Wheat stripe rust management 2023

Key points

- Above average rainfall years are usually conducive to stripe rust infection. However, temperature, especially during spring, was a significant factor in the prevalence of stripe rust in 2021 and 2022.
- 2022 was a complex season for stripe rust management.
- The 2022 season needs to be kept in perspective. Stripe rust pressure in 2023 is likely to be high early in the season requiring timely management. Further development will depend heavily on conditions in spring. The cheapest 'fungicide' could be 3 weeks of dry and warm weather in spring.
- Under favourable environmental conditions, yield loss can be up to 75% if uncontrolled in susceptible (S) varieties.
- Stripe rust is a communal disease with spores being able to travel hundreds of kilometres.
- Pathotypes can vary between districts – know which is dominant in your area and keep updated with in-season information as management can be dynamic.
- 'Green bridge' control is vital to reducing inoculum levels in the environment.

Why was stripe rust such an issue in 2022?

The 2022 season saw high early pressure from stripe rust, which was further complicated by significant areas of later sown crop, prolonged wet and mild seasonal conditions, pathotype distribution and challenges with paddock trafficability to allow timely fungicide applications.

Volunteer cereal plants and grass weeds or the 'green bridge' over summer resulted in an early start to the stripe rust epidemic in 2022. The mild temperature conditions and frequent rainfall throughout the year enabled shorter stripe rust cycles, all leading to higher inoculum and infection levels in 2022. These conditions created an extremely high-pressure season for not just stripe rust, but a range of other foliar diseases in wheat including septoria tritici blotch, yellow leaf spot, leaf rust and fusarium head blight.

The mild temperatures in 2022 extended well into spring which slowed crop development and delayed the expression of adult plant resistance (APR) genes.

The wet conditions limited access to paddocks to apply timely fungicides to more susceptible varieties, causing not only damage to that crop from disease, but also adding to increased inoculum loads within a district. This resulted in elevated pressure on more resistant wheat varieties as well.

Elevated stripe rust levels in the 2020 and 2021 seasons increased the risk of 'green bridge' carryover into the 2022 season. Combined with early sowing opportunities of long season and grazing wheats, this contributed to the early stripe rust epidemic in 2022. There was also a large spread in sowing times in 2022 due to wet weather and machinery trafficability issues. Early stripe rust development in early sown crops added early disease pressure, with seedling infection in later sown crops widespread in 2022. High stripe rust levels in 2022 could support a similar scenario in 2023.

A combination of a late, wet harvest in 2022 and high number of wheat volunteers in many regions could provide a green bridge over summer and a platform for the disease epidemic to establish early in 2023.

In eastern Australia stripe rust was detected on May 25 in 2021 and May 20 in 2022 (Australian Cereal Rust Survey, USyd). This is significantly earlier than the 40-year average of July 13.

The 238 pathotype increased in frequency in 2022, suggesting that this pathotype may be more 'aggressive' possibly having a slightly shorter cycle time and producing more spores with each infection cycle.

> Above average rainfall years are usually conducive to stripe rust infection.

> Temperature, especially during spring, was a significant factor in the prevalence of stripe rust in 2021 and 2022.

> Dominant pathotypes in 2022 were 198, 238 and 239.

What is the risk of stripe rust in 2023?

The threat of another significant stripe rust epidemic in 2023 depends on several contributing factors. These include:

- **Green bridge – increased potential for volunteers:** diseases and/or environmental conditions in 2022 reduced grain size in many regions, resulting in large numbers of small grains being blown out the back of headers during harvest.
- **Green bridge – delayed fallow weed management:** the late harvest of 2022 delayed control of volunteer wheat.
- **Elevated spore loads:** in the environment and also higher risk from green bridge volunteers where the plants are an S rated variety.
- **An early break:** leading to early sown and grazing crops and earlier start to stripe rust epidemic in 2023.

Figure 1 Stripe rust on the leaf of a S variety and RMR variety without fungicide application in 2022.

