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cropping strategy

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Disease Management in wheat (2024)

Fungicide activity and product choice for early fungicide timings GS30-33

This InGRAINed issue (Issue 4) should be read in conjunction with the previous Issue 3 released last Thursday (01/08/24). A later issue to be released in mid-August will cover late season spray timings (GS39-61) and product choice.

Key points

- ***Stripe rust is "public enemy number one" in eastern states' susceptible varieties this season, although the disease may not be as problematic as 2023.***
- ***Epoxiconazole (Group 3 DMI fungicide) is still very effective at giving control of this pathogen if the disease is evident late tillering – first node (GS24-GS31).***
- ***Don't bank on much more than 7 days curative activity following an infection event of stripe rust. Control exceeding 7 days after an infection event on a specific leaf layer will result in "scarring" becoming evident in the crop, even if stripe rust pustules are not observed.***
- ***The GS31/32 fungicide is typically the second most important spray timing in the strategy and is essential for susceptible varieties where disease is present in the crop.***
- ***The timing traditionally coincides with the emergence of the first of the important "money leaves", F-2 and F-3, with F-2 being the more important.***
- ***Where disease pressure is very high in susceptible varieties, and evident in the crop at GS31/32, consider expenditure on mixtures of DMI (Group 3 triazoles) with strobilurins (QoI Group 11) or SDHIs (group 7).***
- ***Epoxiconazole is very strong on stripe rust but needs support from QoI Group 11 with pyraclostrobin (robust rates of Opera) or azoxystrobin for control of stripe rust and STB.***
- ***Prothioconazole is now slightly more effective on STB than epoxiconazole depending on region, but is slightly less effective on rusts.***
- ***RGT Cesario has a NVT rating of R-MR for stripe rust. Please be aware that in 2023 trials in the HRZ of Tasmania, south-east SA, and Victoria it has been susceptible to stripe rust.***
- ***For more resistant cultivars, or in scenarios in WA if there is no disease at GS31-32, it may be possible to delay the first fungicide until the emergence of F-1, which typically emerges in the late second node/early third node stage of development.***
- ***Delaying the first foliar application will be more successful where upfront applications of flutriafol have been used, or where wheat has been sown much later (late May onwards) and there is no or little sign of disease on the older lower leaves.***
- ***A delayed first spray with a follow up at early head emergence is referred to as "Straddle Spray Programme", since two fungicides are applied either side of flag leaf emergence (the strategy "straddles' the flag leaf). The idea is that two sprays replace three sprays.***

We know that fungicides are in general much better protectants (3 - 4 weeks protection) than they are curative agrichemicals. Some fungicides such as chlorothalonil used in grain legumes are purely

protectants and have no curative ability since the molecules are unable to enter the leaf. With more modern fungicides such as the Group 3 DMIs (triazoles), Group 11 QoIs (strobilurins) and Group 7 SDHIs the fungicides have systemic or partial systemic activity allowing them to convey curative activity, i.e. the ability to control disease a number of days after infection has occurred. But how many days after infection can disease still be controlled without damage being observed in the crop? The common answer is that it varies depending on the disease pathogen, and that we have to remember that fungicides that are systemic only move towards the leaf tip after application, they are acropetal. But what about stripe rust? How long after an infection event do we have before the disease scars the leaf tissue?

How curative are the fungicides we use for stripe rust?

FAR Australia has managed a number of fungicide field trials over the years looking at different products. However, a common question is how many days after infection has occurred can I obtain control of stripe rust without the crop being badly scarred by the disease, or it fails to give control? This is difficult to answer in the field as you don't know when the crop was infected. A FAR Australia led project working with Sydney University and funded by GRDC looked at this question under controlled conditions at Cobbitty between 2014 and 2016. Stripe rust inoculated plants were incubated for 24 hours at 10°C in the cabinets where continuous mist was created by ultrasonic humidifiers. After incubation, plants were moved to naturally lit microclimate rooms maintained at 17 ± 2°C.

All three fungicide treatments (applied at full rate) gave almost complete control of stripe rust when applied 1 day prior to infection, and 3 days after (Figure 1). However, if fungicide application was made 7 days after infection, chlorosis due to the presence of the disease became apparent. With Opus (epoxiconazole 62.5g ai/ha) and Radial (epoxiconazole 63g ai/ha & azoxystrobin 63g ai/ha) leaf loss at 7 days post inoculation (infection) was principally chlorosis without active stripe rust pustules, though with FAR F1-14 (a modern SDHI), active infection was higher at 2%, though this difference was not significant.

With fungicide timed 11 days after inoculation, leaf loss due to active infection and associated chlorosis was as great as the untreated control, though the Radial application had almost half the damage expressed in Opus with FAR F1-14 intermediate. Clearly if your mean temperatures in the field are less than 17°C average then the curative might be extended slightly. A good way to think about this data is to think of curative activity in terms of thermal time. If 7 days at an average of 17 degrees was translated in accumulated thermal time, it would mean that damage, and first sign of stripe rust damage was observed after approximately 119-day degrees (7 x 17°C). A daily average temperature at its simplest can be calculated by adding the maximum to the minimum temperature and dividing by two, therefore if the daily average was cooler, say 13°C, then it may be possible to suggest that damage might start occurring 9 days after application rather than 7 days on the infected leaves (i.e 119/13 = 9.15 or approximately 9 days). Remember however that stripe rust has optimum temperature range (ideally 12-20°C) and that higher daytime temperatures may themselves impede development of the fungus.

