, respectively (Figure 2). The proportion of paddocks in this highest category of FCR infection level was lower at 23% in SWNSW, 18% in CWNSW and 14% in CENSW. A lower proportion of paddocks with FCR in this highest category were measured at 7% in SA, 5% in SENSW and 0% in Vic. However, all regions had relatively high FCR levels (≥26% FCR in high or very high categories) ranging from 14% of paddocks in SA up to 62% in NENSW (Figure 2).

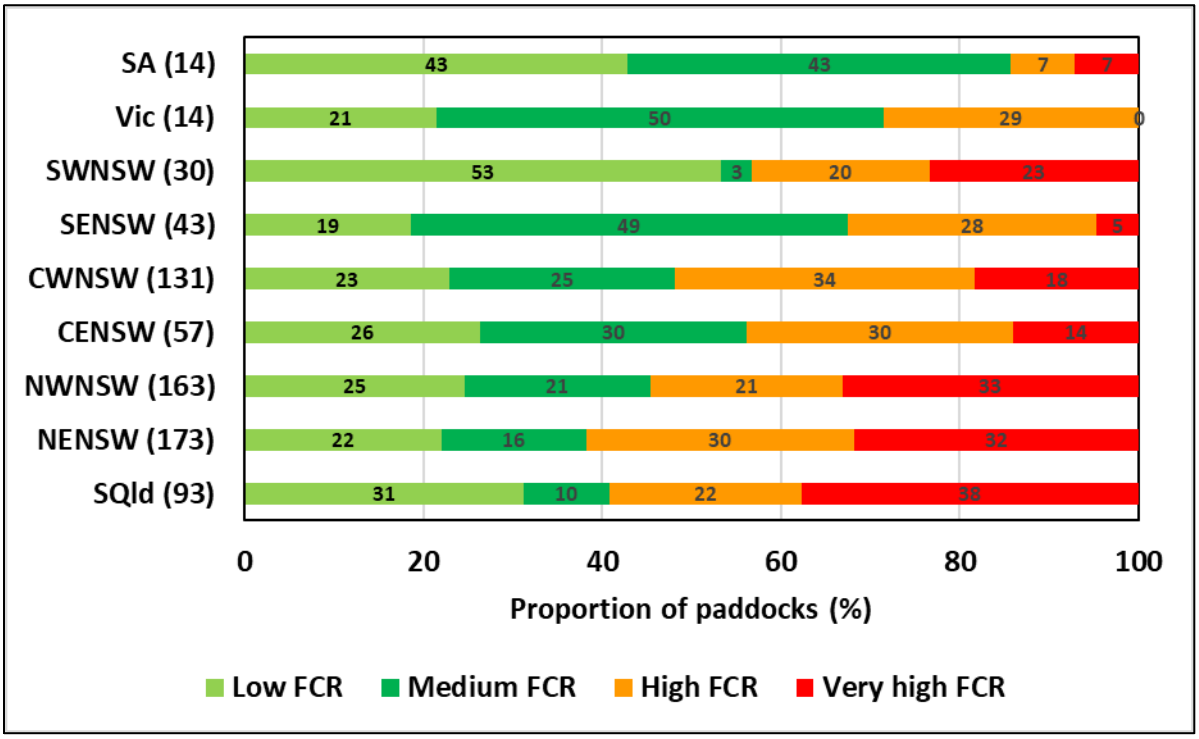

Figure 2. Proportion of winter cereal paddocks in 2022 and 2023 with varying levels of Fusarium crown rot (FCR) infection across sub-regions.

Number in brackets (Y-axis) is the number of paddocks sampled from each sub-region.
Low FCR = ≤10%, Medium FCR = 11–25%, High FCR = 26–50%, Very high FCR = ≥51%

Influence of a single break – what do the numbers say?

Adopt a cereal-cereal-cereal 'rotation' and there is a 27% chance of having high (26 to 50%) and 50% chance of having very high (≥51%) FCR infection (Figure 3). If the preceding crop was a summer break crop, then cotton (22% high FCR and 39% very high FCR in 18 paddocks) was potentially slightly better than sorghum (40% high FCR and 34% very high FCR in 35 paddocks). Fallowing the paddock rather than growing a crop did not reduce FCR levels in the subsequent 32 winter cereal crops tested with 35% having high and 41% very high FCR infection. If the preceding crop was a winter pulse or canola break crop then this risk of very high FCR in the 2022 or 2023 cereal crop was reduced further to 14% (average of pulse species) and 12%, respectively (Figure 3). In terms of pulse break crops, faba bean (14% high FCR and 7% very high FCR in 29 paddocks) was more effective than chickpea (22% high FCR and 20% very high FCR in 51 paddocks) and lupin (50% high FCR and 0% very high FCR in 17 paddocks; Figure 3).

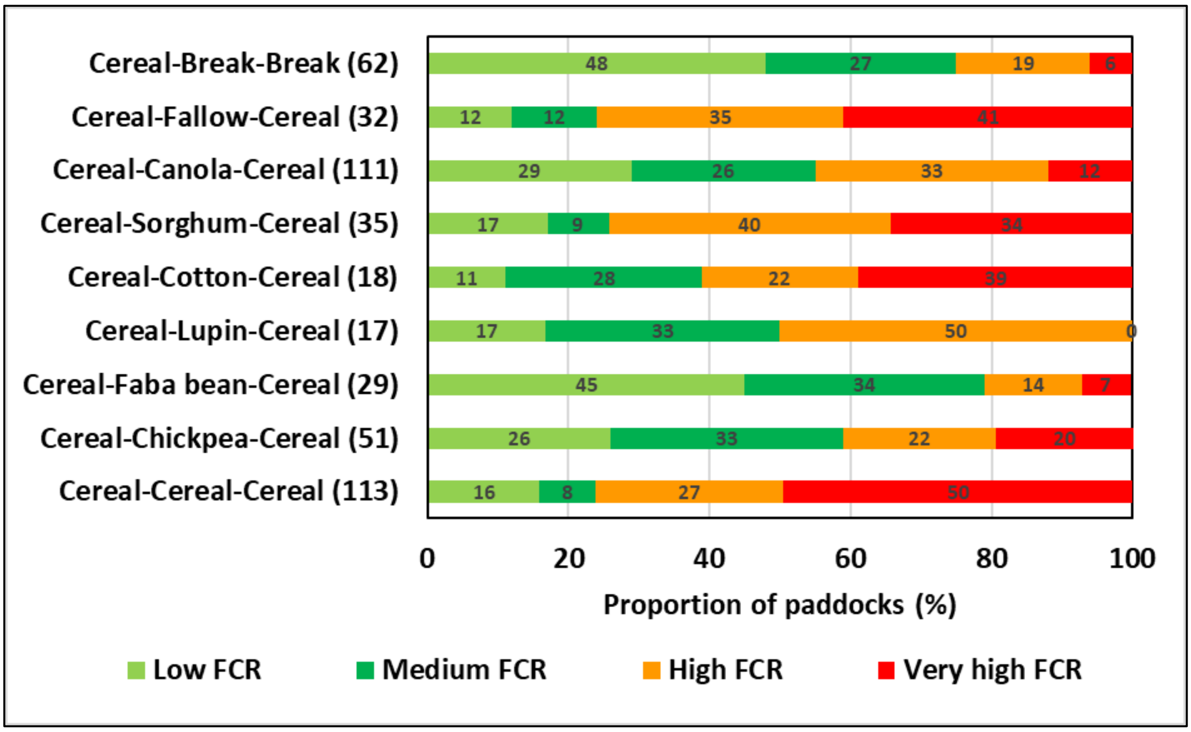

Figure 3. Proportion of winter cereal paddocks in 2022 and 2023 with varying levels of Fusarium crown rot (FCR) infection under different crop rotations.
Number in brackets (Y-axis) is the number of paddocks sampled from each rotation sequence.
Low FCR = ≤10%, Medium FCR = 11–25%, High FCR = 26–50%, Very high FCR = ≥51%

There are a number of potential variables such as FCR infection levels in cereal crops two years ago, stubble management (e.g. burning or cultivation), seed source (e.g. Fusarium grain infection from 2022 FHB epidemic), grass weed management, inter-row sowing, and harvest height which could also underly this data and introduce variability. Clearly non-host crop or fallow periods reduce the probability of higher FCR infection levels and consequently yield loss from this disease so playing the rotation numbers works. However, a one-year break may not be sufficient under higher FCR infection levels. A two-year break further reduced the probability of high and very high FCR infection levels in 2022 or 2023 cereal crops which dropped to 19% and 6%, respectively (Figure 3).

What is the effect of one break crop in three years?

Alright, let's try presenting differently and having a 'glass half full' approach. Assume low and medium FCR infection levels result in <25% whiteheads in a season conducive to disease expression, so does not trigger the 'I told you not to sow another cereal crop in that paddock' argument with your agronomist. In a three-year consecutive cereal situation (cereal-cereal-cereal), there is a 24% probability of this happening. This increased to 33% if the paddock was in fallow two years ago and 28% if it was a pulse crop two years ago. However, the likelihood of this outcome reduced to 23% if it was canola and 20% if it was a summer crop two years ago (Figure 4). Some may like these probabilities and continue to roll the dice whilst others may be swayed more by the probabilities around the second wheat crop having high or very high FCR infection levels (Figure 4).