Stripe rust basics

Green bridge

Several factors dictate the extent and importance of green bridge carryover between seasons. Firstly, the amount of stripe rust within a season increases the probability and likely level of infection in volunteer wheat plants in the following non-cropping phase. Summer rainfall and mild temperatures are also important for the germination and infection of volunteer wheat plants over summer and into early autumn. The actual resistance of the variety grown also contributes to its importance as a green bridge host, with only a few volunteer plants of a susceptible variety required to survive over summer to produce millions of stripe rust spores, which can then infect autumn sown wheat in the next season.

The green bridge is not only important as a host for stripe rust but plays an important part in the life cycle and over-summering of other diseases and insect pests, such as aphids or mites, which can further serve as vectors for cereal viruses such as *Barley Yellow Dwarf Virus* or *Wheat Streak Mosaic Virus*.

Figure 2 Fresh yellow stripe rust pustules (spores) on DS Bennett

Life cycle

Stripe rust or yellow rust is caused by the fungus *Puccinia striiformis* and can appear in a seedling and adult form. In a seedling form, it appears as small, closely packed circular pustules during the vegetative stage and can spread both sideways and along seedling leaves. It does not have the classic 'stripe' appearance and can be easily confused with wheat leaf rust.

In leaves produced after the seedling stage, after growth stage (GS) 30–31, infection becomes confined between veins in wheat leaves preventing sideways spread and giving a striped appearance. The spores occur on the upper surface of the leaves, the leaf sheaths, awns and inside the glumes. In an adult infection, stripe rust can still spread sideways and cover the whole leaf. This reaction is a measure of increased susceptibility of a variety to stripe rust.

Infections appear as fresh yellow and fluffy spores and then turn drier and orange as they age. Spores can be viable on leaves for 2–3 weeks until they desiccate and be visible for much longer than this.

> The time between infection and appearance of symptoms is termed the latent period.

Stripe rust is a biotrophic pathogen. This means it needs a living host to survive, which is why control of the green bridge over summer is so important. It survives mostly on wheat, and to a lesser extent barley, triticale, barley grass, brome grass and phalaris. Good growing conditions favour disease development, with the more vigorous the plant growth, the better the plant host substrate and microclimate within a wheat canopy for stripe rust infection.

Stripe rust cannot carryover on stubble and is not seed-borne. Wind spreads spores within crops and over long distances. There is a dilution factor with spore numbers from the initial source of infection when spread by wind, with dispersal of up to hundreds of kilometres but at low numbers.

A short period of leaf wetness is needed for a stripe rust spore to germinate and infect the leaf, with the infection requiring high humidity and moisture for 4–6 hours. The time between infection and appearance of symptoms is termed the latent period.

The stripe rust cycle time is dependent on climatic conditions and the resistance rating of the variety being grown (Table 1). The optimum temperature range for development is 12–20°C. In this temperature range it will take ~10 days for new spores to emerge from infected leaves, with longer times of up to 80 days at 3°C, and more or less cessation of growth above 25°C (absolute temperatures). The more susceptible the variety is, the greater potential for a shorter cycle time of the pathogen. For example, under ideal environmental conditions, the cycle time can be 10 days in an S or worse rated variety and 14 days in a moderately resistant (MR) variety. High and low temperature do not kill the disease, they just slow down the cycle time. Fresh yellow spores are usually seen in the morning because cool temperature and still air are more conducive for sporulation.

Hot spots can appear in the crop, usually 1–10 metres across, and are generally well developed just before the disease becomes widespread in the crop.

Figure 3 A stripe rust hot-spot in DS Bennett wheat 2023.

Table 1 Differences in latent period for wheat varieties with stripe rust ratings S and MR at different temperatures.

