GOA trial site report

Wheat - understanding the risk associated with growing varieties with varying susceptibility to foliar diseases

Grain Orana Alliance

Trial code:	GADI02023-2
Season/year:	Winter 2023
Location:	Gilgandra
Trial partners:	Kevin Kilby
Trial establishment date:	16/05/2023

Keywords

GADI020, disease, NVT, risk, stripe rust, fungicides, yield response

Take home messages

- There was no yield response to fungicides across a range of varieties with differing levels of resistance in this trial, in a low disease pressure year.
- Yield differences occurred between varieties, consistent to those seen in NVT trails.
- The use of fungicides in dry, low disease pressure years may not be profitable.

Background

2022 was a prolific year for fungal disease in Central West NSW, with stripe rust prevalent in many wheat crops. Grain Orana Alliance (GOA) planted 5 sentinel wheat sites to a range of varieties with the aim of early stripe rust pathogen identification. Stripe rust in 2022 developed earlier in the growing season than normal, before expression of the adult plant resistance (APR) genes, which made early pathogen identification difficult using the sentinels. However, as the crop matured it was evident that some varieties were far more resistant than others and pathotype identification using the sentinels was possible. Yields were taken from these trials and varieties with lower resistance ratings, in some cases, yielded less than half of those which had the most resistance.

Generally, varieties with lower resistance ratings perform well in National Variety Trials (NVT)[1], typically out yielding the standard varieties (i.e. Vixen⏀ averaged 105 and 108% of EGA Gregory⏀ in the NVT Northern East and West respectively), however in the 2022 sentinel trials the varieties with lower resistance rating had a very high yield penalty. The sentinel work indicates that the yield penalty for growing susceptible varieties might be far greater than the yield benefit reported in the NVT trials, as these are managed/treated liberally for fungal disease while the GOA sentinel work had no fungicides applied.

While it is important to understand what level of yield is protected by fungicides, it is also critical to understand what level of risk has been taken on by growers in relying on fungicides to protect yields. In 2022 there were many cases where growers were unable to spray as paddocks were too wet to access. It also starts to illustrate the risk to growers if resistance develops and fungicides are not as effective. This knowledge may help shift growers to more resistant varieties sooner.

This trial looks to quantify the yield losses caused by foliar diseases (mainly stripe rust, septoria and yellow leaf spot) of several common varieties grown in the Orana Region by employing a full fungicide program strategy compared to applying no fungicides.

Aims

- To quantify the yield penalty of a range of common wheat varieties with differing resistance ratings in the presence of fungal diseases.

Treatment descriptions

Twelve varieties commonly grown in the Orana region, with a range of disease resistance ratings, were selected and were either treated with a full fungicide program or were untreated. The varieties and their resistance ratings to stripe rust are listed in Table 1. Fungicides applied are outlined in Table 2.

Table 1: Varieties and their disease rating to stripe rust.

Variety	2023 East Coast rating	239 rating	198 rating
Beckom	MRMS	MR	MR
Catapult	S	S	MRMS
Condo	MS	MRMS	MRMS
Coolah	MSS	-	-
Longsword	R/S	RMR	RMR
LRPB Hellfire	MRMS	-	-

[1] NVT (National Variety Trial)

LRPB Lancer	RMR	RMR	RMR
LRPB Raider	MR	RMR	RMR
LRPB Reliant	MR	-	-
LRPB Trojan	S	-	SVS
Scepter	MSS	MRMS	MR
Vixen	SVS	-	-

Table 2: Fungicides applied

Date	Chemical	Active(s)	Rate (ml/ha)	Wetter	Rate (%)	Application
16/05/2023	Impact®	250 g/L flutriafol	400	N/A	N/A	On fertiliser at sowing
17/08/2023	Presaro® 420SC	210 g/L prothioconazole, 210 g/L tebuconazole	300	BS1000	0.25%	Ground rig
06/09/2023	Tazer Xpert	80 g/L azoxystrobin, 31.25 g/L epoxiconasol	2,000	Hasten	0.50%	Ground rig

Site selection: The site is a higher rainfall area, with reports of disease outbreaks in 2022.

Rainfall: 2023 was a relatively dry season, the in-crop rainfall was approximately 110.6 mm, however there was considerable soil moisture left over from 2022. Rainfall details are in Table 3.

Table 3: Monthly rainfall[2] (mm) and long-term average (LTA).

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2023	52	42	88	30	1	33	30	12	9	27	119	65	**508**
LTA	61	51	48	39	41	44	42	37	39	47	50	54	**553**

[2] Gridded data for the trial site from: Access Gridded Data | LongPaddock | Queensland Government

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Results

Disease observations

- Foliar diseases were not detected

Grain yield

- There were no differences in yield between the sprayed and unsprayed treatments for each variety
- Highest yield was the untreated Beckom$^{\phi}$: 3.5 t/ha
- The lowest yield was the fungicide treated LRPB Hellfire$^{\phi}$: 2.4 t/ha (Figure 1).