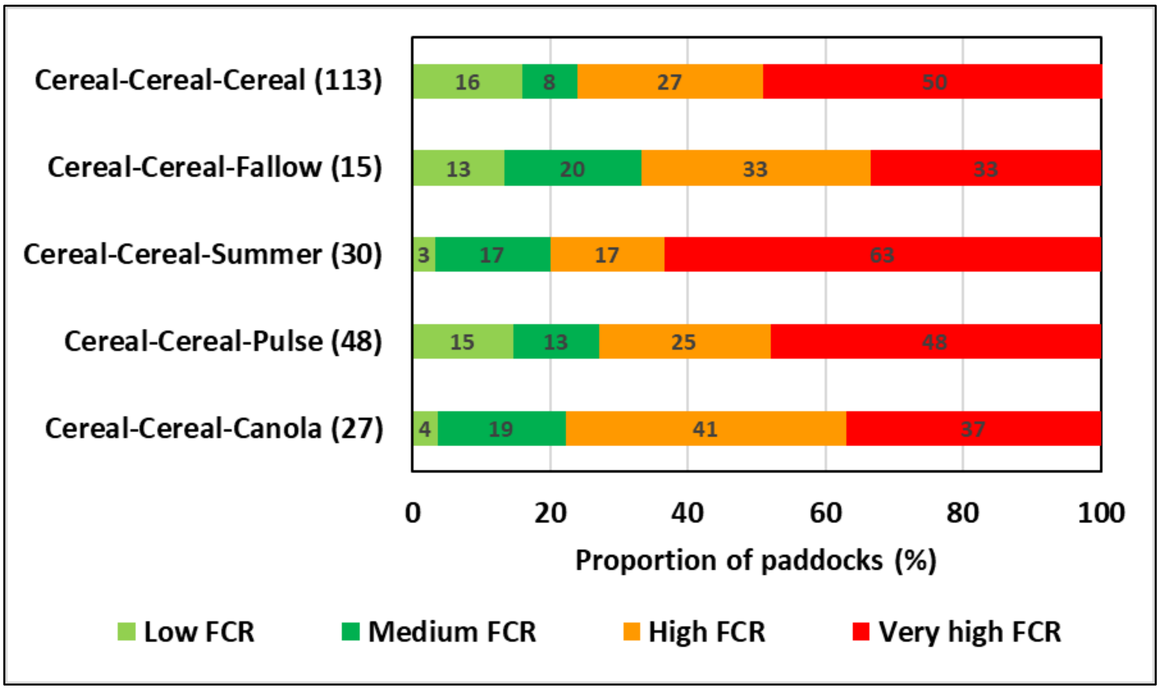

Figure 4. Proportion of winter cereal paddocks in 2022/23 with varying levels of Fusarium crown rot (FCR) infection under different crop rotations.
Number in brackets (Y-axis) is the number of paddocks sampled from each rotation sequence.
Low FCR = ≤10%, Medium FCR = 11–25%, High FCR = 26–50%, Very high FCR = ≥51%

Conclusions

Recent crop history within individual paddocks is a useful guide to the likely risk of FCR infection. However, not all paddocks and underlying crop management are the same so there is variability in the actual numbers, but the rotation sequence clearly drives the probability of having higher or lower levels of FCR infection. This further highlights the value of testing to establish actual FCR infection levels within a paddock using PreDicta®B or cereal stubble plating to further guide crop rotation and other integrated disease management decisions within individual paddocks.

Integrated management of FCR

To manage the risk of yield losses in cereals, firstly identify the risk of Fusarium crown rot in each paddock. High-risk paddocks generally include durum, bread wheat or barley crops being sown into a paddock with a history of stubble retention and tight cereal rotations (including oats). Other considerations include:

- Use effective weed management to reduce grass weed hosts in crop and fallow situations which serve as alternate hosts for the FCR fungus.

- Remember the larger the grass weed when controlled the longer that residue serves as a potential inoculum source
- Given the recent Fusarium head blight epidemic in 2022, ensure that you are sowing seed free of Fusarium infection as infected seed introduces FCR infection into paddocks.

All other management options are implemented prior to sowing so knowing the risk level within paddocks is important. This can be quantified through PreDicta® B testing (SARDI) or stubble testing (NSW DPI).

If medium to high FCR risk, then:

- Sow a non-host break crop (e.g., lentil, field pea, faba bean, chickpea, canola). A two-year break may be required if FCR inoculum levels are very high.

If still considering sowing a winter cereal:

- Consider stubble management options in terms of both impacts on FCR inoculum but also fallow soil moisture storage.

   a. ***Cultivation*** accelerates stubble decomposition which can decrease FCR risk (as the causal pathogen is stubble-borne) BUT it takes moisture and time. Cultivation also increases the spread of Fusarium crown rot inoculum across a paddock in the short term and increases exposure of below ground infection points (coleoptile, crown and sub-crown internode) in cereal plants to contact stubble fragments infected with the FCR fungus. Cultivation close to sowing therefore increases the incidence of plants which get infected with FCR. Cultivation can also significantly reduce soil moisture storage during fallow periods.

   b. ***Stubble baling*** removes a proportion of the above ground inoculum from a paddock potentially reducing FCR risk. The pathogen will then be concentrated in the shorter stubble butts and below ground in the previous rows. Hence, baling in combination with inter-row sowing is more likely to reduce FCR risk. Reduced ground cover after baling and removal of cereal straw can reduce fallow efficiency.

   c. ***Stubble burning*** destroys above ground inoculum but depends on the completeness of the burn. Burning has no effect on the survival of the FCR fungus below ground in crown tissue even with a hotter summer burn. Hence the pathogen will be concentrated below ground in the previous rows with survival between seasons dependent on the extent of summer rainfall. Burning of cereal stubble can considerably reduce fallow soil moisture storage so a ‘late Autumn’ burn is preferable to an ‘early Summer’ burn. Stubble burning in combination with inter-row sowing is more likely to reduce FCR risk.

   d. ***Reducing cereal stubble height*** limits the length of stubble which the FCR fungus can vertically grow up during wet fallow periods restricting the overall inoculum load within a paddock. Consequently, harvesting and leaving retained cereal stubble longer (e.g. stripper fronts) leaves a greater length of stubble for subsequent potential saprotrophic growth of the FCR fungus. This is not a major issue in terms of FCR risk if the retained infected cereal stubble is left standing and kept intact. However, if the infected stubble is disturbed and redistributed across a paddock through grazing, mulching, cultivation or the subsequent sowing process then this can increase the incidence of FCR infection. Recent research in NSW has also demonstrated that increased cereal harvest height allowed saprotrophic growth of the FCR fungus above the harvest height of a following chickpea crop. This resulted in FCR infected cereal stubble being spread out the back of the header during the chickpea harvest process increasing FCR risk for the next cereal crop (Petronaitis *et al.* 2022). Consider matching cereal stubble height at or after harvest in paddocks planned for a following shorter status break crop such as chickpea or lentils to prevent redistribution of retained FCR infected cereal stubble during the break crop harvest process.

- Select a cereal type and variety that has more tolerance to FCR ***and*** that is best suited to your region (see above results). Yield loss from FCR is generally durum>bread wheat>barley>oats. Recent research has shown that cereal type and varietal resistance has no impact on saprotrophic growth of the FCR fungus after harvest. Hence, cereal crop and variety choice does not have subsequent benefits for FCR risk with a paddock.
- Consider sowing a variety earlier within its recommended sowing window for your area. This will bring the grain filling period forward slightly and can reduce water and heat stress which exacerbates FCR expression and yield loss. However, this needs to be weighed against the risk of frost damage. Research across locations and seasons in NSW has shown that sowing at the start versus the end of a three-week recommended planting window can roughly halve the yield loss from FCR.
- If previous cereal rows are intact – consider inter-row sowing to increase the distance between the new and old plants, as most inoculum is in the stem bases of the previous cereal crop. Physical contact between an infected piece of stubble and the coleoptile, crown or sub-crown internode of the new cereal plants is required to initiate FCR infection. Research across locations and seasons in NSW (30–35 cm row spacings in stubble retained systems) has shown that inter-row sowing can roughly halve the number of wheat plants that become infected with FCR. Precision row placement can also provide greater benefits for FCR management when used in combination with rotation to non-host crops.
- Ensure nutrition is appropriate for the season. Excessive nitrogen will produce bulky crops that hastens moisture stress and makes the expression of FCR more severe. Whitehead expression can also be made more severe by zinc deficiency.
- Consider a seed fungicide treatment to suppress FCR. Fungicide seed treatments are not a stand-alone treatment and must be used as part of an integrated management approach.