Mean daily temperature	Latent period range (days)	
	S rated variety	MR rated variety
<8°C	Dormant	Dormant
<8–12°C	20	28
12–20°C	10	14
20–22°C	20	28
>22°C	Dormant	Dormant

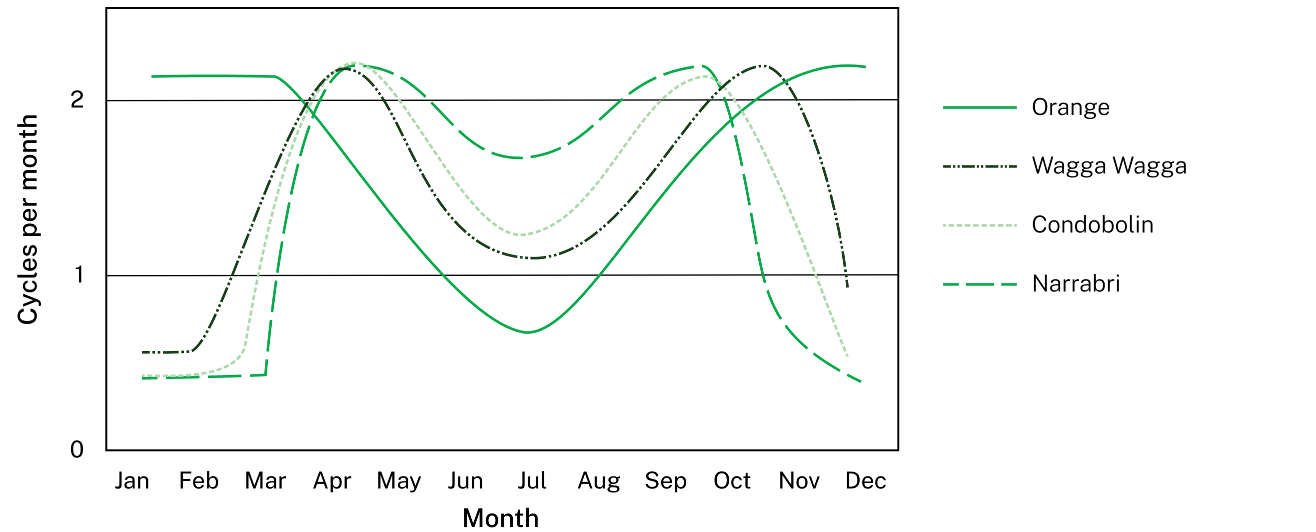

Figure 4 Potential number of stripe rust cycles per month at different locations in NSW. Adapted from Murray et al. 2005.

Head infection

Stripe rust can develop on the inside of the glumes within heads (cup-shaped structure that encloses the seed). Most of this infection occurs when the florets open at flowering. Spores enter the open floret, infect and develop behind the glumes, and accumulate, often piling up on the top of the seed as it grows. Infection of the seed does not occur, and hence there is no seed transmission of stripe rust.

Head infection is the physical incursion of the head and is not related to the resistance rating of the variety. However, a more resistant variety will likely have lower leaf infection levels than a S variety, which is the main source of inoculum for head infection. This does not mean a more resistant variety cannot get windblown head infection from a neighbouring uncontrolled susceptible wheat crop.

Damage to grain quality can occur, with grain from infected spikelets being smaller and potentially contributing to higher screening levels at harvest. Head infection levels are determined at the flowering growth stage.

The spores are blown into individual spikelets as the anthers are exuded from the floret. Once the floret closes after fertilisation, the spores are trapped and do not pose any risk for further infection of neighbouring spikelets or heads. Hence, the main management strategy to limit head infections is to reduce spore load within the canopy through application of a foliar fungicide 2–3 weeks prior to flowering.

Figure 5 Stripe rust pustules clearly visible on the inside of the glume (circled).

How do I know what pathotype I have?

Multiple pathotypes, also known as races or strains, of stripe rust are currently circulating across NSW which complicates varietal resistance ratings and management of this disease. The 4 dominant pathotypes can have different virulence to various resistance genes within a wheat variety, resulting in varieties having vastly different reactions to the different pathotypes. These differences can vary greatly between seasons depending on the pathotype distribution in your area. It is not the variety's resistance genes that are changing, it is the stripe rust pathotype that has blown into your crop that is different and this can change within and between seasons. Management strategies used by growers should reflect these differences in pathotypes and their distribution. If in doubt, manage a crop to its worst-case resistance rating ('East coast rating').

Figure 6 Stripe rust pustules becomes visible as the glumes open around the growing grain.