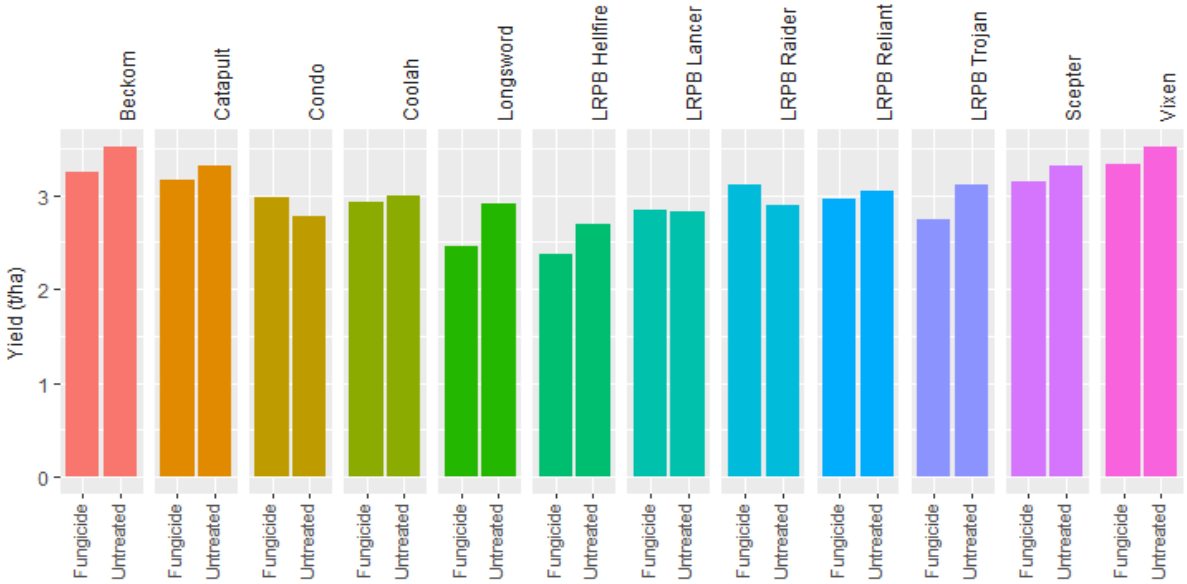

Figure 1: Wheat yield (t/ha)

Grain quality

- There were no grain quality differences between the sprayed and unsprayed treatment of each variety.
- Highest protein was the untreated LRPB Lancer$^{\phi}$: 12.9%.
- Lowest protein for the full fungicide program was Coolah$^{\phi}$: 10% (Figure 2).
- This was below the threshold for APW1. All other treatments would have made APW1, AUH2 or H2 (no treatments had protein levels high enough to make H1 or APH2).
- Screenings were <5% for all varieties.

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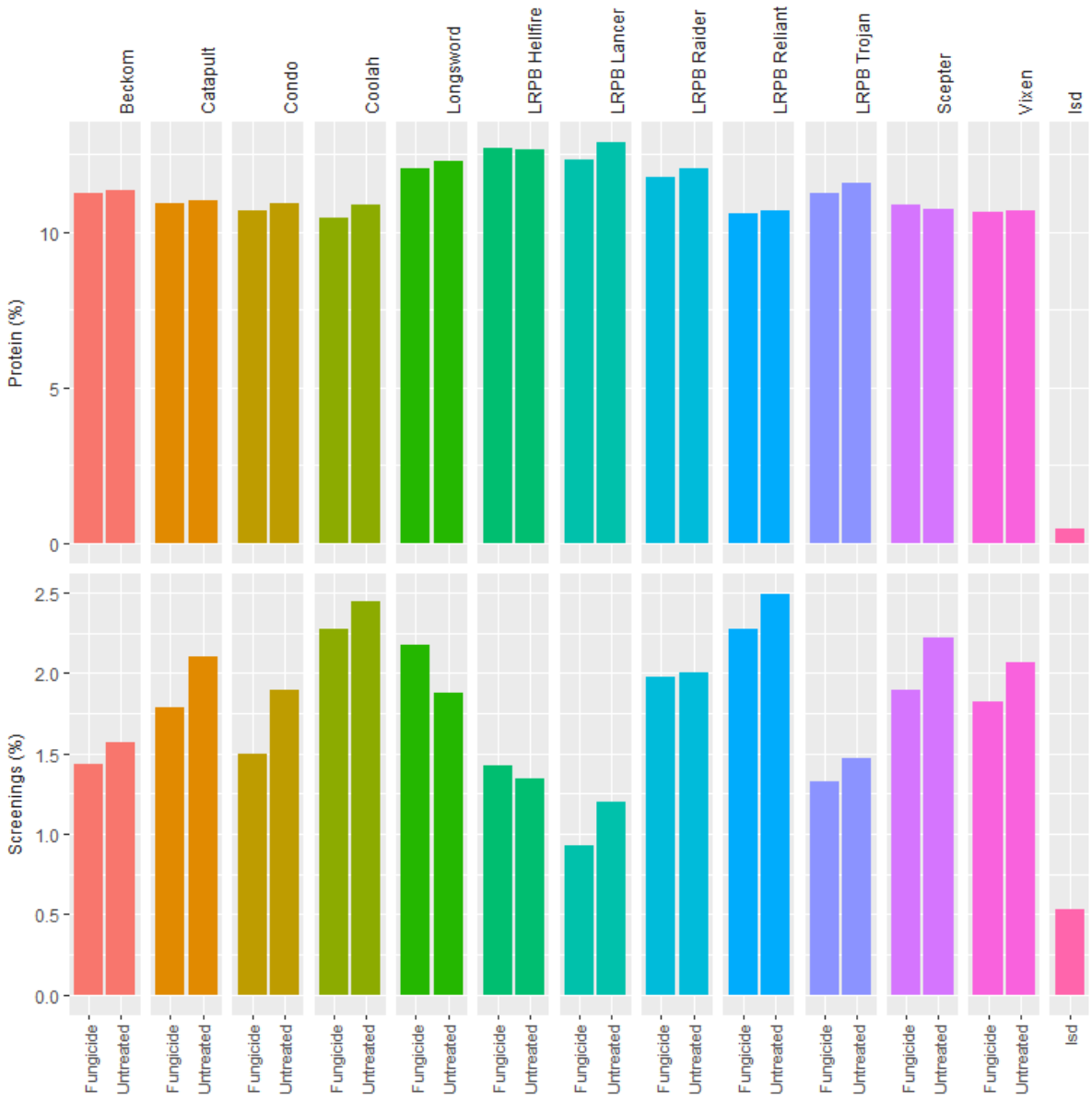