References and further resources

PreDicta®B procedure - Sampling_protocol_PreDicta_B_Northern_regions.pdf (pir.sa.gov.au)

Petronaitis LT, Forknall C, Simpfendorfer S, Backhouse D (2020) Stubble Olympics: the cereal pathogen 10cm sprint - GRDC. GRDC Update paper

Petronaitis T, Forknall C, Simpfendorfer S, Flavel R, Backhouse D (2022) Harvest height implications for Fusarium crown rot management - GRDC. GRDC Update paper

Simpfendorfer S (2022) Fusarium crown rot seed fungicides - independent field evaluation 2018-2021 - GRDC

Acknowledgements

The research undertaken as part of this project is made possible by the significant contributions of growers and their advisers through their support of the GRDC. The author would also like to acknowledge the ongoing support for northern pathology capacity by NSW DPI. This research would also not have been possible without the support of growers and advisors through submission of cereal stubble samples for testing and provision of background rotation data.

Useful discussions with Glenn Shepherd (IMAG consulting) around data presentation are also appreciated.

Contact details

Steven Simpfendorfer
NSW DPI, 4 Marsden Park Rd, Tamworth, NSW 2340
Ph: 0439 581 672
Email: steven.simpfendorfer@dpi.nsw.gov.au
X (Twitter): @s_simpfendorfer or @NSWDPI_AGRONOMY

Date published

August 2024

Can we make better disease management decisions with the use of new technologies?

Nick Poole & FAR Australia team, Ag Victoria, Brill Ag and Trengove Consulting

Background

22 years ago, disease management in Australia changed because of an exotic (overseas) incursion of stripe rust that infected crops in WA in 2002. Rather unfairly it became known as the WA pathotype. It resulted in greater use of both in-furrow and foliar fungicides to control an infection that was to become widespread across the eastern states.

On the plus side it resulted in much greater understanding of how to use fungicides in modern Australian broadacre farming systems. As the use of fungicides increased so the market for fungicides increased, which in turn meant manufacturers had greater confidence in introducing newer fungicide actives and modes of action. ***It is arguable that Australia now has a fungicide armory that is as up to date and powerful as that available to growers in Europe.***

Key Points

- *It is now often the case that low-cost fungicides are included in disease management strategies with little evidence of disease or risk being identified.*
- *In a number of tillering cereal crops genetic yellowing, nutritional spotting and herbicide damage are misdiagnosed as disease resulting in an additional early fungicide application.*
- *Pathogen populations are incredibly adaptive and with more and more fungicides applied our pathogen populations change, becoming increasingly resistant to our modern fungicide armory through a process of selection (sensitive strains are destroyed more resistant strains survive).*
- *20 years later fungicide resistance and reduced sensitivity (partial resistance) is a real issue, particularly in the net blotch, Septoria, powdery mildew and blackleg pathogens.*
- *Whilst improved genetic resistance is a clear way to reduce our dependency on fungicide application, could we use new technologies and simple decision support tools to give us greater confidence to omit a fungicide application.*
- *One of the simplest ways of preserving the activity of our fungicides and reducing our resistance risk is to employ fewer fungicide applications during the course of a growing season.*

That is the objective of a new GRDC investment in wheat (GRDC FAR202503-001RTX) that is testing whether we can use decision support tools such as disease development apps, spore traps, simple wet weather rules of thumb and disease thresholds that would allow us to;

> ***Either – spray with greater certainty, omit a fungicide or delay fungicide to a later timing with the intention of using less fungicide***

Can we make better disease management decisions with the use of new technologies?

Nick Poole & FAR Australia team, Ag Victoria, Brill Ag and Trengove Consulting

The new project that is in its first year has four protocols covering the three year research programme. A selection of trials from these protocols (which are outlined below) are being conducted across four states in SE Australia at nine research sites, three in Victoria, three in SA, two in NSW and one on Tasmania.

Protocol 1. The economic value of germplasm, cultural control and at sowing inputs in foliar disease management strategies.

Objective: This will investigate the value of cultural control associated with rotation position, genetic resistance and at sowing fungicide inputs on the need for foliar fungicide inputs in the spring.

Protocol 2. Strategies based on decision support tools and new technologies.

Objective: To validate foliar fungicide treatments derived from spore trap results, simple environmental trigger points, % threshold infection levels on specific leaf layers and model-based decision support apps covering stripe rust & Septoria.

Protocol 3. Adjustment in foliar fungicide rates, timings and active ingredients based on more resistant germplasm.

Objective: To validate foliar fungicide strategies that reduce the number of fungicide applications and rate of fungicide whilst adhering to AFREN principles (Australian Fungicide Resistance Extension Network) to reduce resistance risk.

Protocol 4. Long term effects of stubble management, green bridge control and resistant germplasm on foliar disease levels in continuous wheat.

Objective: Based at two sites (Horsham & Gnarwarre), a two-year trial using larger block plots would seek to assess the cumulative impact of adopting Integrated Disease Management (IDM) measures aimed at reducing the disease risk in the following crop.

What is happening internationally?

As part of the project FAR Australia looked at how decisions on fungicides and disease management more generally are made in other parts of the world hooking up with international contacts in New Zealand, Canada and the UK. Although new technologies were being tested most management decisions were based on disease presence or risk combined with knowledge of the development stage. In most cases fungicides were applied within the principal stem elongation development period of GS30 – 59. Although many countries had specific threshold levels for particularly diseases it was unclear whether the thresholds were being used on farms, with time taken to arrive at threshold levels and logistics of large farm enterprises often cited as a reason for just spraying at particular development stage with less attention being addressed to the level of disease present.

Today we will look at the trials to explore how we have fared with our spray decisions this season. The project must own its decisions, good and bad since fungicide decisions are primarily decisions based on our attitude to risk, therefore where we don't take out insurance it needs to be based on sound rational and scientific evidence.

Integrated management of Net form net blotch (NFNB) with triple mutant fungicide resistance threats in south-west Victoria

Darcy Warren[1], Nick Poole[1], Aaron Vague[1], Max Bloomfield[1] & Rajdeep Sandhu[1]
[1] Field Applied Research (FAR) Australia

This paper brings together findings from the GRDC funded, QDPI lead project "Program 5 - Integrated management strategies for Net Form Net Blotch in low, medium, and high rainfall zones", looking specifically at lessons learned in the NFNB Stubble management × fungicide management trial in 2024 and early observations in 2025.

Key point summary

- NFNB severity reached high levels in untreated plots, with late-season infection exceeding 80% in low-input fungicide programs.
- Fungicide management significantly increased yield (mean response +1.21 t/ha) while stubble management alone did not provide a yield benefit.
- High-input fungicide programs delivered the best economic returns (ROI up to $3.78 per $1 spent), though disease was not completely controlled.
- Stubble management (burning or cultivation) did not significantly influence disease or yield in this trial, but remains an important tool where barley follows barley.
- The presence of triple fungicide resistance in *P. teres f. teres* in the region highlights the need for integrated disease management (IDM), combining fungicides with resistant varieties, crop rotation and paddock hygiene.

Background

Net form net blotch (NFNB), caused by *Pyrenophora teres f. teres*, remains one of the most significant foliar diseases of barley in southern Victoria. Its prevalence has increased alongside widespread cultivation of susceptible barley cultivars. In recent years, resistance and reduced sensitivity to all three major fungicide groups (DMI, QoI, and SDHI) has been confirmed in Australian NFNB populations. This triple resistance in the pathogen population presents a major challenge to disease control, requiring a shift away from reliance on fungicides alone.

The 2024 NFNB Stubble management trial was established as part of the GRDC funded, QDPI lead project "Program 5 - Integrated management strategies for Net Form Net Blotch in low, medium, and high rainfall zones" to investigate the interaction between fungicide input and stubble management, and to assess their impact on NFNB development, grain yield and economic return.

Trial 3. NFNB Stubble management × fungicide management multi-year trial

- **Location:** Lethbridge, Vic- medium grey clay soil
- **Previous crop:** Wheat (2023)
- **Sown:** 30 May 2024; harvested: 20 December 2024
- **Stubble treatments:** Standing, cultivated (2 May), burnt (2 May)
- **Fungicide strategies:**
  - *Low input*: Systiva (fluxapyroxad) seed treatment only
  - *High input*: Systiva, Opera (GS31), Aviator Xpro (GS39-49) & Opus (GS59)

Integrated management of Net form net blotch (NFNB) with triple mutant fungicide resistance threats in south-west Victoria

Darcy Warren[1], Nick Poole[1], Aaron Vague[1], Max Bloomfield[1] & Rajdeep Sandhu[1]
[1] Field Applied Research (FAR) Australia

Grain yield:
Mean yield across the trial was 7.40 t/ha. The effect of fungicide management was highly significant ($p < 0.001$), increasing yield by an average of 1.21 t/ha. Stubble management had no significant effect on yield ($p = 0.678$).

Economic return:
High-input fungicide strategies produced strong positive margins (ROI up to $3.78), while low-input programs returned negative margins in all stubble treatments (Table 1).

