WHAT ARE FOLIAR FUNGAL DISEASES IN WHEAT REALLY COSTING US?

Maurie Street[1], Ben O'Brien[1], Rohan Brill[2] & Steven Simpfendorfer[3]
[1]Grain Orana Alliance
[2]Brill Ag
[3]NSW DPIRD

PHOTO: Trials in central and southern NSW have helped growers understand the impact of foliar fungal diseases on current wheat varieties.

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QUICK TAKE

- **Several wheat varieties have become popular because of their perceived higher yield potential, despite their low levels of stripe rust resistance.**
- **These varieties perform well when diseases are absent or adequately controlled, however if fungicide application is compromised yield penalties can be more than 50%.**
- **Wheat varieties with improved disease ratings may yield slightly lower when disease is not present but they have far less downside risk to yield and profit when fungicide applications are delayed or missed.**
- **Growing wheat varieties with better disease resistance is good for the industry as it reduces the risk of breakdowns in genetic resistance to disease and/or the development of fungicide resistance.**

Wheat diseases were estimated to be costing Australian growers as much as $400 million dollars in the 1980s. In 2009 the estimate had grown to $913m.

IT is likely that this loss would be substantially more in today's dollars. Stripe rust, yellow leaf spot and septoria tritici blotch are the main foliar diseases and are estimated to contribute close to 50% of these losses.

Effective genetic protection from these fungal diseases tends to follow an ebb and flow. When effective genetic resistances are overcome by pathogen mutations (e.g. stripe rust pathotypes), breeders then need to identify new effective sources of genetic resistance to incorporate into new varieties. This takes time to integrate into commercial varieties, and the resistance is at risk of being overcome as well. Because of this, the need for fungicide intervention to manage cereal leaf diseases will often be needed to maintain yields and profitability where genetic resistance is not enough.

Wheat breeders also have many competing attributes they 'breed' for. Disease resistance is not always the number one priority and often, varieties with good resistance may not have the best yield potential, or the opposite, that the most productive varieties can have low levels of resistance.

Thankfully, fungicides are relatively cheap and generally effective in controlling cereal leaf diseases but there is still a cost to growers in terms of time, product and application. In many cases the saved or protected yield covers the cost of control, but there may be more to consider in choosing to grow susceptible wheat varieties.

Good seasons, new pathotypes

Improved seasonal conditions since 2020, coupled with changes in the prevalence and distribution of stripe rust pathotypes 238 and 239 resulted in several widely grown wheat varieties (e.g. Vixen) displaying unexpected susceptibility to these new pathotypes. These varieties were commonly grown in the years from 2017 to 2019, which were less conducive to disease due to the drier conditions, and stripe rust incidence was low and control measures often unnecessary.

Successive years of disease build up since 2020 and very wet conditions in 2022 prevented or at least delayed access to many paddocks for timely foliar fungicide applications, and significant disease infections resulted in major yield losses. The 2022 season really highlighted the increased risk growers take when employing a strategy of growing large areas of high yielding but stripe rust susceptible varieties and relying solely on fungicides to manage this disease.

Although stripe rust is often blamed for losses, these same wet conditions would have also favoured the development of other cereal leaf diseases such as yellow leaf spot and septoria tritici blotch, which can also affect yield and profitability.

In high disease pressure years, such as 2022, it is likely the varieties with better disease resistance would not have incurred such yield losses but by how much?

There are wider ramifications of growing more susceptible wheat varieties in our farming systems such as:

- potential requirement for more inputs, such as fungicides and application costs – dollars that could be spent elsewhere to improve yields, for example urea applications
- increased prevalence of diseases in the farming environment leads to a greater chance of pathotype changes and a breakdown of the currently effective genetic resistances
- greater use of fungicides leads to a greater the chance of development of fungicide resistance and of selecting for resistance in secondary or non-target pathogens such as powdery mildew.