Figure 2: Protein and screenings.

Discussion

2023 was a dry season, resulting in no diseases being detected. Fungicides were applied as determined by the trial protocol, however these proved not to provide any yield benefits, and were most likely uneconomic.

Despite 2023 being below average rainfall, the average site yield was ~ 3 t/ha and the average protein was 11%. There was over 1.1 t/ha yield difference between the highest and lowest yielding varieties, in part reflecting NVT

results i.e. Beckom(ф) outperforms LRPB Hellfire(ф)[3]. Some of the varietal yield differences may be due to varieties being sown out of their recommended window, for example the early season variety Longsword(ф) sown on 16/5/23.

The was however no significant differences in grain quality for each treated and untreated variety.

The 2023 season was very dry with very low disease pressure, and probably also demonstrates that the use of fungicides was not necessary under these circumstances.

Conclusions

- There was no yield response to fungicides across a range of varieties with differing resistance levels in this low disease pressure year.
- There were yield differences between varieties, consistent to those seen in NVT trails.
- The use of fungicides in dry, low disease pressure years may not be profitable.

Acknowledgements

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DISCLAIMER — TECHNICAL

[3] NSW Winter crop variety sowing guide

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Appendix

Results

Variety	Fungicide	Yield (t/ha)		Protein		Screenings (%)	
Beckom	Fungicide	3.24	abcde	11.26	fgh	1.44	efghi
	Untreated	3.51	ab	11.32	efg	1.58	cdefgh
Catapult	Fungicide	3.16	abcde	10.90	ghij	1.79	bcdefg
	Untreated	3.31	abce	11.02	ghi	2.10	ab
Condo	Fungicide	2.98	abcde	10.70	ij	1.50	defgh
	Untreated	2.77	dfg	10.90	ghij	1.90	bcdef
Coolah	Fungicide	2.93	abcde	10.45	j	2.27	ab
	Untreated	2.99	cdefg	10.87	ghij	2.45	a
Longsword	Fungicide	2.46	fg	12.02	cd	2.17	ab
	Untreated	2.91	cdefg	12.27	bc	1.88	bcdef
LRPB Hellfire	Fungicide	2.37	g	12.67	ab	1.42	fghi
	Untreated	2.69	dfg	12.62	ab	1.35	ghi
LRPB Lancer	Fungicide	2.84	bef	12.30	bc	0.92	i
	Untreated	2.83	cdefg	12.86	a	1.20	hi
LRPB Raider	Fungicide	3.11	abcde	11.75	de	1.97	abcde
	Untreated	2.89	cdefg	12.05	cd	2.00	abcd
LRPB Reliant	Fungicide	2.96	abcde	10.57	ij	2.27	ab
	Untreated	3.04	cdefg	10.70	ij	2.49	a
LRPB Trojan	Fungicide	2.74	efg	11.25	fgh	1.32	ghi
	Untreated	3.11	abcdef	11.55	ef	1.48	efgh
Scepter	Fungicide	3.14	abcde	10.85	hij	1.90	bcdef
	Untreated	3.31	abce	10.75	ij	2.22	ab
Vixen	Fungicide	3.33	acd	10.62	ij	1.82	bcdefg
	Untreated	3.51	ab	10.70	ij	2.07	abc
lsd	lsd	0.60		0.46		0.53	