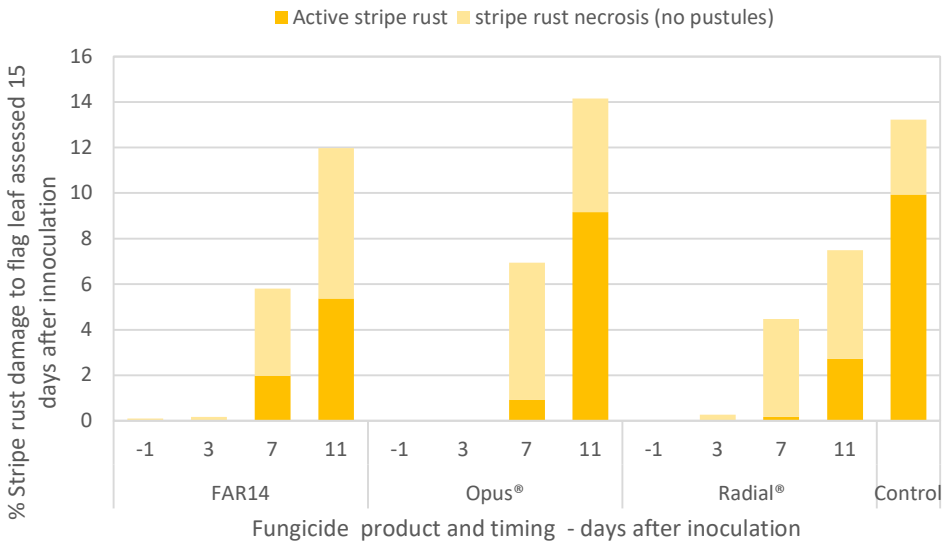

Figure 1. Influence of fungicide treatment timed 1 day prior and 3, 7 and 11 days after stripe rust inoculation on flag leaf area damaged (active and chlorotic area) assessed **15 days** after inoculation – cv Elmore (MR-MS rating). LSD (0.05) within a fungicide treatment: 3.3 (active), 3.2 (chlorotic). LSD between fungicide treatments: 2.9 (active), 4.1 (chlorotic). Incubation at a mean 17 ^{0}C.

Early fungicides timings (GS30-33) and product choice for the different strategies

GS30 (start of stem elongation)

- This spray timing should not be necessary if flutriafol in furrow has been used on the basal fertiliser.
- If no flutriafol or broad-spectrum foliar acting seed treatment has been applied at sowing, then consider this very early spray timing if stripe rust or severe wheat powdery mildew (WPM) is noted in the crop canopy.
- Overall, this is generally a less important timing for fungicides in wheat as the primary "money leaves" have not yet started to emerge.
- Remember, GS30 is typically at least 6-8 weeks before the flag leaf emerges so it won't protect the key leaves below the flag F-1 and F-2.
- So, if you spray at GS30 "Mind the Gap" between the first and second spray unless it is very dry, this spray timing will not remove the need for GS32 intervention.

In 2024, this spray timing should only be necessary if stripe rust susceptible varieties were unprotected with flutriafol at sowing, or where stripe rust is evident in the crop on inspection. In 2022, many crops were sprayed at this growth stage (or before during tillering) and then did not receive a second or further spray until flag leaf. This led to the principal money leaves of F-1 and F-2 being badly infected since they were not directly protected with fungicide. So "**Mind the Gap"** is the key message if you start your fungicide programme very early (end of tillering – GS30) and aim to follow up at flag leaf. **Only consider spraying very early when you have clear evidence of severe disease, and your cultivar is susceptible. Spraying at this stage is likely to require a further fungicide application before the crop reaches flag leaf** since the ideal timing

intervals between fungicide sprays is 3 – 4 weeks. In the extreme infection conditions of 2022, it was less than 3-week intervals between fungicides that was needed in order to control infection!

Product choice:

At such an early timing, a straight application of Group 3 DMI triazoles can be very effective. 2023 again illustrated that if stripe rust is present, epoxiconazole applied at 31- 62.5g ai/ha (e.g. Opus®125 at 250 – 500ml/ha) is still very effective. For very cheap insurance in scenarios where drier environments are expected to assist disease management, then tebuconazole could also be considered at its full rate (124.7g ai/ha) for stripe rust control.