Disease severity:
NFNB infections were low to moderate early in the season (GS31–39) likely due to a late May sowing however escalated rapidly by the grain fill stage (GS71–75). Untreated/low input plots recorded 80–83% infection compared with 50–59% in high-input plots. Stubble management did not significantly affect disease in the wheat-barley rotation.

Discussion
The results from this trial confirm that fungicides remain effective in reducing NFNB severity and protecting yield, however they also highlight the limitations of a fungicide-dependent approach. Despite four applications across multiple modes of action, NFNB was not fully controlled, with late-season infection still exceeding 50% in high-input treatments. As the presence of triple resistant mutants becomes more widespread in the NFNB pathogen population so the sustainability of such high input programs becomes more questionable.

Stubble management and rotation
Although previous wheat stubble treatments did not influence final disease levels or grain yield in this trial, the preceding wheat crop meant inoculum carryover was relatively low. In continuous barley systems, stubble retention is a major driver of NFNB epidemics. Burning or cultivating barley stubbles remains an important strategy to reduce inoculum pressure, particularly where fungicide efficacy is compromised by resistance and reduced sensitivity. In 2025, trial plots have again been established, overlaying the 2024 trial, and therefore sown into barley stubble. Early season assessments at first node GS31 have shown significant reductions in disease severity in the lower canopy where stubble inoculum has been removed. Although severity levels recorded were relatively low (<10 % leaf area infected (LAI)), these results have been generated in a June sown crop of a MS variety cv Neo CL (more resistant than the 2024 trial) and would realistically be expected to have little to no infection under normal circumstances.

Integrated management of Net form net blotch (NFNB) with triple mutant fungicide resistance threats in south-west Victoria

Darcy Warren[1], Nick Poole[1], Aaron Vague[1], Max Bloomfield[1] & Rajdeep Sandhu[1]
[1] Field Applied Research (FAR) Australia

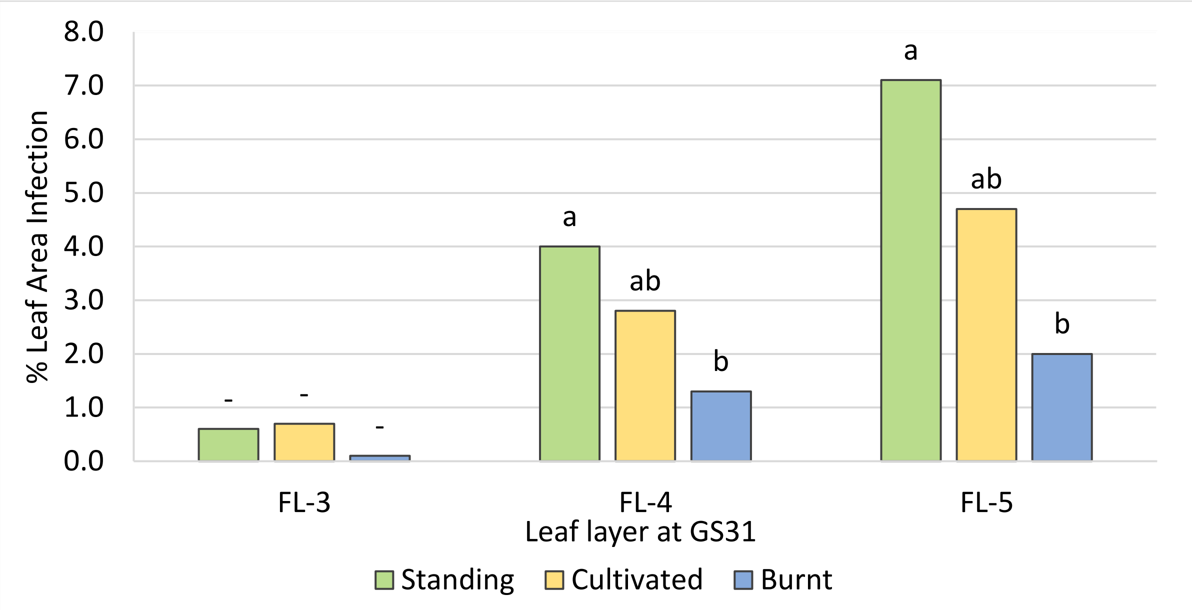

Figure 1. Influence of stubble management on early season Net form net blotch (NFNB) severity (%LAI), assessed 18 August 2025, cv Neo CL.

Resistant varieties

The trial highlights the vulnerability of susceptible varieties under high NFNB pressure. Fungicide input provided yield protection but was unable to deliver complete control. Resistant or moderately resistant cultivars provide the most sustainable protection and should form the foundation of integrated NFNB management. However, shifts in disease spectrum (e.g. increased scald and/or leaf rust) need to be monitored when varietal resistance is utilised.

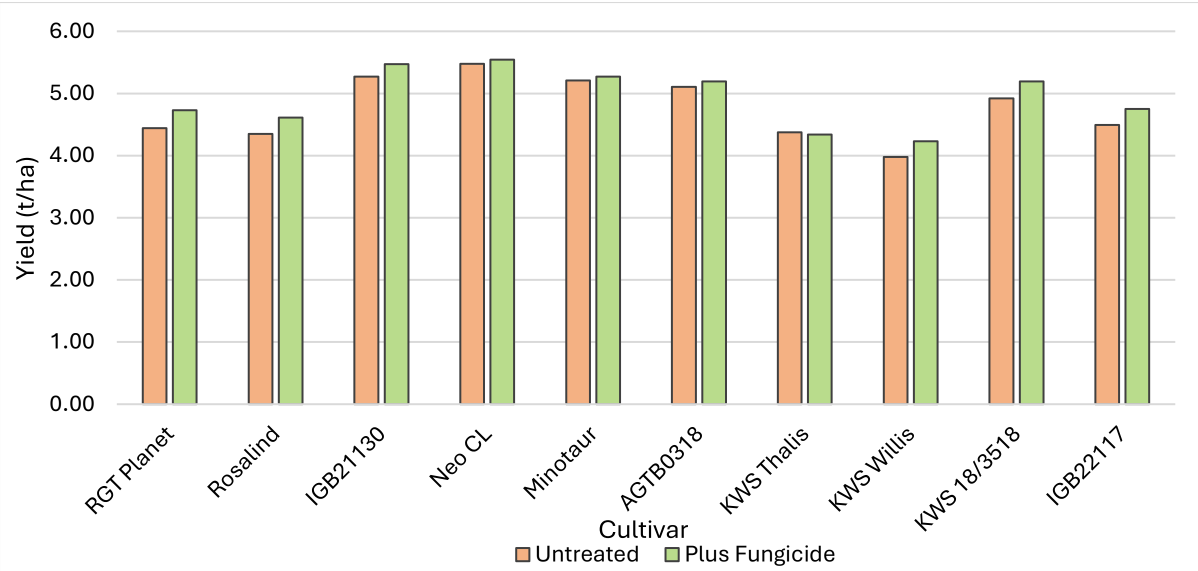

Figure 2. Results from FAR Australia's 2024 Barley Germplasm Evaluation Network (GEN) TOS 2 trial showing influence of barley variety and fungicide application on grain yield (t/ha) (P Value= <0.820, LSD= ns). These trials provide an insight into newly released barley varieties and promising breeder lines and their potential to provide more disease resistant, high yielding options.

Integrated management of Net form net blotch (NFNB) with triple mutant fungicide resistance threats in south-west Victoria

Darcy Warren[1], Nick Poole[1], Aaron Vague[1], Max Bloomfield[1] & Rajdeep Sandhu[1]
[1] Field Applied Research (FAR) Australia

Fungicide use

The economic data reinforces that low-input fungicide programs are not viable under high NFNB pressure, while high-input programs can still deliver ROI in the short term. However, in the presence of the triple resistant mutations, overuse of fungicides risk accelerating the loss of remaining efficacy. Strategic and targeted fungicide applications and integration of IDM tools is essential.

Table 1. Margin ($/ha) after fungicide, application and stubble management costs have been deducted from the value of additional yield at $345/t.

		Response to Fung. and Stubb. Man.	Cost of treatment	Extra income from fung.	Margin after input cost and app.	Return on Investment
Fung. Input	**Stubble Management**	**t/ha**	**$/ha**	**@$345/t**	**$/ha**	**$ back for every extra $1 spent**
Low	**Standing**	0.00	$36.00	$0.00	-$36.00	
Low	**Cultivated**	-0.06	$125.00	-$20.70	-$145.70	-$0.23
Low	**Burnt**	-0.24	$46.00	-$81.77	-$127.77	-$8.18
High	**Standing**	1.16	$141.85	$400.20	$258.35	$3.78
High	**Cultivated**	1.05	$230.85	$360.53	$129.68	$1.85
High	**Burnt**	1.11	$151.85	$383.99	$232.14	$3.31

Conclusion

This trial shows that fungicide programs continue to provide yield and economic benefit in susceptible barley varieties, but they cannot provide complete NFNB control. With triple fungicide resistance now present in the region, integrated disease management strategies are critical. Resistant cultivars, stubble management in barley-on-barley rotations, and diverse cropping sequences should all be combined with strategic fungicide use. These strategies will reduce pathogen inoculum, limit reliance on chemical control, and extend the life of existing fungicide options.

