# Stripe rust control using grazing or pre-grazing fungicide application in EGA Wedgetail wheat 2010

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**Key words**

Dual purpose wheat, stripe rust, grazing, fungicides

**GRDC code**

GOA00002

**Take home message**

- Jockey seed treatment in this trial offered no delay of stripe rust onset and no yield advantage
- Grazing had a positive impact upon yield- mostly attributed to the effects of canopy management rather than disease control
- Early season stripe rust control, using fungicides only, impacted on final yield

## Introduction

Severe and early onset of stripe rust (Yr) in moderately susceptible wheat varieties such as EGA Wedgetail has been estimated to lead to potential yield losses of up to 45% (Murray, G et al. 2005) The fungus infects leaves of susceptible varieties and as the fungus completes its life cycle it produces yellow pustules on the leaf surface. It is through this loss of photosynthetic area that the disease reduces yields and grain quality.

Stripe rust development is favoured by warmer temperatures (15-20°C) during both the autumn and the spring. Winter temperatures decrease the rate of cycling of the disease and therefore the advancement of infections through the canopy. The higher temperatures of summer and the normally drier climate also tend to limit the growth and spread of the disease but not prevent it.

Mid and short season varieties being sown later often do not experience high pressure in the autumn or early crop stages with the disease progress limited by cooler winter temperatures. In contrast the long season or dual purpose varieties are exposed to the favourable Yr development conditions during autumn.

Our current dual purpose (DP) varieties also lack any strong genetic resistance and adult plant resistance will not offer any seedling or early season protection. This susceptibility coupled with ideal conditions for disease development could lead to:

- High infection rates and leaf area loss
- High levels of infection in the lower canopy that can explode coming into the warmer spring conditions
- Large sources of inoculum that can infect surrounding later sown wheat crops

A common management recommendation for DP crops that are infected with Yr in the autumn is to graze them. It is thought this helps to control rust through two pathways

1. Removal of Yr inoculum by the grazing stock through their consumption of infected leaf material
2. Opening the crop canopy to accommodate better airflow and circulation. This is thought to reduce the amount and time of leaf wetness required for disease development.

One trial was undertaken by Grain Orana Alliance in 2010 to test this common recommendation to see if reducing Yr in the autumn through grazing offered any yield advantage in the spring.

**Materials and methods**

The trial site was established at Wongarbon NSW. The trial was surrounded by a commercial EGA Gregory wheat crop and the paddock came out of a canola rotation in 2009.

The trial was a RCBD with 3 replicates with plots of 1.5m x 10m. The dual purpose wheat was cv. Wedgetail sown at 45kg/ha on the 2$^{nd}$ May 2010. The trial was sown with MAP @ 100kg/ha and broadcast pre-sowing with 98kg/ha of urea.

Between each treatment plot a buffer plot of cv.Wylie wheat was sown. These plots received no fungicide or grazing treatments at all. Wylie is rated as MS for Yr and this ensured even disease pressure was applied to all treatments.

The treatments are listed in Table 1 below.

**Table 1.** *Various treatments applied in dual purpose wheat trial, Wongarbon 2010.*

| Treat. No. | Seed Treatment | Grazed | Propiconazole @ 250mL/ha- 7 day pre graze | Tebuconazole @ 145mL/ha | |
|---|---|---|---|---|---|
| | | | | Z32 | Z39 |
| 1 | Nil | Yes | | | |
| 2 | Nil | No | | | |
| 3 | Nil | No | Yes | | |
| 4 | Nil | Yes | Yes | | |
| 5 | Nil | Yes | Yes | Yes | |
| 6 | Nil | Yes | Yes | Yes | Yes |
| 7 | Nil | Yes | Yes | | Yes |
| 8 | Nil | Yes | | Yes | |
| 9 | Nil | Yes | | Yes | Yes |
| 10 | Nil | Yes | | | Yes |
| 11 | Jockey | Yes | | | |
| 12 | Jockey | No | | | |
| 13 | Jockey | Yes | | Yes | |
| 14 | Jockey | Yes | | | Yes |
| 15 | Jockey | Yes | | Yes | Yes |
| 16 | Jockey | Yes | Yes | | Yes |

Propiconazole 250g/L was applied on the 16/7/2010 @ 250mL/ha using a hand boom with a 75L/ha water volume through TT01 nozzles @ 3 bar pressure.

Dry matter samples were taken on 27/7/2010 as 1 meter of row samples. Dry matter samples where again taken on the 30/8/2010 as 1 meter of row samples.

The grazing was simulated by mowing relevant plots with a lawn mower on the 27th July. The crop was at Zadoks growth stage Z27-Z29. Plots were cut to a height of ~8cm and the leaf material removed from plots.

