Stripe rust sentinel sites in Central NSW in 2022 - what did we learn?

Maurie Street & Ben O'Brien, GOA

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Take home messages

- The stripe rust sentinel sites highlighted the importance of growing more resistant wheat varieties in high-risk seasons (fallow green bridge, high disease pressure in the previous season, wetter than normal long term weather forecast) to limit stripe rust development and yield loss.
- The 2022 season had unprecedented stripe rust pressure associated with frequent rainfall and prolonged mild temperatures during spring.
- Early disease pressure saw significant seedling infections in all wheat varieties, including those with higher levels of adult plant resistance (APR)
- Seedling infections are not a good predictor of varietal response later in the season and made the prediction of pathotype, based on early season varietal infection, difficult in the field.
- Multiple stripe rust pathotypes were detected at most sites, highlighting the advantage of selecting wheat varieties with higher multiple-pathotype resistance, best indicated by their East Coast Stripe Rust Rating
- Varieties with lower levels of stripe rust resistance, without any fungicide treatment, yielded much lower than those with higher levels of genetic resistance. This highlights the elevated yield at 'risk' associated with growing susceptible varieties if growers could not apply timely fungicides to control the disease as was the case for many in 2022.
- Growers' level of risk associated with choosing to grow stripe rust susceptible varieties can easily outweigh the potential yield reward where timely disease control is hindered.

Background

Throughout the drought seasons of 2017, 2018 and 2019, stripe rust was of little consequence to many growers. Varietal responses to stripe rust infections behaved as could be expected and were easily controlled, often by a single fungicide application.

For most, the drought began to break in February 2020 starting a much wetter phase for the next three seasons. Disease prevalence in 2020 was mild with lower disease inoculum coming out of the drought, but with the good seasons, including subsequent wet summers that supported 'green bridge' survival of the stripe rust pathogen in volunteer wheat plants, disease pressure began to build.

In the period from 2017 to 2021, several new wheat varieties were widely adopted, with some having lower levels of stripe rust resistance to newer pathotypes. At the same time, three new pathotypes of stripe rust established in eastern Australia; the 239, 198 and 238 pathotypes which were first detected in 2017, 2018 and 2021 respectively. The distribution of the specific pathotypes throughout the growing regions of NSW also varies between seasons.

By 2021 we had a level of disease inoculum that many growers and advisors had limited recent experience in managing, a suite of new varieties and new pathotypes to deal with. Coupled with the persistent wet conditions of 2022, ideal for fungal disease development, wet weather also hindered timely application of fungicides. Cooler than average conditions also slowed crop development and increased the time period that fungicides needed to protect key plant parts for. In this 'perfect storm' some growers and advisors struggled to keep abreast of stripe rust.

The outcome was that some assumed new pathotypes were present and unnecessarily treated all wheat varieties with foliar fungicides. Others made assumptions of the pathotype present and choose not to treat some varieties, only to find different pathotypes were present in their region and yield loss followed. This led to the implementation of five 'Stripe Rust Sentinel Sites' undertaken by GOA with GRDC resourcing in 2022.

What are the Stripe Rust Sentinel Sites?

Wheat varieties receive disease ratings based upon their response when exposed to a specific pathogen based on a nationally co-ordinated GRDC NVT pathology program. In the case of stripe rust, disease nurseries rely on natural infection from common pathotypes which blow into and establish at various locations across Australia in each season of evaluation. The resistance level in any one variety to the different stripe rust pathotypes can vary along with the subsequent management required to limit disease development and yield loss. Knowing what stripe rust pathotype(s) are present in a wheat crop assists implementation of appropriate management strategies.

For many growers and advisors, their expectation of varietal response in 2022 was largely based upon experience in the past 1-2 seasons, but with new pathotypes emerging and their changing distribution each season, the outcome was sometimes unexpected.