AFTERNOON TIMETABLE

VIC HRZ CROP TECHNOLOGY CENTRE FIELD DAY
FRIDAY 10th OCTOBER 2025

In-field presentations at Cereal Research site	Station No.	1:30	2:00	2:30	3:00	3:30
Dr Steven Simpfendorfer, NSW DPIRD **Fusarium crown rot in central and southern cropping systems: it's all a numbers game.** *Steve looks at Fusarium crown rot (FCR) which remains a major constraint to winter cereal production*	5	1				
Darcy Warren, Nick Poole and Ben Morris, FAR Australia ***Making better decisions on disease management practices in wheat and barley*** *Nick, Darcy and Ben look at three key GRDC projects (RiskWise, IDM strategies for NFNB & Wheat Disease Management) that seek to use new technologies and decision support tools to make profitable and sustainable decisions with fungicides.*	6		1			Closing address and refreshments
Ashley Amourgis, SFS, and Ben Jones, FAR Australia ***Pushing potential profit? Benchmarks for agronomy and profit*** *The first year results our new GRDC Hyper Profitable Crops project are out. Ashley and Ben look at the analysis of agronomic and profitability benchmarking in the region.*	7			1		
FAR Australia team *The Gnarwarre team look at this year's* ***Germplasm trials for wheat & barley*** *- what have learnt so far in GEN (consistent variety performers, genetic resistance to disease & response to fungicide).*	8				1	
In-field presentations		1:30	2:00	2:30	3:00	3:30

Note we will only split into two groups if high numbers attend (otherwise we will run one group).	1
If we do split into groups we would ask that you stay in your allocated groups. Thank you for your cooperation.	

Pushing potential profit?

Some benchmarks for wet and drier environments.

Ben Jones and Rebecca Murray, FAR Australia

Introduction

In a world of water, where do you turn to check if your crop management is working to the profitable potential? The Hyper Profitable Crops project has some answers. Input use, agronomy, yield and quality were monitored on 93 paddocks across the high rainfall zones of southern Australia in 2024. Common input and grain pricing, together with weather data, were used to set some initial benchmarks. Crop performance relative to benchmarks can be used to indicate where management (or simply the season) might have led to a poor outcome, and what might be changed to improve future results. Thirty paddocks in southwest Victoria were part of the first season of the project.

Method

Paddocks in either wheat or barley were volunteered by farmer members of discussion groups run by each hub (hosted by Southern Farming Systems). Input data was recorded between harvest of the previous crop and harvest of the focus crop. The hub facilitator recorded inputs, took soil samples (mid-season), and visited paddocks regularly to track growth stage. Before harvest, quadrats of mature plants were harvested and processed to estimate total biomass, yield components, and also provide data for quality analysis. Weather data was taken from the nearest SILO grid cell location (https://www.longpaddock.qld.gov.au/silo/point-data/).

Water-limited potential yields were estimated according to 25 kg/ha/mm grain x (growing season rainfall + irrigation + 30 % of fallow rain – 60 mm evaporation). Growing season was estimated for each hub area as the weeks where average rainfall exceeded a third of evaporation (30 year, over 3 week contiguous periods). A water use cap of 480 mm was applied across all groups, but in future will be adapted to better reflect the growing season. Radiation/temperature limited yields were estimated according to relationships with the photothermal quotient: photosynthetically active radiation divided by average temperature in the four weeks before estimated flowering date.

An estimated gross margin was calculated using the whole paddock yield, with quality set by the sample grain and price according to publicly available grain prices in May 2025 (with adjustment for freight rates according to discussion group location). A common input price list was used across the project and adjusted where necessary to reflect changes in each hub area. Where inputs applied across multiple years (eg. lime, soil amelioration) the cost per year was estimated *pro rata*. Operation costs were estimated on a similar basis. Since releasing the 2024 season reports (and for this analysis), harvest cost has been updated to be in proportion to yield (assuming throughput effectively limits harvest rate for crop yields > 3 t/ha).

Benchmarks

The analysis breaks profit into several components:

Potential yield	whichever of water- and radiation/temperature-limited yield is lowest.
Per cent of potential	how much of potential yield was achieved
Price achieved/tonne	depending on quality, port price and estimated freight for each group
Cost	total of inputs, operation cost

Pushing potential profit?

Some benchmarks for wet and drier environments.

Ben Jones and Rebecca Murray, FAR Australia

Profit and cost are both expressed in terms of potential yield, so that they are comparable across water- and radiation/temperature-limited paddocks.

Benchmarks were calculated for each paddock and averaged across discussion groups, to determine some initial benchmark levels against which all paddocks could be compared.

Results

Many discussion groups achieved an average per cent potential yield achieved around 80% or higher (Figure 1). This seems like a reasonable benchmark for production. Higher per cent potential yields were achieved in drier environments and probably reflect under-estimation of stored water in soils with high plant available water. Some of the SFS Tas paddocks had yield limited by the water use cap, when the radiation/temperature potential yield would more correctly apply. These groups would have lower average per cent potential achieved.

Differences in price achieved reflect port and freight differences (Figure 2), but also quality achieved. In some groups, more of the paddocks are sown to cultivars with maximum feed grades.

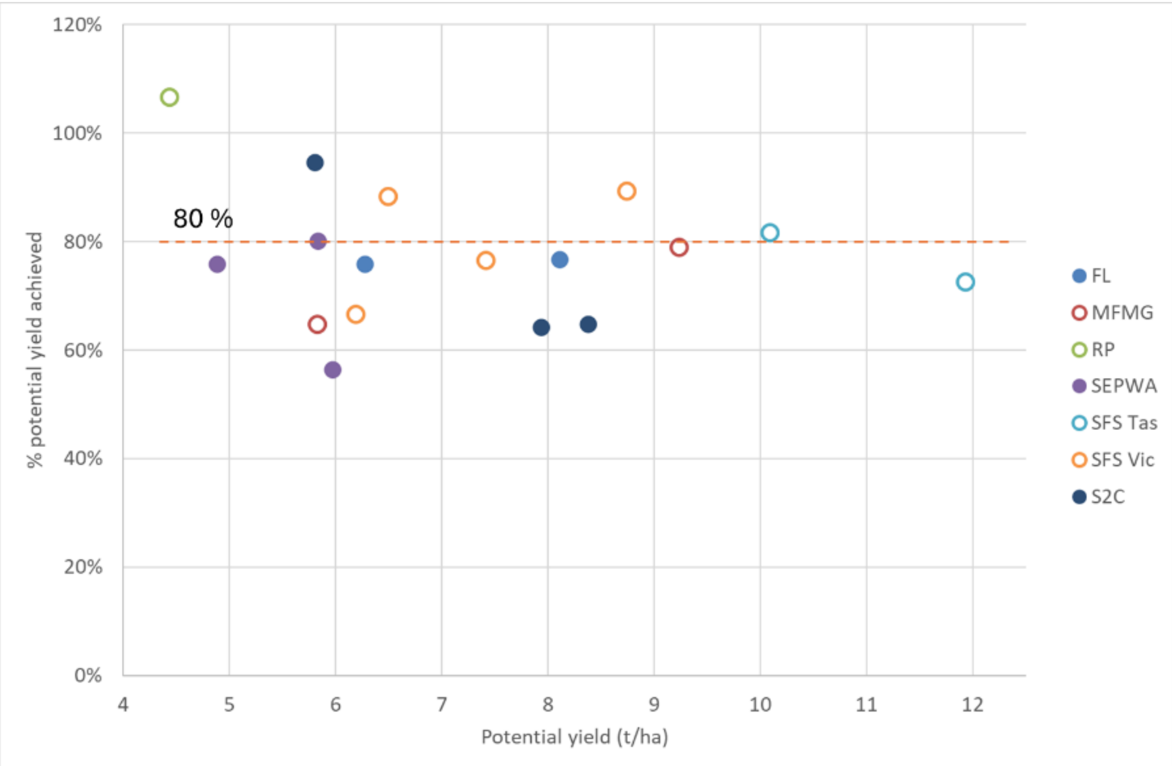

Figure 1. Potential yield benchmark: average per cent potential yield for each discussion group vs potential yield. Colours represent different hubs. The dashed line is a proposed potential yield benchmark of 80%.

Pushing potential profit?

Some benchmarks for wet and drier environments.