Table 2 Pathotype distribution by year

Pathotype	Year first detected	Stripe rust infections (%)		
		2020	2021	2022
198	2018	61	45	26
238	2021	0	2	36
239	2017	8	42	36
134 variants (Yr17 and 17 +27)	2002	28	10	2

What is the difference between seedling plant resistance and APR?

The response of a variety to stripe rust infection is determined by the interaction of its resistance genes with the pathotype present. The reaction depends on 2 forms of resistance, seedling resistance and APR.

Varieties are generally susceptible as seedlings and increase with resistance as they develop and the APR genes become active.

Both seedling and APR genes, and combinations of both, provide varying levels of crop protection which can be influenced by environment, temperature, crop nutrition and disease pressure.

Growers need to be aware that varieties which predominantly rely on APR for stripe rust protection might be more susceptible to stripe rust infection early in the season until the APR becomes active and provides protection.

The reaction of a variety to stripe rust depends on 2 forms of resistance:

- seedling resistance, and
- adult plant resistance (APR).

Seedling resistance

Seedling disease resistance is important to minimise stripe rust levels in the environment. The genes are effective from seedling emergence through to maturity, against the pathotype they provide resistance to. They are commonly referred to as all stage resistance (ASR) genes.

Seedling resistance is usually controlled by a single gene. Unfortunately, stripe rust is a highly variable pathogen and continually develops new pathotypes that can overcome single-gene seedling resistance. Wheat breeders have found that stripe rust overcomes single-gene resistance relatively quickly unless it is combined with other genes for resistance. Wheat breeders have focused on APR genes in combination with those for seedling resistance. In current commercial varieties, there is a lack of effective seedling resistance to the dominant stripe rust pathotypes currently in Australia.

Adult plant resistance (APR)

Most varieties rely on APR genes for stripe rust protection, which as the name implies, become active as the plant ages. APR is an important resistance tool as it reduces the development of stripe rust within the top 3 leaves (flag, flag–1 and flag–2) or the 'money leaves' of the wheat plant, especially after head emergence.

APR genes become effective at various growth stages, ranging from GS14 (fourth leaf, for RMR) through to GS59 (full head emergence, Table 3). This growth stage differs between wheat varieties and their resistance rating.

Table 3 The differing growth stages at which APR is active depending on the variety's resistance rating.

Disease resistance rating	Abbreviation	Growth stage (Zadoks) when APR is active
Moderately resistant	MR	30–32 (early stem elongation)
Moderately resistant–moderately susceptible	MRMS	37–39 (flag leaf emergence)
Moderately susceptible	MS	49–60 (awn peep–start of flowering)
Moderately susceptible–susceptible	MSS	61–75 (flowering–mid milk)

Fungicide applications may be required at earlier growth stages to minimise infection levels until the APR gene(s) are expressed within different varieties. A visual sign that APR is working is when 'flecks' can be seen through the leaf when the leaf is held up to the light (Figure 7).

Figure 7 APR expression causing 'flecking' in a wheat leaf.

There are a number of APR genes used in Australian commercial wheat varieties. The effectiveness of these genes can be influenced by factors such as:

- temperature (they often work better at higher temperatures and can be delayed under cooler temperatures)
- crop nitrogen (N) status. High N may delay activation
- the wheat variety that they are deployed in
- the number of APR genes present (their effects are often additive)
- the pathotypes of stripe rust present.

Nitrogen interactions

High N nutrition can delay crop maturity and the expression of APR genes within a variety. These crops can also be more susceptible to stripe rust infections due to having thicker canopies and higher leaf nitrate levels, a food source for the pathogen. Under high levels of N nutrition growers need to manage a variety as one category lower in resistance (e.g. manage an MRMS as an MS).

Disease management – cultural and chemical

Before you sow

Consider reducing the area sown to varieties with S stripe rust rating which are reliant on fungicides to protect yield.

Varietal resistance can differ between the various stripe rust pathotypes, with pathotype distribution also varying dramatically between seasons.