The Australian Cereal Rust Survey provides a valuable, free rust pathotyping service to support industry. However, due to the biological nature of stripe rust (10 to 14-day latent period) the specialised processes required to confirm pathotypes can take a few weeks. This service was never designed to provide instant pathotype information to growers and advisors to make informed management decisions within a season. With little or no understanding of stripe rust pathotyping, many growers and advisors have unfairly criticised the process and simply resorted to spraying some wheat paddocks unnecessarily whilst others may not have sprayed assuming good resistance when in fact they should have sprayed as a different pathotype was present. In both cases, profit was lost. Remember, stripe rust has long (up to 100s km) wind dispersed spores so pathotype distribution can change rapidly between and within seasons.

In an attempt to provide timely stripe rust pathotype information to growers and advisors in 2022, GOA established several Stripe Rust Sentinel Sites to help identify dominant pathotypes early in the season. The sites were planted to 18 wheat varieties, many were commonly grown, but several were chosen based on their unique reaction to different pathotypes. It was intended these sentinel varieties and their relative level of disease response, early in the stripe rust epidemic would help identify, with some confidence, the likely pathotype present. By extending this information to local growers and advisors it was hoped they could make more informed decisions on required disease management.

Table 1. Wheat varieties included in the sentinel trials and their relative resistance ratings. (Adapted from the National Variety Trials website)

Variety	134 17+ Pathotype	198 Pathotype	239 Pathotype	2023 East Coast
Ballista(b)	MSS	MR	MR	MSS
Beckom(b)	MRMS	MR	MR	MRMS
Borlaug 100(b)	MRMS	SVS	MS	SVS
Catapult(b)	MR	MRMS	S	S
Condo(b)	MS	MRMS	MRMS	MS
Coolah(b)	RMR	RMR	RMR	MSS
Devil	MRMS	MR	S	SVS
Emu Rock(b)	MRMS	SVS	MRMS	SVS
Longsword(b)	R	RMR	RMR	R
LRPB Flanker(b)	RMR	MR	MR	MRMS
LRPB Hellfire(b)	RMR	RMR	MR	MRMS
LRPB Lancer(b)	RMR	RMR	RMR	RMR
LRPB Mustang(b)	RMR	R	RMR	MR
LRPB Spitfire(b)	MR	MR	MR	MR
LRPB Trojan(b)	MR	SVS	MRMS (P)	S
Mace(b)	SVS	MS	MS	SVS
Scepter(b)	MSS	MR	MRMS	MSS
Vixen(b)	MS	MR	S	SVS

Five sentinel sites were established for the 2022 winter crop period at Coolah, Gilgandra, Coonamble, Wongarbon, and Tottenham in Central NSW. Seed for the 18 varieties chosen was accessed through a GRDC funded project to ensure varietal purity. A single plot of each variety was sown (no replication) at each site. The plots were not intended to be harvested or analysed other than the varietal response in visual leaf infection to the naturally occurring stripe rust pathotypes present at the location throughout the season. The varieties were sown by plot seeder in a randomised arrangement. No in furrow or foliar fungicides were applied to the sites throughout the entire season.

Sites were assessed, focusing on incidence or occurrence rather than severity, as the project aim was to identify varieties hosting the disease, to in turn identify the likely pathotype. Early infections were sampled and sent to the Australian Cereal Rust Survey to be pathotyped.

What did we find?

Seedling infections

Disease pressure had been building in our cropping systems since the break of the drought, bolstered particularly by the large green bridge from the wet summer of 2021-22. This led to very high inoculum pressure when the sentinel sites were emerging in early July.

For many wheat varieties, their resistance largely relies on Adult Plant Resistance (APR) genes and, as the name suggests, this protection may not become active until the plant moves beyond the seedling stages.

The disease pressure resulted in several varieties exhibiting seedling stripe rust infections from early to mid-tillering in some cases. However, these early infections did not appear to be a good indicator of varietal susceptibility later in the season when the APR genes within the different wheat varieties became active. A good example of this is the detection of seedling stripe infection on LRPB Lancer at Wongarbon, Tottenham, and Coolah locations at the first assessment, yet LRPB Lancer, proved by the end of the season to be one of least susceptible entries as would be expected with an RMR rating for the key 134, 198 and 239 pathotypes (Table 1). Unfortunately, as these seedling infections were present at all sites on several varieties, so it limited the usefulness of this approach to clearly identify pathotype with such an early stripe rust epidemic.