GS31-32 (1st – 2nd node) – approximately Flag -2 (F-2) emergence & F-3 coverage

- The GS31/32 fungicide is typically the second most important spray timing in the strategy and is essential for susceptible varieties where disease is present in the crop.
- The timing traditionally coincides with the emergence of the first of the important "money leaves", F-2 and F-3, with F-2 being the most important.
- Ideally this spray should be sprayed no more than 4 weeks earlier than the flag spray application (GS39), particularly when conditions are conducive for disease.
- In a wet disease conducive HRZ & MRZ seasons, it is the flag leaf spray that will be the most important fungicide application, not GS31-32 since the upper two leaves are more important than F-2 and F-3.
- In a dry less disease prone season, although the relative importance of the GS31/32 spray is elevated compared to the flag leaf, the overall response to fungicide application is reduced.
- Dry weather following the GS31/32 application will reduce the expenditure required for the flag spray (in effect drier weather following the GS31/32 now forms part of a more tactical approach).
- In 2023 there were limited rainfall events of 5mm or more between GS31/32 and GS39, so monitor this development period very closely since it will determine your expenditure at flag leaf emergence GS39.

Product choice GS31-32 (F-3 & F-2 target leaves):

Where disease pressure is very high in susceptible varieties, and evident in the crop at GS31/32, consider expenditure on mixtures of DMI (Group 3 triazoles) with strobilurins (QoI Group 11) or SDHIs (group 7). Where that is not the case then straight DMIs or DMI mixtures could be considered for more disease resistant scenarios or the lower end of the rate ranges below. Or if no disease is present consider what you are spraying for, particularly if you applied flutriafol or used a broad-spectrum seed treatment?

Stripe rust susceptible (little or no evidence of STB) e.g. late emerged crop with much lower STB pressure

A straight application of Group 3 DMI epoxiconazole can be very effective. 2023 again illustrated that if stripe rust was present, **epoxiconazole applied at 31- 62.5 g ai/ha** (e.g. Opus®125 at 250 – 500ml/ha) is very effective.

High disease pressure:

Septoria tritici blotch (STB) main target but stripe rust susceptible: Group 3 DMI Prothioconazole mixed Group 7 SDHI Bixafen or Prothioconazole mixed with Group 11 QoI azoxystrobin**.** For example,

Aviator Xpro – 300 – 500ml/ha delivering prothioconazole 45 – 75g ai/ha and bixafen 22.5 – 37.5g ai/ha

Stripe rust main target but STB present: Group 3 DMI epoxiconazole mixed with Group 11 QoI azoxystrobin**.** For example,

Maxentis – 300 – 600ml/ha delivering prothioconazole 30-60g ai/ha and azoxystrobin 40-80g ai/ha

Or **Elatus Ace** – 500ml/ha delivering propiconazole 125g ai/ha (Group 3 DMI) and benzovindiflupyr 20g ai/ha (Group 7 SDHI).

These mixtures will also control yellow leaf spot, basal leaf rust and wheat powdery mildew (WPM). Depending on frequency of Group 11 QoI resistance in WPM, the control of WPM where QoI mixtures are used may be poorer than expected.

No disease or evidence of disease: In regions where STB and stripe rust are not present in the crop or region (e.g. many regions of WA) consider whether there is sufficient disease to warrant spraying, and if possible, delay application to the next leaf emergence F-2 and F-1 at GS32-33 (second – third node) and then reassess. If by virtue of better resistance ratings and lack of the disease this is possible, then it may be possible to reduce the number of fungicide applications, particularly if the second half of growing season (flag leaf onwards) turns drier.

GS33 – (third node) approximately flag-1 emergence & F-2 coverage

- **Do not adopt delayed applications of the first fungicide to GS33 where the cultivar is susceptible to STB or stripe rust, and/or the disease is easy to find in the crop.**
- For more resistant cultivars, or in scenarios in WA if there is no disease at GS31-32, it may be possible to delay the first fungicide until the emergence of F-1 which typically emerges in the late second node/early third node stage of development.
- Delaying the first foliar application will be more successful where upfront applications of flutriafol have been used, or where wheat has been sown much later (late May onwards).
- A delayed first spray with a follow up at early head emergence is referred to as “Straddle Spray Programme”, since two fungicides are applied either side of flag leaf emergence (the strategy *“straddles’* the flag leaf).

This strategy potentially results in two sprays replacing three based on lower disease pressure at the start of stem elongation. If after a delayed first fungicide disease pressure is reduced by drier weather post flag leaf, potentially one application with drier weather acting as the second fungicide will suffice. FAR Australia continues to research the key thresholds and disease resistance ratings to refine this approach.

It is also worth stating that if conditions dry up in the period of stem elongation (GS30-39), and the cultivar is resistant to the dominant disease in the region, it may assist the first fungicide being delayed further until flag leaf emergence itself. Again, this is particularly pertinent in shorter season HRZ scenarios where flutriafol was adopted at sowing with little or no disease development evident in the crop (a scenario more likely in WA this season).

Field Applied Research (FAR) Australia gratefully acknowledge GRDC investment for the historical fungicide evaluation under controlled conditions.

It would also like to acknowledge the support of breeders with Germplasm Evaluation Network trials across Australia and industry manufacturers for entries into Fungicide Fingerprinting trials. These are FAR's independent research evaluations where control varieties and treatments are funded by FAR Australia.