Under high levels of N nutrition growers need to manage a variety as one category lower in resistance (e.g. manage an MRMS as an MS).

Increasing the area sown to varieties with better resistance that are less reliant on multiple fungicide applications has several benefits:

- less production of inoculum that can infect other crops, not only on your farm but in the wider district. This helps take the pressure off more resistant varieties
- less area requiring fungicide applications using a ground rig or aerial application, especially in wet seasons where trafficability can be an issue or in regions where other crops (e.g., chickpea, canola) are competing for spray rig access
- timeliness of in-crop fungicides is important, but not as critical as in S varieties.
- yield penalties are lower if the fungicide application is delayed compared with growing S varieties
- a longer-term shift away from growing S and VS varieties will help reduce the development of fungicide resistance and new pathotypes of stripe rust.

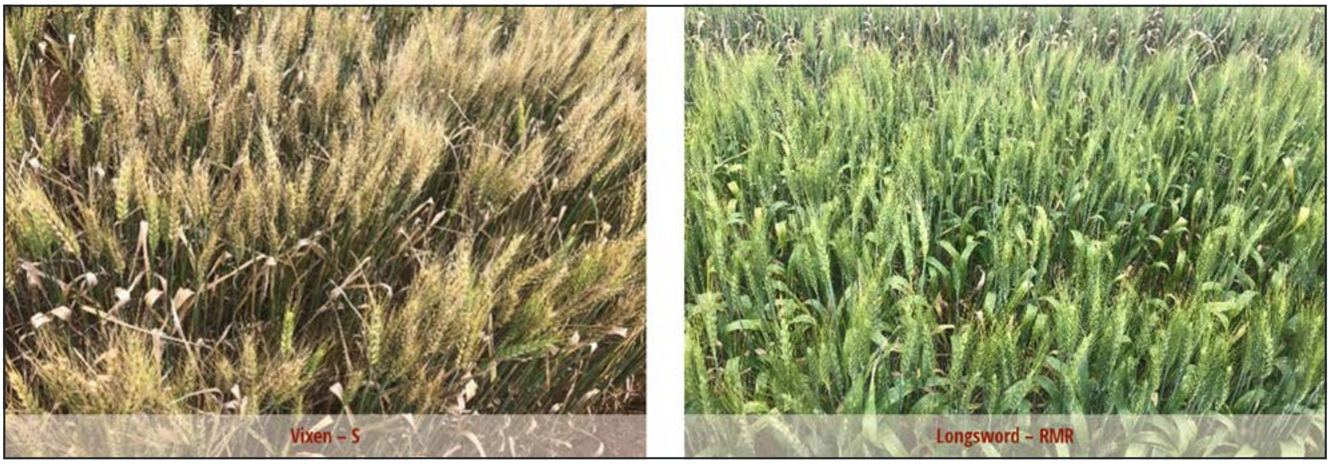

Figure 8 Vixen⦵, an S rating to the 238/239 pathotype versus Longsword⦵, rated RMR to the 198 and 238/239 pathotype in a Grain Orana Alliance (GOA) experiment, Wellington 2022. No fungicides were applied.

Table 4 Resistance to different pathotypes of stripe rust of some commonly grown wheat varieties. Source NVT online.

Variety	Year of release	Stripe rust resistance 2023			
		East Coast	Yr_134_17+ pathotype	Yr_198 pathotype	Yr_239 pathotype
Bread wheat					
Beckom	2015	MRMS	MRMS	MR	MR
Borlaug 100	2018	SVS	MRMS	SVS	MS
Catapult	2019	S	MR	MRMS	S
DS Bennett	2018	S	S	S	S
Illabo	2018	MRMS	-	-	-
Longsword	2017	R/S	R/S	RMR	RMR
LRPB Lancer	2013	RMR	RMR	RMR	RMR
RockStar	2019	S	MRMS	MR	S
Scepter	2015	MSS	MSS	MR	MRMS
Sunmaster	2020	MRMS	MRMS	MR	MR
Sunmax	2016	RMR	RMR	RMR	RMR
Vixen	2018	SVS	-	-	-
Durum					
DBA Lillaroi	2015	MS	-	-	-
DBA Vittaroi	2017	MS	-	-	-
Westcourt	2019	MR	-	-	-

For the latest disease ratings, head to: https://nvt.grdc.com.au/nvt-disease-ratings

Will APR be enough?