The presence of seedling infections in main season sown wheat was very widespread commercially in 2022. This is not commonly seen by many growers and may have contributed to the concerns of many that the disease may have mutated, or resistances have broken down which in turn resulted in some unnecessary spraying.

Pathotypes present

Twenty-two disease samples were taken from the sentinel sites during the season and sent to the Australian Cereal Rust Survey for pathotyping where rust was observed either in the first instance at a site or where its presence on a particular variety may have been unexpected. It should be noted that the sampling for pathotyping at any one site was not comprehensive, as this was not the original aim of this project, and that testing was only to properly confirm pathotype for comparison with visual observations within field plots.

From the testing conducted, the 239 pathotype was the most common pathotype confirmed at four of the five sites, with no 239 detected from the limited samples submitted from Gilgandra. The 238 pathotype was confirmed at three sites, Wongarbon, Gilgandra, and Coonamble. The 198 pathotype was only confirmed at two sites, Wongarbon, and Coolah.

Interestingly, at two sites only, one pathotype was confirmed in submitted samples - Tottenham with 239 and Gilgandra with 238. The other three sites had two or more pathotypes confirmed. It is possible that multiple pathotypes were also present at the sites but may not have been detected due to limited sampling. The takeaway from this is that in central NSW in 2022, basing expectation and management decisions for a particular variety on the presence of just one pathotype during the season, may have been flawed.

The confirmation of the 238 pathotype at three sites (Wongarbon, Gilgandra and Coonamble) suggests that it may have become widespread even though it was only first identified in 2021. Presence at these three sites represents a significant geographical cross section of the central west wheat belt.

There was no detection of the 134 pathotype at any of the sites. This reflects recent findings of the National Cereal Rust Survey with limited identification of this older pathotype in 2022.

Impacts on crop performance

The impact of stripe rust on crop performance was variable as would be expected given the sentinel sites were not treated with any foliar fungicides. Without the contrast provided by nil/lower disease (controlled by fungicide) it is not possible to conclude with confidence, if the impacts on leaf area were entirely disease related and in turn what impact this had on final grain yield. That said, the tables below summarise the observed percentage green leaf area (GLA) remaining on the top two leaves of the crop as well as the final yield, test weight and screening levels.

In viewing this data, please take note of the later crop stages (when assessed) for each of the varieties, as assessments were delayed due to wet weather. These delays may have resulted in some leaf loss being a natural symptom of crop senescence rather than an impact of disease. Also note that the tables are ordered based on yield from the lowest to the highest at each location and how that correlates with both the varietal susceptibility to stripe rust and the GLA remaining in the upper crop canopy.

Table 2. Wheat varieties tested, stripe rust ratings, % green leaf area (GLA) at late-stage crop maturities and the resultant test weight (TWT), screenings (SCN) and yield- Tottenham sentinel site 2022. Confirmed pathotype 239 present

Variety	Rating 198 Pathotype	Rating 239 Pathotype	Zadok Stage	% GLA Flag	% GLA Flag -1	TWT kg/hL	SCN %	Yield t/ha
Vixen(b)	MR	S	90	0	0	62.0	13.0	0.79
Devil	MR	S	87	0	0	67.7	14.3	1.33
Catapult(b)	MRMS	S	87	0	0	71.6	9.3	2.04
Emu Rock(b)	SVS	MRMS	90	40	0	69.9	6.0	2.20
Mace(b)	MS	MS	87	40	0	72.7	4.1	2.42
Ballista(b)	MR	MR	90	5	0	74.5	4.3	2.53
LRPB Flanker(b)	MR	MR	87	30	5	75.3	3.6	2.77
LRPB Trojan(b)	SVS	MRMS (P)	81	50	30	74.2	5.7	2.86
Borlaug 100(b)	SVS	MS	85	50	0	74.6	3.2	2.93
LRPB Spitfire(b)	MR	MR	85	20	0	74.5	5.2	3.02
Coolah(b)	RMR	RMR	80	60	10	76.5	2.9	3.08
Condo(b)	MRMS	MRMS	90	0	0	75.5	4.6	3.14
LRPB Mustang(b)	R	RMR	87	50	20	74.7	5.4	3.25
LRPB Hellfire(b)	RMR	MR	85	40	5	75.3	4.5	3.26
Scepter(b)	MR	MRMS	85	15	5	77.0	1.7	3.56
LRPB Lancer(b)	RMR	RMR	85	70	60	76.4	2.8	4.14
Beckom(b)	MR	MR	87	80	40	73.8	6.4	4.21
Longsword(b)	RMR	RMR	81	30	10	NA	NA	NA