Understanding the impact of foliar diseases

Grain Orana Alliance (GOA), with the support of the Grains Research and Development Corporation (GRDC), conducted trials in central and southern NSW in 2023 and 2024 to help growers understand the impact foliar fungal diseases have on a range of current wheat varieties.

With a better understanding of the yield gap created by controllable foliar fungal diseases, growers and advisors will be able to make more informed choices around wheat varieties based on both their risk and reward proposition.

Small plot trials investigated the performance of a range of commonly grown, regionally specific wheat varieties. Fungicides were applied to reduce disease levels to as low as practically possible in treated plots with currently registered fungicides. There were also plots of the same varieties completely untreated for disease.

The aim of the trials was to quantify yield loss across a range of popular varieties to help better inform growers of the level of risk (yield loss) associated with growing varieties when disease control is not possible or compromised.

The fungicide program (Table 1) was designed to reduce disease to minimal incidence and impact for the 3 most prevalent foliar diseases: stripe rust (*Puccinia striiformis f.sp. tritici*), yellow leaf spot (*Pyrenophora tritici-repentis*) and septoria tritici blotch (*Zymoseptoria tritici*). No consideration was given to the economic viability of this approach.

The treatment strategy is not a recommendation and is in no way suggested to be commercially relevant.

The 2023 season was drier than average in both regions with relatively low levels of disease. In the central west, the 2024 growing season was very wet with relatively consistent rainfall received throughout the growing period, which is conducive to fungal disease development. Conditions were closer to average in the Riverina but still favoured disease development at all sites.

Details of the trial program and results are in the paper published for the GRDC Grains Research Update – Hillston 2026

Full details of individual site trial results can be found at www.grainorana.com.au/documents

Table 1. Fungicide applications and time (days after sowing) at each site

Year	Site	Number of foliar applications	Application timing (days after sowing)
2023	Ganmain	5	37, 56, 88, 112 & 133
	Gilgandra	3	70, 93 & 113
	Wellington	3	70, 93 &114
	West Wyalong	5	37, 77, 92, 119 & 133
2024	Caragabal	5	35, 64, 78, 106 & 121
	Ganmain (early sown)	5	54, 80, 101, 124 & 139
	Ganmain (main season)	5	43, 69, 90, 113 & 128
	Gollan	4	45, 76, 105 & 126
	Manildra	6	37, 57, 86, 128 & 149

What the trials revealed

The yield response in these trials was closely related to rainfall but not entirely. The sites with the highest yields were also the sites where varieties with lower stripe rust resistance exhibited the greatest yield losses.

When looking at the range of yields across all the trials, the level of disease impact increases with decreased stripe rust resistance (Figure 1), indicating stripe rust was most likely the major driver in yield loss in these field experiments.

Figure 1 illustrates the relative varietal yield performance of both treated and untreated means, over all the trial sites as a percentage of the site mean yield.

The lowest yield of the resistant–moderately resistant LRPB Lancer(ↀ) was 99% of the site mean but as high as 112% and so showed only 12% yield variation. This can be compared to Vixen (susceptible–very susceptible), which yielded as high as 126% and as low as 67% of the site mean yield with a variation of 59%.

The varieties with above average yields included LRPB Lancer(ↀ), LRPB Reliant(ↀ), Beckom(ↀ) and LRPB Major(ↀ), all having a relatively small range of variability in response to foliar disease control and site/year. These have a stripe rust rating of moderately resistant–moderately susceptible or better. Boree(ↀ) and Vixen(ↀ), with a susceptible–very susceptible rating outyielded almost every other variety when treated for foliar diseases (upper limit) but the downside risk (lower limit) was also far greater when left untreated. The yield reduction of susceptible varieties is often more than double that of the more resistant wheat varieties.