Generally, if a variety has a level of stripe rust resistance rating below MR then fungicides are required to minimise early infection until APR is expressed. All varieties, unless rated R, are susceptible to stripe rust infection as seedlings, which normally only occurs in seasons when early disease pressure is high.

APR is a very useful control mechanism. When significant stripe rust infection exists in a crop and the APR genes are active, the APR can strip significant green leaf area while controlling the existing stripe rust infections (Figure 9). Hence, APR needs to be used in combination with foliar fungicides. The fungicide provides early protection in a season conducive to stripe rust development, helping to control the disease until APR is reliably expressed. The APR then becomes active under low infection levels without the loss of green leaf area and prevents further stripe rust development within that crop.

In-furrow fungicides at sowing

- An in-furrow treatment with flutriafol fungicide on starter fertiliser will generally control stripe rust for 6–8 weeks from sowing, suppressing seedling infections and reducing the disease pressure within that crop. This can also have the additional benefit of reducing pressure on surrounding crops or later sown varieties along with activity on other cereal diseases such as take-all.

In-crop fungicides

There are a number of factors to consider when planning fungicide management strategies with the aim to maximise retention of green leaf area on the top 3 leaves (flag, flag−1 and flag−2) throughout the season to protect yield potential.

When planning fungicide strategies consider:

- observed or predicted level of stripe rust in your crop or region, including in season information on pathotype distribution
- seasonal conditions: recent and/or predicted rainfall and temperature, which dictates infection events and disease cycle time
- the level of genetic resistance within a variety to different pathotypes and the corresponding need for protection at various growth stages (Table 5)
- nitrogen status of crop: high N crops having delayed APR expression and are more conducive to infection so manage those crops one resistance level lower than they are rated
- crop growth stage and whether APR is visually active
- 3–4 weeks protection is the standard from a fungicide application. Curative activity is roughly half the cycle time so 5 days if on a 10 day cycle time or 10 days if on a 20 day cycle
- predicted weather conditions for the next 3 weeks. The cheapest 'fungicide' is often 3 weeks of dry and warm weather during spring
- crop yield potential and commodity price, as fungicide applications are an economic decision
- other leaf diseases that may be an issue within that crop or region.

Figure 9 Longreach Spitfire⊕ wheat showing APR stripping out the wheat leaf.

Table 5 Timing and number of fungicide applications for differing resistance ratings under ideal seasonal conditions.

Stripe rust resistance rating	Number of applications*	Growth stage (Zadoks) for timing of applications
S	3	31, 39, 50
MS	2	31, 39
MR	1	31

*Additional applications may be required in high pressure years. Fungicides may not be required at all in years with low disease pressure.

Grazing crops

Grazing crops can be sown as early as February–March and depending on their resistance rating can provide stripe rust with a widespread, early host (Figure 10) allowing elevated levels of inoculum to be released into the environment if not managed. This can result in high inoculum loads being present in a region when main season wheat varieties emerge.

Figure 10 Early sown grazing crops can act as a green bridge and need to be managed to minimise inoculum build-up. Bennett wheat, July 2022.

Grazing is one tool that can limit stripe rust development if the grazing is uniform i.e. preferential grazing is avoided, and the crop is uniformly eaten down or 'crash grazed'. This can be difficult in favourable growing conditions with high biomass production that limits the ability to effectively crash graze if limited livestock numbers are available. Large paddocks can also result in some areas not being grazed suitably, which can leave large amounts of leaf area for stripe rust development. Stripe rust spores are not toxic to stock but stock prefer not to graze areas heavily infected with stripe rust.