Table 3. Wheat varieties tested, stripe rust ratings, % green leaf area (GLA) at late-stage crop maturities and the resultant test weight (TWT), screenings (SCN) and yield- Coolah sentinel site 2022. Confirmed pathotype 198 & 239 present

Variety	Rating 198 Pathotype	Rating 239 Pathotype	Zadok Stage	% GLA-Flag	% GLA-Flag -1	TWT kg/hL	SCN %	Yield t/ha
Vixen(b)	MR	S	87	5	0	58.9	12.6	1.13
Catapult(b)	MRMS	S	85	0	0	62.3	10.9	1.34
Devil	MR	S	87	3	0	61.0	10.4	1.43
Emu Rock(b)	SVS	MRMS	85	10	5	67.2	10.2	1.61
Mace(b)	MS	MS	87	10	5	64.0	7.7	1.76
Borlaug 100(b)	SVS	MS	85	5	10	69.2	5.6	2.12
LRPB Trojan(b)	SVS	MRMS (P)	85	50	30	66.8	6.0	2.14
Coolah(b)	RMR	RMR	85	20	10	63.2	7.6	2.21
LRPB Flanker(b)	MR	MR	85	60	50	68.4	5.7	2.24
LRPB Spitfire(b)	MR	MR	81	90	50	70.9	6.1	2.31
Ballista (b)	MR	MR	87	20	10	69.5	6.1	2.45
Scepter(b)	MR	MRMS	83	30	10	70.4	6.2	2.73
LRPB Lancer(b)	RMR	RMR	81	90	80	78.9	4.9	3.07
LRPB Mustang(b)	R	RMR	85	80	70	73.5	5.2	3.19
Condo(b)	MRMS	MRMS	85	0	0	77.4	5.5	3.22
LRPB Hellfire(b)	RMR	MR	85	80	40	73.7	4.0	3.32
Beckom(b)	MR	MR	81	90	60	76.4	4.2	3.87
Longsword(b)	RMR	RMR	85	80	70	77.9	2.0	4.39

Table 4. Wheat varieties tested, stripe rust ratings, % green leaf area (GLA) at late-stage crop maturities and the resultant test weight (TWT), screenings (SCN) and yield- Gilgandra sentinel site 2022. Confirmed pathotype 238 present.

Variety	Rating 198 Pathotype	Rating 239 Pathotype	Zadok Stage	% GLA-Flag	% GLA-Flag -1	TWT kg/hL	SCN %	Yield t/ha
Devil	MR	S	91	0	0	63.5	6.0	2.03
Vixen(b)	MR	S	91	0	0	54.3	14.1	2.20
Catapult(b)(b)	MRMS	S	89	0	0	73.5	4.0	2.23
Emu Rock(b)	SVS	MRMS	91	5	0	72.4	4.8	2.55
LRPB Spitfire(b)	MR	MR	91	0	0	78.9	3.5	2.77
LRPB Hellfire(b)	RMR	MR	85	40	0	78.3	3.6	2.79
LRPB Trojan(b)	SVS	MRMS (P)	87	20	0	78.0	0.7	2.89
Mace(b)	MS	MS	87	0	0	76.3	1.8	2.97
Coolah(b)	RMR	RMR	87	30	0	78.1	2.5	3.14
LRPB Lancer(b)	RMR	RMR	87	0	0	78.6	1.6	3.28
Beckom(b)	MR	MR	85	5	0	77.2	2.1	3.56
LRPB Flanker(b)	MR	MR	91	10	0	75.9	1.9	3.73
Borlaug 100(b)	SVS	MS	91	0	0	72.2	2.5	3.75
Condo(b)	MRMS	MRMS	91	0	0	78.4	2.4	3.76
LRPB Mustang(b)	R	RMR	91	5	0	77.3	2.8	3.86
Scepter(b)	MR	MRMS	91	0	0	79.4	1.5	3.91
Ballista(b)	MR	MR	87	0	0	77.9	1.4	3.93
Longsword(b)	RMR	RMR	87	2	0	78.8	0.9	4.22