Ben Jones and Rebecca Murray, FAR Australia

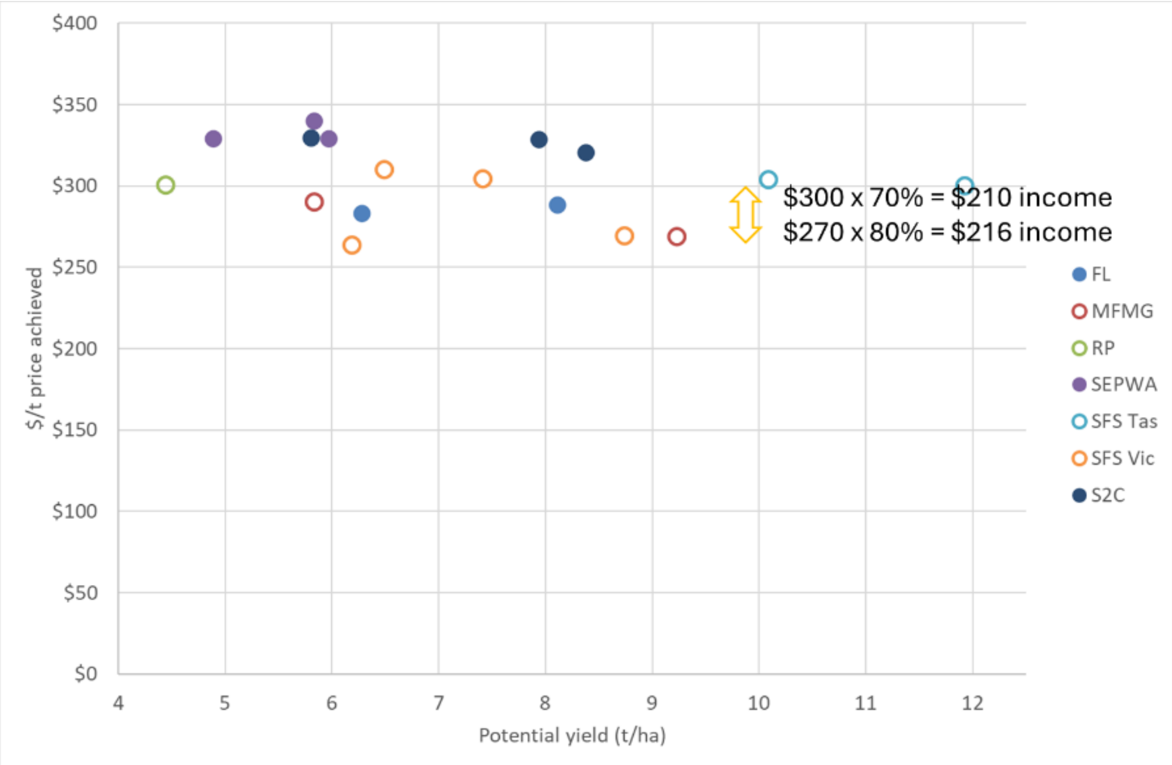

Figure 2. Price achieved benchmark: average grain price achieved in each discussion group vs potential yield. Colours represent different hubs.

**FL = FarmLink (NSW), MFMG = Mackillop Farm Management Group (SA), RP = Riverine Plains (NSW), SEPWA = South East Premium Wheat Association (WA), SFS = Southern Farming systems, S2C = Stirlings to Coast (WA)*

Costs were quite consistent across the groups when expressed relative to potential yield, allowing for many of the groups not including fallow costs (Figure 3), and the highest SFS Tas group having a higher potential yield than indicated. Cost per tonne of potential yield was approximately $100/t above 8 t/ha, and an additional $10/t below it. These may be useful benchmarks.

Many of the groups achieved $130 profit per tonne potential yield (Figure 4) across the range of potential yields. This appears to be a useful upper benchmark. Medium and low benchmarks have been suggested at $100 and $60 profit per tonne potential yield.

Pushing potential profit?

Some benchmarks for wet and drier environments.

Ben Jones and Rebecca Murray, FAR Australia

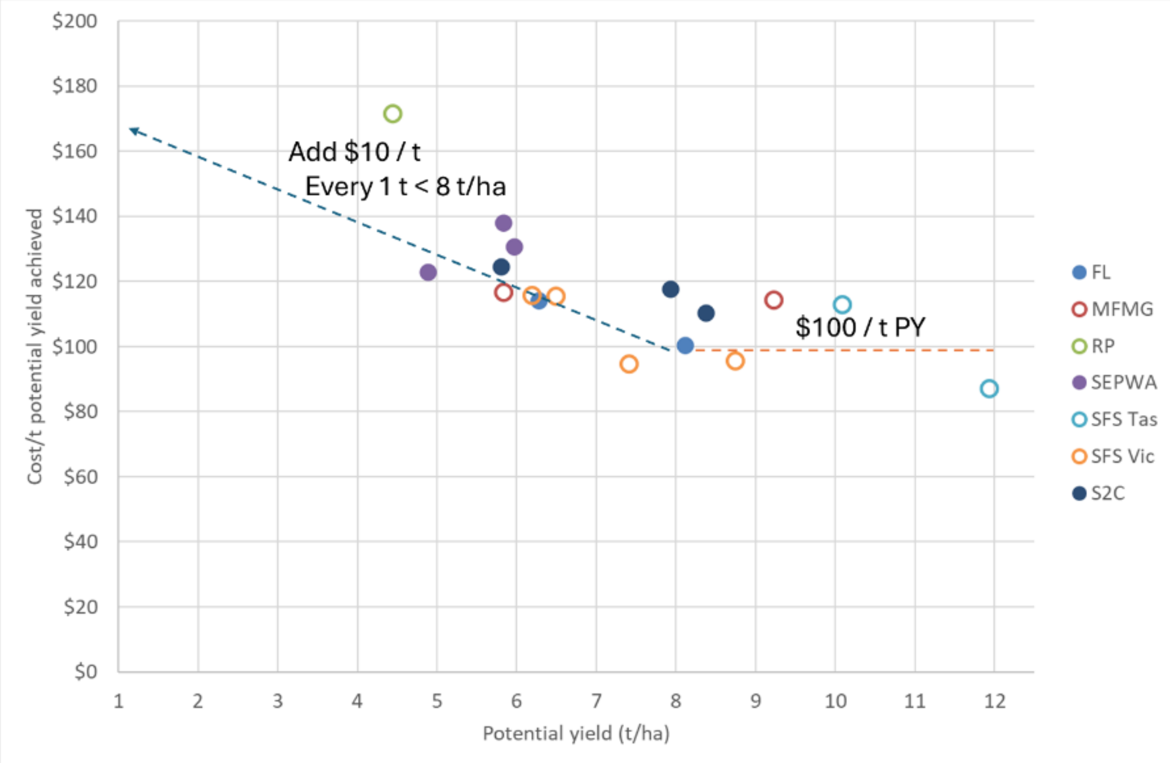

Figure 3. Cost benchmark: average cost per tonne potential yield in each discussion group vs potential yield. Colours represent different hubs. In hubs with open circles, costs were not measured before sowing. The dashed line is a proposed cost benchmark of $100/t potential yield, increasing $10/t for each t/ha below 8 t/ha.

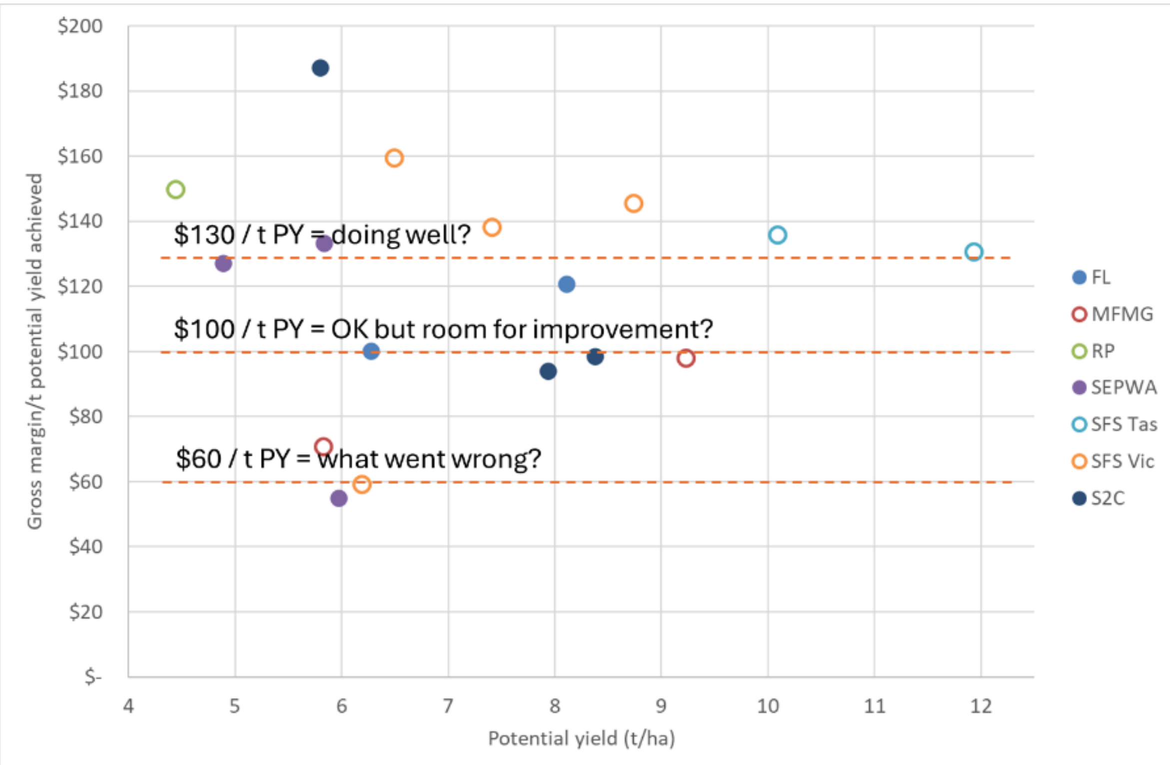

Figure 4. Profit benchmark: average profit per tonne potential yield in each discussion group vs potential yield. Colours represent different hubs. Dashed lines indicate proposed benchmarks.