Growers and advisors have chosen wheat varieties based on high yield potentials, and these trials have confirmed that this can be a good strategy – if leaf diseases can be managed. The downside risk or potential yield loss when disease control may not be possible or timely is often not fully understood or considered when making varietal choices. It could be argued that there is little current empirical data available to help growers to quantify yield loss to manageable foliar diseases like stripe rust when considering wheat varieties.

This research has highlighted the significant risk that susceptible wheat varieties carry with yield losses of more than 60% in several cases, albeit with no leaf disease control. Though, growers may be delayed or prevented from applying one or 2 foliar fungicides, very rarely would they be prevented from providing any control. However, the yield impact of missing one key timing in a susceptible–very susceptible variety is more substantial than in more resistant varieties. This work has also shown that wheat varieties with moderate resistance (moderately resistant–moderately susceptible or better) are relatively resilient and if growers were unable to apply any fungicides the downside is a yield loss of <10%.

Additionally benefits of growing more resistant varieties, aside from mitigating the risk of yield loss, include:

- time can be spent on other farming activities
- lower fungicide input costs
- reduction in risk to the breakdown of genetic resistance
- reduction in the risk that fungal pathogens develop resistance to fungicides.

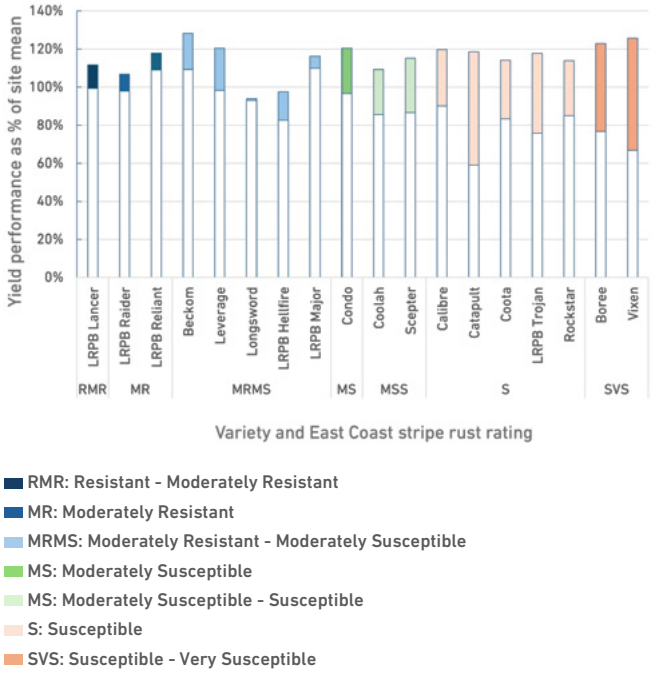

Figure 1. Variation in varietal yield performance as a percentage of site mean including both treated and untreated outcomes from 9 sites over 2 years.

(ↀ) ***The above varieties are protected under the*** **Plant Breeders Rights Act 1994.**

Balancing yield potential and disease risk

Growing wheat varieties with higher disease susceptibility because it has the highest yield potential introduces a significant risk to growers in circumstances when disease control is hindered or not possible. Many growers may not appreciate the exceptionally large downside risk to yield and quality when spraying does not occur.

There are varieties available with high yield potential and with good disease resistance that carry much less risk when leaf disease control is not possible. Yields in these varieties may vary as little as 10% even when leaf disease levels are high, in contrast, susceptible wheat varieties may incur yield losses up to 60% when untreated.

Growers can also save time and money on control programs. This, combined with the improved stewardship afforded to the industry through less reliance on fungicides and less potential for shifts in pathogen virulence, could suggest that the *risks can sometimes exceed the rewards* for growing more susceptible wheat varieties. This of course is up to the individual's attitude to risk and the capacity available to them to spray large areas of crop with foliar fungicides, although economically justifiable, when they could be doing other things.

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More information

Maurie Street
Mobile: 0400 066 201
Email: maurie.street@grainorana.com.au
Web: Grain Orana Alliance (GOA)

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