Table 5. Wheat varieties tested, stripe rust ratings, % green leaf area (GLA) at late-stage crop maturities and the resultant test weight (TWT), screenings (SCN) and yield- Wongarbon sentinel site 2022. Confirmed pathotype 198, 238 and 239 present.

Variety	Rating 198 Pathotype	Rating 239 Pathotype	% GLA-Flag	% GLA-Flag -1	TWT kg/hL	SCN %	Yield t/ha
Vixen(b)	MR	S	0	0	59.8	13.5	0.98
Devil	MR	S	0	0	60.3	11.9	1.09
Catapult(b)	MRMS	S	0	0	68.5	12.4	1.45
LRPB Trojan(b)	SVS	MRMS (P)	15	0	70.0	9.2	2.04
Ballista(b)	MR	MR	0	0	73.4	6.5	2.13
Emu Rock(b)	SVS	MRMS	20	0	73.8	7.8	2.23
Borlaug 100(b)	SVS	MS	5	0	73.1	4.5	2.28
Mace(b)	MS	MS	5	0	71.8	7.4	2.38
LRPB Spitfire(b)	MR	MR	5	0	72.3	7.5	2.50
LRPB Flanker(b)	MR	MR	5	0	75.9	3.8	2.80
Coolah(b)	RMR	RMR	15	5	76.1	2.1	2.82
LRPB Hellfire(b)	RMR	MR	40	10	77.4	5.8	3.16
Scepter(b)	MR	MRMS	20	0	76.5	3.7	3.32
LRPB Mustang(b)	R	RMR	50	10	77.3	5.8	3.36
Beckom(b)	MR	MR	50	5	77.2	5.6	3.74
LRPB Lancer(b)	RMR	RMR	50	20	79.9	3.1	4.07
Longsword(b)	RMR	RMR	40	5	78.3	3.4	4.42
Condo(b)	MRMS	MRMS	30	0	80.1	3.5	4.58

Table 6. Wheat varieties tested, stripe rust ratings, % green leaf area (GLA) at late-stage crop maturities and the resultant test weight (TWT), screenings (SCN) and yield- Coonamble sentinel site 2022. Confirmed pathotype 238 & 239 present

Variety	Rating 198 Pathotype	Rating 239 Pathotype	Zadok Stage	GLA-Flag	GLA- Flag -1	TWT kg/hL	SCN %	Yield T/ha
Vixen(b)	MR	S	91	0	0	70.9	5.3	1.59
Devil	MR	S	85	0	0	68.6	9	1.73
Catapult(b)	MRMS	S	89	2	0	67.5	15.8	2.34
Emu Rock(b)	SVS	MRMS	91	15	0	70.4	8.4	2.50
Mace(b)	MS	MS	87	20	0	73.2	4.3	3.19
LRPB Spitfire(b)	MR	MR				76.6	4.8	3.46
LRPB Hellfire(b)	RMR	MR	85	20	10	76.4	3.9	3.66
LRPB Trojan(b)	SVS	MRMS (P)	85	40	10	75.6	6.8	3.77

Coolah(b)	RMR	RMR	83	40	30	76.4	2.3	3.86
Ballista(b)	MR	MR	91	0	0	71.7	3.5	3.87
LRPB Flanker(b)	MR	MR	83	15	0	76.8	1.4	3.94
Borlaug 100(b)	SVS	MS	87	10	5	76	1.8	3.99
LRPB Lancer(b)	RMR	RMR	81	50	10	77.6	2.4	4.29
LRPB Mustang(b)	R	RMR	87	25	5	74.6	3.9	4.39
Scepter(b)	MR	MRMS	83	15	0	74.8	3	4.47
Condo(b)	MRMS	MRMS	85	30	20	76.6	3.3	4.63
Longsword(b)	RMR	RMR	83	40	20	75.3	2.8	4.81
Beckom(b)	MR	MR	91	50	30	74	3.9	5.20