Consider using flutriafol on starter fertiliser to reduce early stripe rust development but note the 4-week grazing withholding period (WHP). There are other fungicide products available to reduce early stripe rust development, but these products have label restrictions including longer WHP on inability to graze after use. Favourable growing conditions can lead to some dilution of the fungicide in the plant and shortening of the period of control. Using a fungicide at sowing lowers the early disease pressure in the crop and offers some flexibility with in-crop fungicide management.

Remember, 2022 was a complex season for stripe rust management.

Key management tips

- Be prepared. A proactive approach is always better than reactive strategies.
- Choose your variety carefully. Consider the logistical challenges of growing varieties highly susceptible to stripe rust. Can you effectively manage the area of S varieties? Balance the potential yield of a S variety against the high risk of yield loss.
- Know what pathotypes were present in your district last season and monitor pathotype distribution throughout 2023 across NSW. Stay up to date with industry intelligence from Sydney University (USyd) and Grains Research and Development Corporation (GRDC). USyd offer an interactive map that is updated every 2 weeks throughout the season that displays location × pathotype.
- Know the N status of your paddock and adjust your stripe rust management accordingly.
- Consider using registered fungicides (e.g. flutriafol) on starter fertiliser to suppress early infection, particularly with susceptible varieties.
- Monitor crops during the growing season and apply a foliar fungicide early in the epidemic at critical growth stages, if required.
- Know the resistance rating of each variety for the dominant diseases in your region and your paddock. Stripe rust may not be the only important leaf disease in high rainfall seasons.
- Chasing fully rust-free crops may not always be economical.
- In 2023, control stripe rust early and then adapt your management to match seasonal conditions.
- Keep the 2022 record wet and prolonged cool conditions during grain fill in perspective. High input strategies that were economical in 2022 may not be in 2023, as climatic conditions and pathotype distribution differ between seasons and regions and are the overriding factors in epidemic development.

FAQ

Has the resistance of my variety broken down?

Varieties are screened for dominant stripe rust pathotypes present in Australia. As you cannot breed for something that does not yet exist in the environment, breeders cannot pre-emptively breed for every stripe rust strain that exists globally. When there is a new exotic introduction there will be winners and losers with the resistance gene packages that varieties contain. Remember, your variety has not changed, the change is within the stripe rust pathotypes. For clarification on new pathotypes send leaf samples to the Australian Cereal Rust Survey (details below).

Has my LongReach Lancer⍉ resistance broken down?

There is no indication that this has happened to date. The variety has been around for a while now and in some paddocks ‘off types’ (contaminants) will be present that may be more susceptible to stripe rust. Know the difference between a hotspot (potential resistance change) and a ‘hot plant’ (individual scattered plants with leaf infection across a paddock that indicates a seed purity issue). In years with lower disease pressure than 2022, varieties with an MR rating will remain disease free, but in high pressure years these varieties may still have some level of infection and flecking on the leaf when APR becomes active after spores have blown into the crop.

Keep the 2022 record wet and prolonged cool conditions during grain fill in perspective.

Why can I still see pustules in the crop after I have applied a fungicide?

Fungicides do not kill the pustules and they do not make them disappear overnight. Pustules need to desiccate and dry out to become non-viable, but this can take 2–3 weeks depending on conditions. Fresh infections produce pustules that are more yellow and fluffy (especially early in the morning). They then turn more orange and flatten as they dry. Even older non-viable dried up orange pustules can remain visible on leaves throughout the season. However, the actual spores can still be viable for 2–3 weeks and initiate new stripe rust infections. Alternatively, it could be a new infection due to the fungicide not having any curative activity on the pathogen during the latency phase. The pustules you are seeing were developing after a curative (kickback) period of the fungicide has passed.

For the latest disease ratings, head to: https://nvt.grdc.com.au/nvt-disease-ratings

Does a 'head wash' spray stop stripe rust head infections?

The name 'head wash' can be misleading for stripe rust as the aim is to maintain the green leaf area throughout grain fill and minimise spore numbers within the canopy when the crop is flowering. The aim is not to protect the head, as head infections do not occur through the anthers as with the disease fusarium head blight (FHB). Fungicide application timing to reduce stripe rust head infection in susceptible varieties is important, with ideal application timing 2–3 weeks prior to flowering to reduce spore load within the canopy at flowering. Application at flowering can be too late if stripe rust infection already exists within the canopy as the spores will still be viable to initiate head infections. Head infection is determined at flowering and once evident on the inside of glumes (Figure 5) cannot be removed with fungicide application.