Pushing potential profit?

Some benchmarks for wet and drier environments.

Ben Jones and Rebecca Murray, FAR Australia

Discussion/Conclusion

Application

The benchmarks are currently easiest applied by farmers who had a paddock in the project in 2024 and can calculate and compare their own benchmarks from the reports. Anyone who can estimate potential yield should be able to calculate what they should be achieving, and begin to target production, price or cost for further investigation if their profit benchmark appears low.

For example, if potential yield is around the 80% benchmark, the cause of a poor profit result rests either with price achieved, or cost.

The cost benchmark should also have application in-season, as a guideline on how much would be reasonable to spend (or try to save) if the potential yield is likely to be different from planned. For example, at a potential yield of 6 t/ha, a cost benchmark of $120/ha/t potential yield should lead to a total $720/ha spend. If rain leads to a potential yield of 9 t/ha, the cost benchmark of $100/ha/t potential yield suggests a total $900/ha spend, or no more than $280/ha more (including harvesting the additional yield).

The practical challenge in this application is how early any change in potential yield is known, vs. how much has been spent. In 2024 in the southwest Victorian paddocks, there was little that could be varied within 12 weeks of harvest (Figure 5). About $20/ha/t potential yield is spent between 20 and 12 weeks before harvest. In other areas (not shown) the expenditure is spread over a longer period, and potentially easier to adjust to the season.

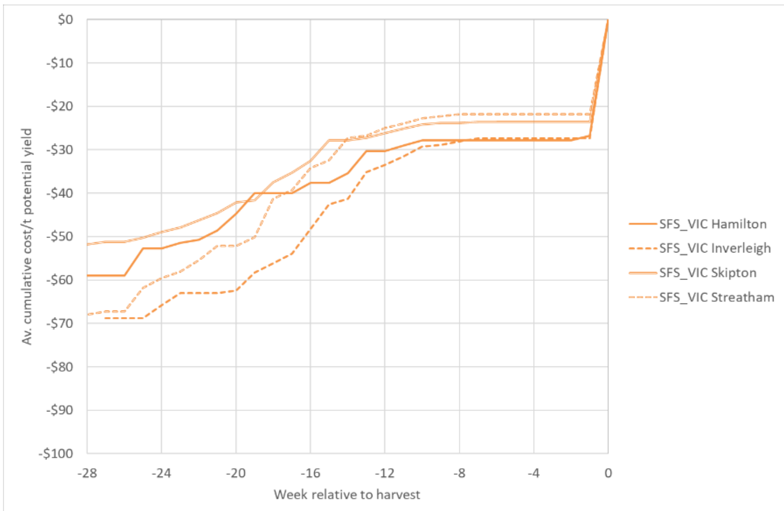

Figure 5. Cost remaining to be spent vs weeks before harvest, average for southwest Victorian (SFS_VIC) discussion group paddocks in 2024.

Future

Much effort this season has gone into establishing the system for transferring data from AgWorld and calculating this first round of benchmarks. The benchmarks, and the questions growers and advisers are asking, will in turn help to further refine the reports for the 2025 season paddocks.

Pushing potential profit?

Some benchmarks for wet and drier environments.

Ben Jones and Rebecca Murray, FAR Australia

There are some obvious refinements; for example, the profit benchmark should be related to potential price achieved. Assuming costs will only vary slowly, the profit benchmark should be the main thing to change from year to year (with price).

Acknowledgements

The Hyper Profitable Crops project is funded by GRDC (FAR2403-002SAX).

Thank you to all the growers who contributed data, and to the many hub facilitators involved in setting up paddocks, collecting and editing data and reviewing reports. In southern Victoria we would like to thank our SFS facilitators Ashley Amourgis and Greta Duff. Thank you also to Paul Feely (Federation University CeRDI), the people of the AgWorld Helpdesk, and to members of the FAR Team involved in the project: Darcy Warren, Max Bloomfield, Aaron Vague and Nick Poole.

Closing the yield gap - reflection on FAR Australia research results from east v west.

Nick Poole & FAR Australia team

Background

The following results are taken from observations in FAR's own Germplasm Evaluation Network (GEN) trials comparing the profitability of controlling disease with foliar fungicides in eastern states versus WA. Why is this important? Compared to 20 years ago we have some of the most advanced fungicide technology available to us here in Australia. However, over those 20 years we have moved from under use of fungicide to overuse of fungicides particularly in L-MRZ regions of Australia. The following research data starts to identify where we don't see profitable returns from fungicides.

Key Points

- *The current presence of stripe rust Puccinia striiformis and Septoria tritici blotch (STB) Zymoseptoria tritici in eastern states milling wheat crops results in significantly higher returns from fungicide application in the Eastern states crops compared to WA.*
- *The maximum yield response in Scepter to a three-spray fungicide programme incorporating SDHI fungicide over three years at our high yielding research site at Wallendbeen has been 5.72t/ha 2022, 1.85t/ha 2023 and 3.28 t/ha 2024.*
- *In contrast in the WA HRZ of Esperance the following response were seen in Scepter in 0.11t/ha in 2021, 0.17t/ha in 2022 and no response in 2024 (no site in 2023).*
- *In lower yielding scenarios in the eastern states at 3-5t/ha one disease is driving response more than any other in wheat,* ***it is stripe rust****.*
- *As 2023 indicated you can have very high levels of STB inoculum at GS31, but it does not mean that the disease will rob you of yield. Yield reduction is associated with wet conditions during stem elongation when the main yield contributing leaves emerge, the so-called money leaves.*

Results

Foliar fungicide application in **wheat** in the eastern states is a major driver of closing the yield gap, even in drier years such as 2023 and 2024. In the relatively high yielding NSW research site at Wallendbeen, it was cereal rusts that were driving the yield responses, with stripe rust the key disease in all varieties except Triple 2 that lost yield potential as a result of leaf rust (Figure 1). However, in FAR Australia research results in the WA HRZ it has been difficult to demonstrate the same effect on yield and profit.

Closing the yield gap - reflection on FAR Australia research results from east v west.

Nick Poole & FAR Australia team

The following 2024 graphs illustrate this difference with reference to FAR Australia's Germplasm Evaluation Network (GEN) trials where cereal varieties are tested with and without a comprehensive fungicide programme.

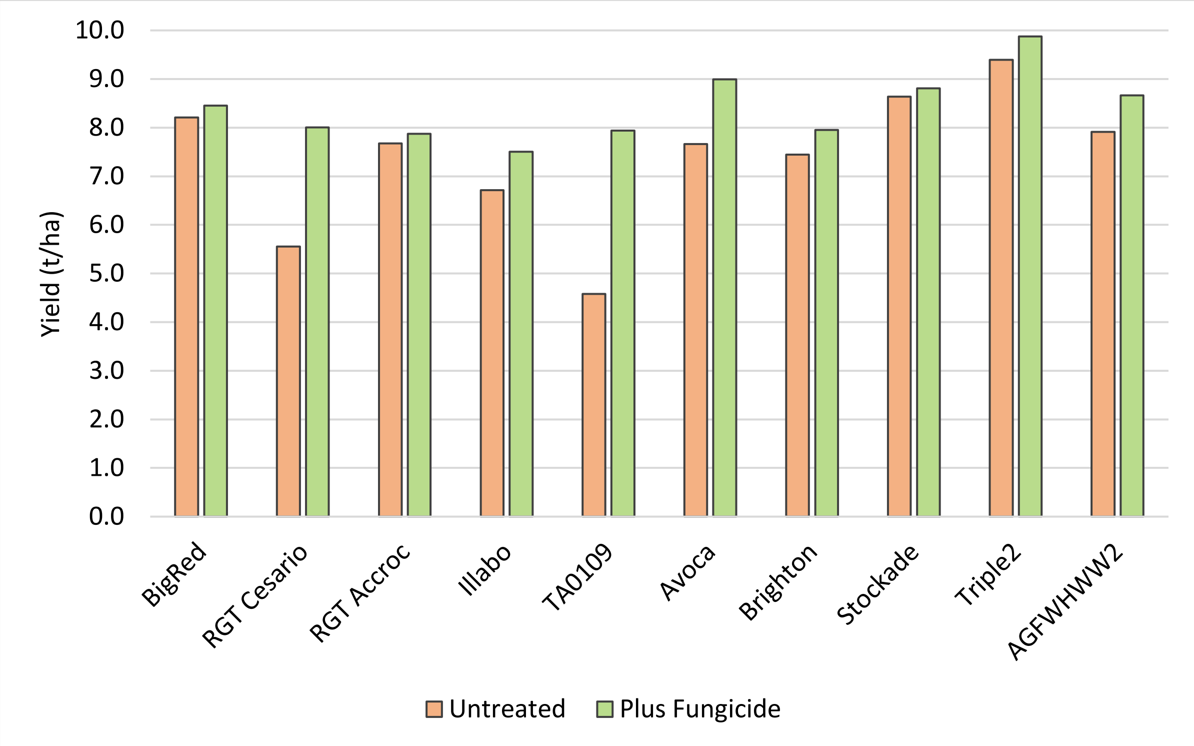

Figure 1. Variety yield response to fungicide application – **Wallendbeen CTC, NSW 2024** sown 17 April **2024**. **GSR (Apr-Nov) 390.8mm**

When yield potential is high it is easy to make the case for fungicide applications in susceptible varieties. However, we can use data such as this over a number of years to explore the yield gap due to disease in different regions and use the data to pick reliable high yielding options that don't depend on the level of fungicide.