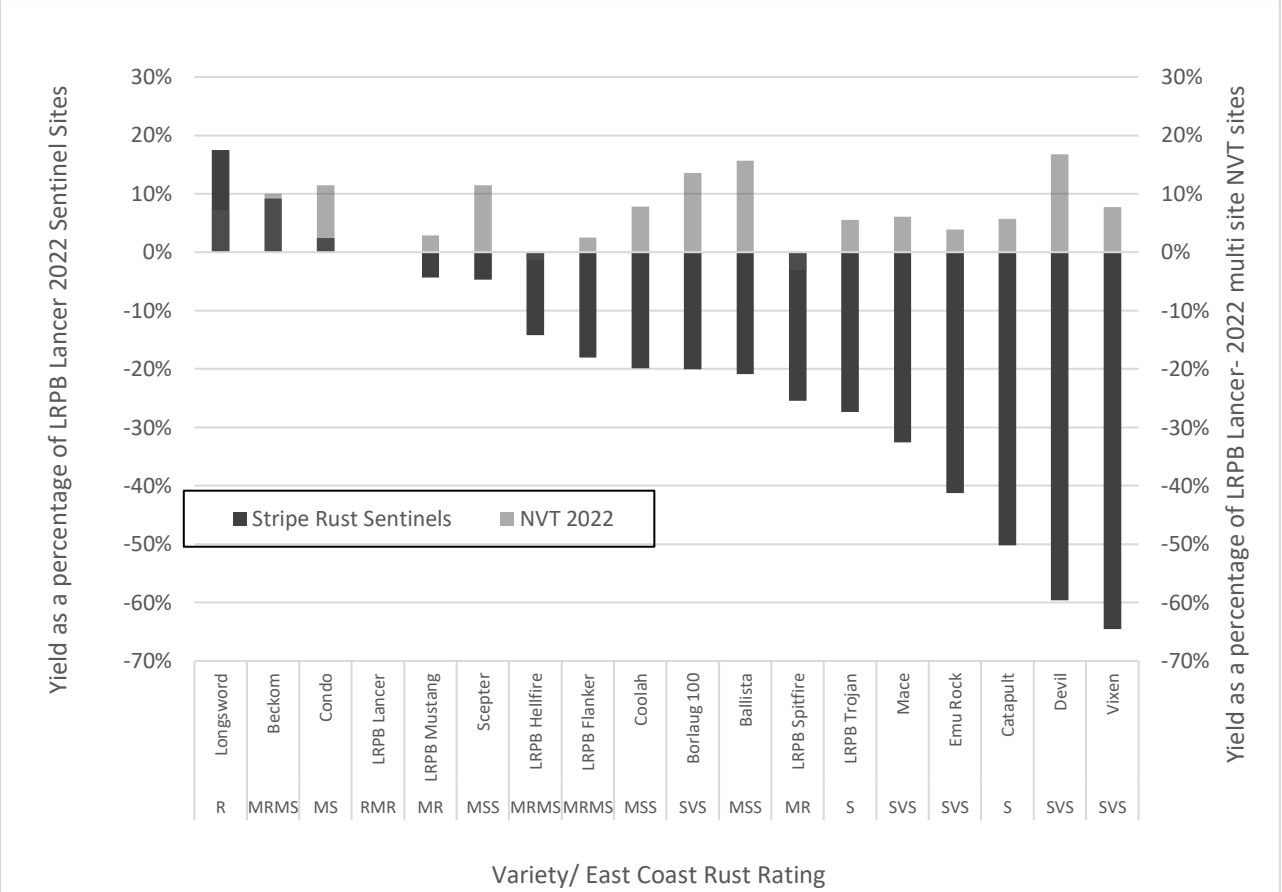
As can be seen in the data above some varieties have retained significantly more GLA than others. Although not universal, there is a good correlation with improved stripe rust disease ratings. The retention of GLA also correlates reasonably well with final yield. With only a few exceptions, the highest yielding varieties have at R to MR levels of stripe rust resistance and higher levels of GLA.