Figure 11 Stripe rust pustules of various ages – the bright yellow are fresh and the darker orange are older.

Will a fungicide applied with my broadleaf spray be effective?

The majo rity of broadleaf, in-crop herbicide applications, occur around mid-tillering (GS25 to GS31). Fungicides are only active in the leaf for 3–4 weeks, and as such do not provide extended control. Applying a 'cheap insurance' fungicide into your mix during tillering will not give you protection through to GS39, when the flag leaf emerges. If a fungicide is applied around GS25 with a broadleaf herbicide, under high stripe rust pressure, a second dedicated fungicide application at GS31 will still be needed in susceptible varieties.

NOTE: there is minimal evidence of fungicides improving yield when sprayed prior to early stem elongation (GS30/31). At best it will suppress inoculum pressure only.

Is there fungicide resistance in stripe rust?

There is currently no evidence of fungicide resistance in the stripe rust fungus. However, individual pathotypes of wheat and barley leaf rust have been identified by Professor Robert Park at Sydney University to have developed resistance to multiple Group 3 (DMI, triazole) actives. This is a significant finding as both stripe rust and leaf rust are from the same *Puccinia* genus, meaning that there is no reason why individual stripe rust pathotypes cannot develop fungicide resistance in the future.

Fungicide stewardship is more important than ever to reduce the likelihood of resistance development in stripe rust and to minimise off-target selection for fungicide resistance/reduced sensitivity in other wheat pathogens which cause diseases such as powdery mildew and septoria tritici blotch. Both these pathogens have already developed varying levels of fungicide resistance or reduced sensitivity within Australia.

Figure 12 Carefully weigh up the pros and cons of growing a variety like Catapult, rated S.

Is growing a susceptible variety which is higher yielding in my district fine if I keep the fungicides up to it?

The more susceptible the variety, the more critical the fungicide application timing is. Variables such as the ability to 'get over the country' with ground rigs for timely fungicide application, trafficability issues, the yield risk versus yield reward, and selection for fungicide resistance all need to be considered.

Consider paddocks with better drainage and trafficability to minimise the risk associated with delayed fungicide applications. For example, in 2022, many growers and advisors reported delayed foliar fungicide applications by ~10 days, related to trafficability or access to aerial application. In the more susceptible varieties, and under the high inoculum loads of 2022, this delay resulted in up to 40% yield loss.

Consider growing manageable areas of S varieties along with areas of more resistant varieties. This enables timely management of the S varieties, while having some flexibility in fungicide timing on better rated varieties, with lower risk to yield if the fungicide application is delayed. During 2022, stripe rust susceptible varieties had between 2 to 4 or more fungicides applied to manage stripe rust. Use of 4 fungicide applications is not a sustainable way to manage stripe rust. It promotes both on and off target selection for fungicide resistance within pathogen populations.

The interactive pathotype map is updated throughout the season and can be found here: Australian Cereal Rust Survey - Faculty of Science (sydney.edu.au)

Other helpful information

Simpfendorfer S, Park R and Chhetri M (2022) Northern region wheat stripe rust epidemic in 2021 – learnings for 2022. GRDC Update

Paddock Practices: Stripe Rust GRDC

Australian Cereal Rust Survey: Australian cereal rust reports. University of Sydney

Murray G, Wellings C and Simpfendorfer S (2005). Stripe rust: understanding the disease in wheat. NSW Department of Primary Industries.

Podcasts

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Rust pathotype identification

Full details of how to submit a sample to the Australian Cereal Rust Survey, USyd.

Collect 15–20 infected leaves with active pustules in a paper envelope (do not use plastic). Include the latitude and longitude of sample location, date of collection, variety, and your full contact details. Send to:

University of Sydney
Australian Cereal Rust Survey
Reply Paid 88076
Narellan NSW 2567

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