An application of 145mL/ ha of Tebuconazole was applied to appropriate plots at GS Z32 on the 27/8/2010. This was applied by hand boom at 75L/ha water volume through TT01 nozzles @ 3 bar pressure. A second application of 145mL/ha of Tebuconazole was applied to appropriate plots on the 17/9/2010.

The crop was assessed for stripe rust infection at a number of stages throughout the trial.

The crop was harvested for grain yield and assessed for moisture, protein, screenings and test weight.

ANOVA was used to assess treatment affects on yield with the calculated LSD used to separate significant mean at the 95% confidence level.

## Results

A very low level of stripe rust infection was first observed on July 16. However the level of infection was slight and no consistent treatment effects were apparent.

There was no significant difference between treatments in dry matter yields taken on the 27th of July just prior to implementing the simulated grazing treatment.

Dry matter samples taken on August 30 showed the three non grazed treatments where significantly higher than grazed treatments. However, as expected there was no significant difference between the grazing treatments.

Leaf infection was monitored at a number of growth stages. Any effect of early treatments such as the tillering fungicide application or grazing was quickly diluted. The following graph was the leaf infection ratings on September 17, 56 days after grazing.

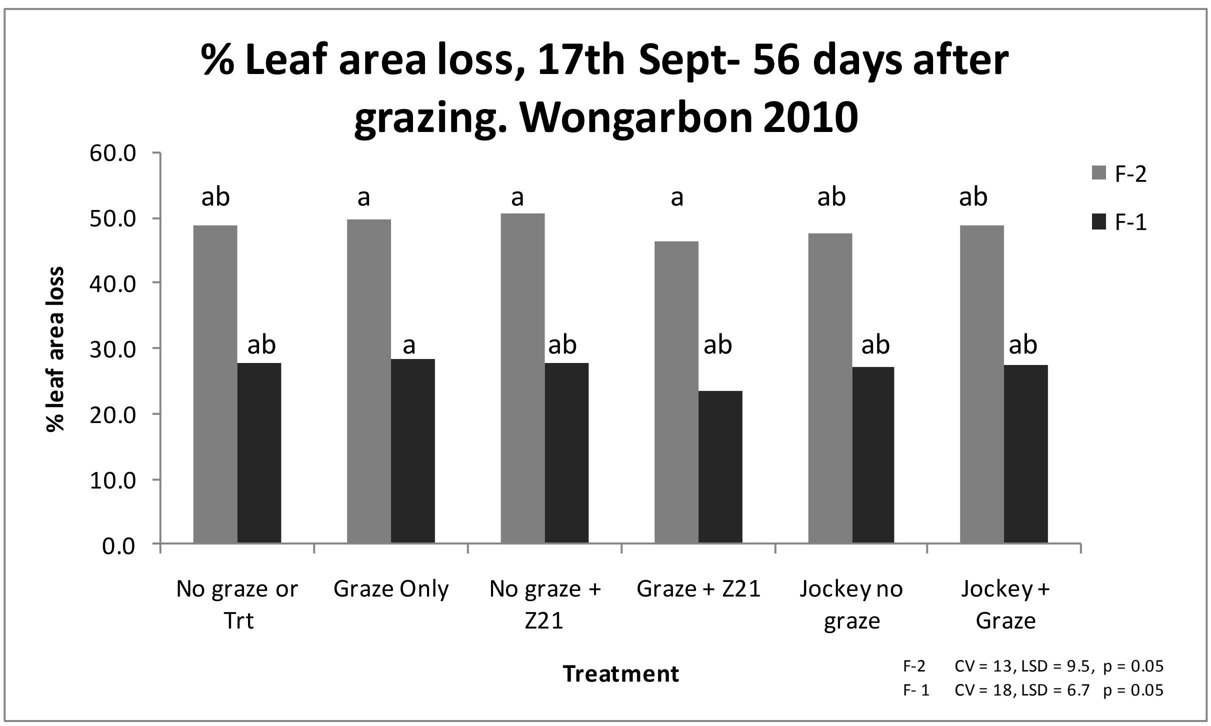

**Figure 1. Effect of treatments on leaf area loss to stripe rust infection on 17th September**

As can be seen there was no long lasting effect of any of the early treatments on leaf area infection.

Later leaf assessment results only demonstrated largely what would be expected with normal application of Z32 or Z39 fungicides sprays.

The yield results are obtained from the trial are outlined in Table 2 below.