It can be seen at some sites many varieties have fallen short of quality parameters for both test weight and screening levels (cells highlighted). The lowest test weights and highest screenings are again associated with the more stripe rust susceptible varieties, noting these are also generally the lowest yielding varieties.

Yield across the varieties tested were highly variable. At each site, the lowest yielding variety was only 21-50% of the highest yield recorded for a variety. At most sites the maximum yield achieved were around 4 to 5 t/ha, and the lowest yields were 2.2 to 3.6 t/ha lower.

How does this compare to the same varieties when treated for strip rust?

The National Variety Trials (NVT) for wheat are currently managed to best practice for foliar diseases including stripe rust. As such, yields achieved in these trials could be taken as a reliable measure of varietal performance when stripe rust is managed, as opposed to the sentinel sites where the disease was not managed and left to naturally develop throughout the season.



NB- not all varieites were present at all NVT sites used in this analysis

Figure 1. Performance of wheat varieties as a percentage of LRPB Lancer® in selected NVT trials and stripe rust sentinel sites in central NSW 2022

Based on specific varieties as illustrated above, the performance when managed for stripe rust in the NVT trials shows many varieties outperformed the chosen benchmark of LRPB Lancer®. It should be noted the data for LRPB Lancer® is for a main season sowing which is earlier than optimum for this variety. That said, several varieties showed a substantial improvement in yield of up to 17% (grey bars). However, when comparing performance in the Stripe Rust Sentinel Sites where stripe rust was not managed (black bars), only Longsword®, Beckom® and Condo® yielded 17%, 9% or 2% better than LRPB Lancer®, respectively. The remaining 14 varieties performed 4% to 65% worse than LRPB Lancer ® with no stripe rust management in 2022. (Figure 1, black bars) Vixen® for example was 65%, Devil® at 60% and Catapult® at 50% lower yielding than LRPB Lancer®. Considering the superior yield potential of these varieties when treated for stripe rust, the decline in yield is much worse- 72%, 67% and 56% respectively. The magnitude of the yield decline closely followed the East Coast stripe rust ratings moving from resistant to susceptible varieties. Results support the conclusion that a large portion of yield decline could be attributed to stripe rust.

This level of yield decline with the high yield potentials of 2022 would also confirm that based on these stripe rust sentinel sites, growers could have suffered more than 3 t/ha yield penalties if stripe rust was not managed in susceptible varieties in central NSW in 2022.

In varieties with mid-range resistance levels such as Coolah® or LRPB Flanker®, the yield loss would likely have been closer to 20% or ~1 t/ha from stripe rust if not managed. Whereas

the RMR varieties such as LRPB Lancer$^{\Phi}$, Longsword$^{\Phi}$, and Beckom$^{\Phi}$ appeared to have suffered only minor impacts on crop performance where stripe rust was not managed at all in a very high-pressure season, with pressure potentially increased by the presence of unmanaged and highly infected plants within meters, at these sites.