The ability of stripe rust to rob yield however is not limited to high yielding scenarios but also scenarios where rainfall deciles are well below the norm. This was observed in southern Victoria in 2024 when growing season rainfall was restricted to 255mm and yields from May sown wheats was pegged at 3-5t/ha (Figure 2).

In contrast in the same season with roughly similar and yields the following results were obtained in the Esperance port zone in the WA HRZ (Figure 3).

Closing the yield gap - reflection on FAR Australia research results from east v west.

Nick Poole & FAR Australia team

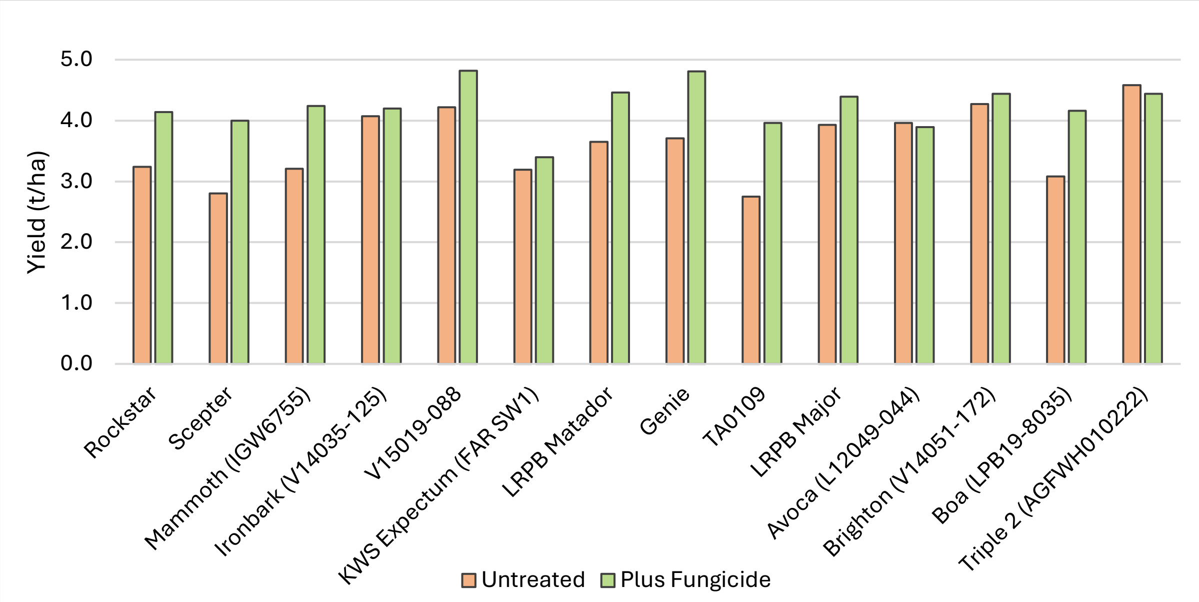

Figure 2. Influence of variety and fungicide application (based on three foliar sprays) on grain yield (t/ha) at **Gnarwarre, Victoria CTC** – sown 20 May **2024**. **GSR (Apr-Nov) 255mm.**

Key point: *The fungicide response of varieties averaged between minus 0.07t/ha – 1.2t/ha. Genie gave over a tonne response to fungicide compared to 0.08t/ha in Esperance, WA 0.28t/ha in Scaddan, WA and minus 0.31t/ha in Frankland River, WA. In Scepter the yields of fungicide treated crops were 1.2t/ha greater than untreated at Gnarwarre.*

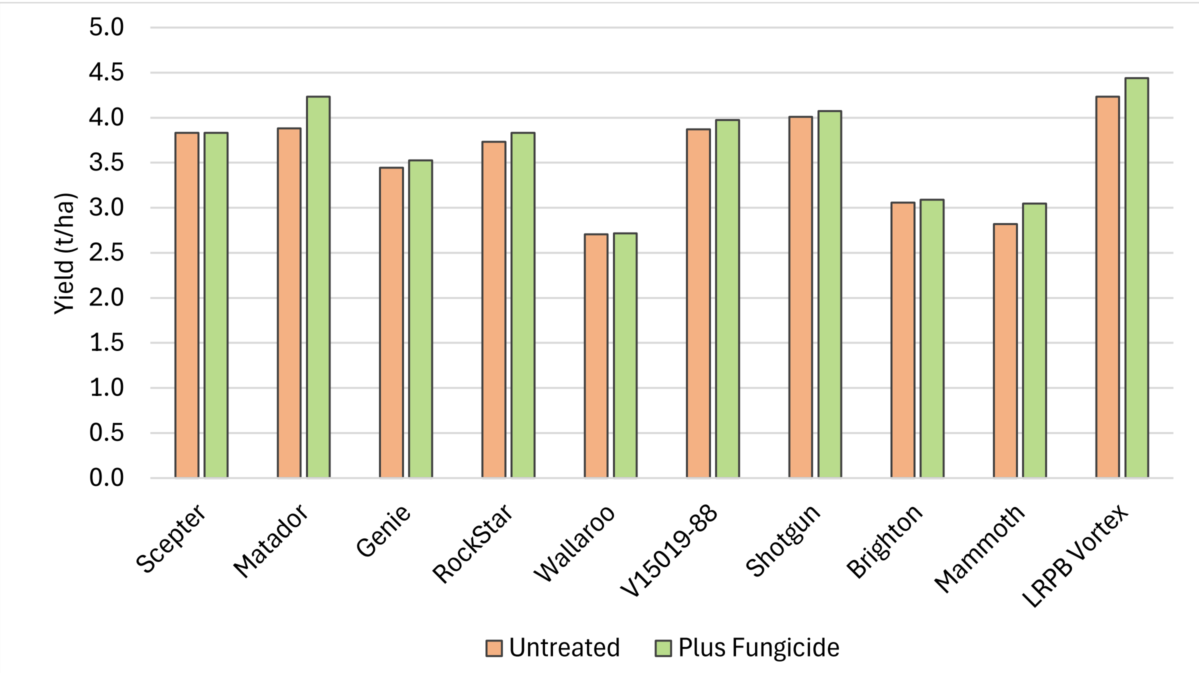

Figure 3. Influence of variety and fungicide application (based on two foliar sprays) on grain yield (t/ha) at **Gibson, Esperance CTC** – sown 10 May **2024** (t/ha). **GSR (Apr-Oct) 279mm.**

Closing the yield gap - reflection on FAR Australia research results from east v west.

Nick Poole & FAR Australia team

Key point: *The only significant yield results were amongst varieties in Esperance. There was no significant response to fungicide application. In Scepter the yields of treated and untreated were identical.*

So why the difference and was it just 2024?

The difference is simply the absence of two diseases in the west that are regularly robbing yield in the eastern states, stripe rust *Puccinia striiformis* and to a lesser extent Septoria tritici blotch (STB) *Zymoseptoria tritici*. Much of the milling wheat germplasm (e.g. Scepter) grown in the eastern states is susceptible to these two diseases. This difference between east and west appears not to be "a one off", since been recorded in trials at FAR Australia in previous years. The only caveat is that WA trials have not been exposed to Wheat Powdery Mildew (WPM). However, in 2025 the later sown GEN trial in Esperance has high levels of WPM in susceptible varieties. This will be an important piece of new data for the GEN research programme.

SCAN THE QR CODE TO LEARN MORE ABOUT US

SOWING THE SEED FOR A BRIGHTER FUTURE

Field Applied Research (FAR) Australia

HEAD OFFICE: Shed 2/ 63 Holder Road
Bannockburn
VIC 3331
Ph: +61 3 5265 1290

12/95-103 Melbourne Street
Mulwala
NSW 2647
Ph: 03 5744 0516

9 Currong Street
Esperance
WA 6450
Ph: 0437 712 011

Email: comms@faraustralia.com.au
Web: www.faraustralia.com.au