**Table 2.** *Yields as a result of various treatments and their statistical significance by ANOVA and T tests, Wongarbon 2010*

| Treat | Summary | Mean Yield t/ha | a = 0.05 |
|---|---|---|---|
| 1 | Graze Only | 3.85 | CDE |
| 2 | No graze or Trt | 3.54 | E |
| 3 | No graze + Z21 | 3.94 | BCDE |
| 4 | Graze + Z21 | 4.00 | BCDE |
| 5 | Graze + Z21 + Z32 | 4.40 | ABC |
| 6 | Graze + Z21 + Z32 + Z39 | 4.76 | A |
| 7 | Graze + Z21 + Z39 | 4.46 | AB |
| 8 | Graze + Z32 | 3.90 | BCDE |
| 9 | Graze + Z32 + Z39 | 4.67 | A |
| 10 | Graze + Z39 | 4.25 | ABCD |
| 11 | Jockey + Graze | 3.73 | DE |
| 12 | Jockey no graze | 3.58 | E |
| 13 | Jockey Graze + Z32 | 3.83 | CDE |
| 14 | Jockey Graze + Z39 | 4.29 | ABCD |
| 15 | Jockey Graze + Z32 + Z39 | 4.34 | ABC |
| 16 | Jockey Graze + Z21 + Z39 | 4.38 | ABC |

**Discussion**

For consideration in the context of the following discussion it must be highlighted that

- This crop was sown 2-3 weeks later than most dual purpose crops would be sown in this district, this may have limited the time for disease build up.
- The onset of stripe rust in 2010 was later than often seen in this district, not only in this trial which may have been a result of the later sowing.
- The level of stripe rust present at the first fungicide spray was low. This may have been due to the late sowing or as previously mentioned environmental conditions.
- Only one simulated grazing was applied because of the shortened growing period.
- Rainfall in the later part of the crop cycle was significant, normally it is suggested this will increase both the likelihood and severity of yield loss from stripe rust.

From the initial observations of Yr incidence in this trial the treatment of seed with fluquinconazole (Jockey) has had no impact on the initial onset of stripe rust in 2010. This was further demonstrated in yield with a factorial analysis showing no significant difference in yield obtained with or without Jockey seed treatment ($\alpha = 0.05$).

When comparing a tillering fungicide spray with grazing, both treatments resulted in a significant improvement in yield. However, was this increase in yield related to Yr control or a reduction in canopy and therefore conservation in water for later in the season?

Factorial analysis of tillering sprays vs. grazing treatments indicates the later may be more likely.

**<u>Table 3.</u>** *Factorial analysis of grazing and/or tillering fungicide treatments upon yield, Wongarbon 2010.*

| Scenario | Tillering spray | Graze | Yield t/ha | Significance ($\alpha = 0.1$) |
|---|---|---|---|---|
| 1 | No | Yes | 4.1 | B |
| 2 | No | No | 3.56 | C |
| 3 | Yes | Yes | 4.39 | A |
| 4 | Yes | No | 3.94 | C |

Using the table above assuming the pre-grazing tillering spray was sufficient to control any Yr infection present at that time we can extrapolate the disease effects from other effects that grazing may have had such as canopy manipulation.

Considering scenarios 3 & 4, any Yr infection in both these treatments should have been controlled by the fungicide application. However, grazing in scenario 3 significantly increased yield by 0.45 t/ha which cannot be attributed to Yr control.

However, when comparing no treatments (fungicide or grazing) in scenario 2 with a combination of both grazing and fungicide application in scenario 3 there is a yield benefit of 0.83 t/ha. This is 0.29 t/ha greater than the effect of grazing alone (+0.54 t/ha in Scenario 1). This suggests a cumulative benefit of both controls options of grazing and fungicide application.

**Summary**

Although only based on one trial in one season the results of this trial appear to suggest that

- Any impact of grazing on yield (~0.5t/ha) is more attributed to other effects of the grazing than its effect on Yr control
- Early season Yr control did have an impact on yield in this trial (~0.3t/ha) and control did have some impact on yield but effective control was only offered through fungicide application not grazing.
- The best results where gained with a combined approach where both a fungicide and grazing treatment were applied.
- The response appeared to be additive with grazing increasing yield by 0.5t/ha and fungicide application by +0.3 t/ha so combined a total yield increase of 0.8 t/ha was achieved.

Further research in 2011, under higher levels of stripe rust infection commonly seen in earlier sown dual purpose wheat crops, is required to confirm the impacts observed in this trial of grazing and/or early season fungicide application on disease control and yield.

## References

Murray G, Wellings C, Simpfendorfer S and Cole C  (2005). Stripe Rust.: Understanding the Disease in Wheat. NSW Department of Primary Industries.

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