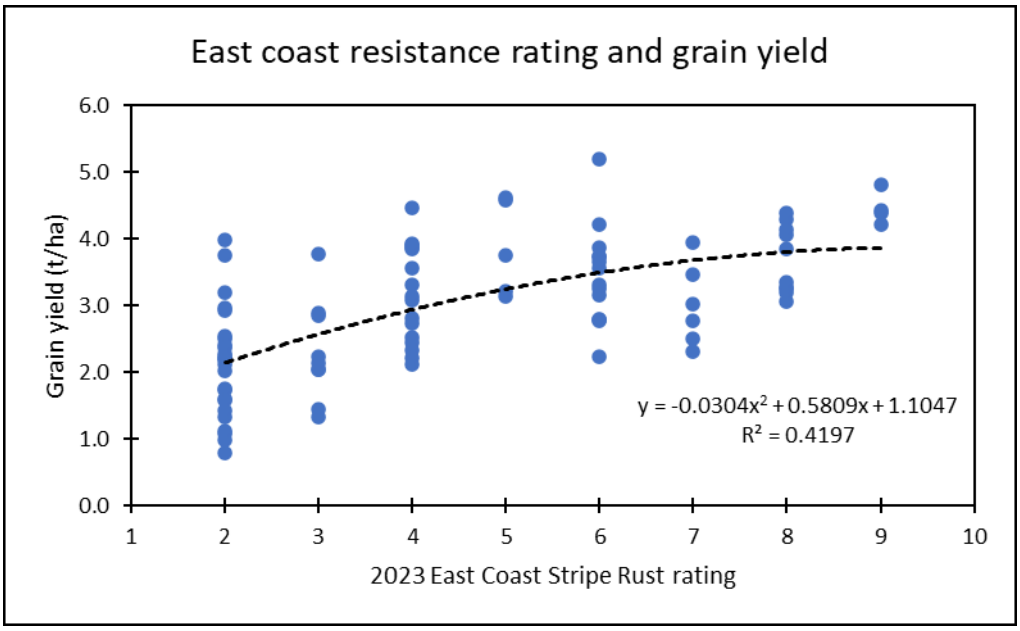


Figure 2. Grain yield in 2022 at Tottenham, Coolah, Gilgandra, Wongarbon and Coonamble sites by the east coast stripe rust ratings. Numbers on the x axis are varietal disease ratings where 1=VS, 2=SVS, 3=S, 4=MSS, 5=MS, 6=MRMS, 7=MR, 8=RMR and 9=R.

If considering the yields by rust rating, grain yield across four sites was correlated with the East coast resistance ratings (R^2=0.4197) and the 239 pathotype ratings (R^2=0.4719, data not shown), but was not correlated with pathotype 198 ratings (data not shown). Using the east coast disease ratings, the predicted yields ranged from 2.1 t/ha for an S rating to 3.9 t/ha for an R rated variety, with predicted incomes of $645/ha and $1161/ha respectively (assuming wheat was valued at $300/t). The $516/ha income advantage for selecting R over S rated varieties in unsprayed circumstances strongly indicates the importance of selecting resistant genotypes when considering variety choice for the 2023 growing season.

Summary

Currently there are 3-4 main pathotypes of stripe rust circulating across the NSW cropping belt and the management of varieties depending on their level of resistance to these pathotypes could differ. It was a desire to identify the pathotypes in 'real time' to support growers and advisors making more informed variety specific management decisions within a season.

However, what was illustrated by this project is that 2022 turned out a little different. The unprecedented early season disease pressure resulted in significant seedling infections, impacting most varieties, which were not a good indicator of pathotype or later season varietal responses.

What was also observed was that multiple pathotypes were detected at the majority of sites. The outcome being that only varieties with good levels of resistance across pathotypes 'held up' in 2022. Consequently, the 2022 East Coast rating, which is the worst resistance rating against the dominant stripe rust pathotypes present in the previous season, was the most reflective of varietal performance in these central NSW trials in 2022.

The impact on green leaf area and the subsequent impact on yield followed closely the stripe rust resistance ratings for the included varieties. The impact on performance was considerable, with the more susceptible varieties yielding more than 3 t/ha less than the best performing/most resistant varieties across the five Stripe Rust Sentinel Sites in 2022.

This scenario provides a good illustration of the 'risk vs reward' associated with growing stripe rust susceptible wheat varieties. Many growers have adopted several more susceptible varieties due to their improved yield potentials of up to 17% over a more resistant check variety such as LRPB Lancer ⓟ (Figure 1). However, in situations where the application of foliar fungicides was not possible, yield of stripe rust susceptible varieties in most cases was up to 65% lower (Figure 1). Yet based on NVT data and the 2022 Sentinel sites, there is a suite of varieties with higher stripe rust resistance ratings and competitive yield performance better suited to high-risk disease situations. Growing susceptible varieties in 2022 may have represented a much greater risk than the potential reward.

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Contact details

Maurie Street
Grain Orana Alliance
PO Box 2880
Dubbo NSW 2830
Ph: 0400 066 201
Email: maurie.street@grainorana.com.au

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ⓟ Varieties displaying this symbol beside them are protected under the Plant Breeders Rights Act 1994.