Septoria tritici blotch (*Zymoseptoria tritici*) in wheat – a comparison of early control methods, Hamilton, Victoria

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Key messages

- Dry conditions reduced the severity of septoria tritici blotch
- Timing of fungicide application did not affect (p<0.05) grain yield or quality
- Consider using seed or fertiliser fungicide treatment when grazing wheat early in the season
- Multiple fungicide applications using different active groups will reduce the risk of fungicide resistance developing in Zymoseptoria tritici
- Grazing can add feed value to the wheat crop and reduce disease pressure

INTRODUCTION

Septoria tritici blotch (STB), caused by the fungus *Zymoseptoria tritici*, will cause yield losses to susceptible wheat varieties under favourable conditions when left untreated. Favourable conditions are leaf wetness, caused by rain or heavy dew, and mild temperatures (<20 oC). As the disease has two parts to its disease cycle, sexual and asexual, wind and raindrops can spread the disease. This makes it difficult to control the disease in a wet year, making active control methods necessary.

The septoria fungus survives between seasons on infected stubble. A number of rainfall events over time leads to the sexual spores being released from the sexual fruiting bodies (perithecia) that have formed on the stubble. These spores are dispersed by wind travelling large distances. For an infection to occur the wheat leaf must remain wet for greater than 48 hours. Following infection, black fruiting bodies (pycnidia) form in infected lesions on the leaves, becoming evident in about 28 days. Asexual spores are slowly released from pycnidia when the leaf surface is wet and spores are dispersed by splashes to other leaves where they cause new infections.

Yield losses occur when STB infection reaches the upper canopy of the wheat plant. STB is a necrotrophic fungus, meaning it causes cell death in order to survive, grow and reproduce. This means infected leaves will have reduced green area, and therefore reduced photosynthesis and sugar production. This results in the plant having reduced yield potential. As the final three leaves (flag, flag-1, flag-2) to emerge in a wheat plant contribute the most to grain yield, keeping them infection free for as long as possible will reduce yield loss.

Managing secondary spread of STB due to the asexual spores can reduce the spread of disease through the canopy. Early disease control can reduce or delay the infection of the lower canopy, and the consequent spread of asexual spores to the upper canopy. Fungicides in the form of seed/fertiliser treatments and foliar sprays are the most common in-season control methods. The current triazole and strobilurin chemistries are most effective as preventative treatments, meaning they will stop new leaves from becoming infected. This is why flag leaf emergence (GS39) is a critical application timing as it is critical for yield.

Grazing is an option for in-season inoculum reduction in mixed farming enterprises. Planting a dual purpose wheat early will mean the plant is actively producing biomass during the winter feed gap. By grazing during the tillering growth stage, any leaves that have been infected by STB (the leaf can be infected but not yet showing symptoms) are removed. This reduces the inoculum for secondary spread through the canopy later in the season.

Ensuring as much disease inoculum is removed as possible through the use of different chemical groups and cultural methods, will reduce the risk of fungicide resistance. This can be done both within a season and between seasons. Within a season it is important to use more than one method of disease control, to prevent the build-up of potentially resistant fungal populations. This includes early, mid and late season control and does include using more than one chemical application.

The aims of this experiment were to:

- Determine if grazing alone can reduce STB disease pressure
- Determine how long flutriafol, applied to the fertiliser, can control STB into the season
- Assess the efficacy of the preliminary SDHI seed treatment to control STB
- Assess whether the effectiveness of early control with grazing or seed treatments is improved with a foliar application of the foliar fungicide Opera® (pyraclostrobin and epoxiconazole) at GS39 (flag leaf emergence)

METHOD

A randomised complete block design field trial was established at the SFS Hamilton cereal site on May 21 2015. The trial aimed to determine differences in STB disease severity and grain yield parameters as a consequence of different early season STB control methods (listed below). Beaufort wheat was sown and the following treatments were applied:

1. Untreated control
2. Untreated control plus Opera® 1 L/ha (pyraclostrobin and epoxiconazole) applied at GS39
3. Impact® (flutriafol 200 g/ha) coated MAP fertiliser at sowing at 100 kg/ha
4. Flutriafol coated MAP fertiliser at sowing at 200 kg/ha + GS39 Opera® application at 1 L/ha
5. SDHI ST (seed treatment)* at 150 mL/100kg
6. SDHI ST at 150 mL/100kg + GS39 Opera® application at 1 L/ha
7. Grazing simulation at GS22†
8. Grazing simulation at GS22 + GS39 Opera® application at 1 L/ha

**A preliminary SDHI (succinate dehydrogenase inhibitor) (active group 7) that is still at the research stage for STB control in wheat was used, and will be referred to as SDHI ST.*

†Grazing was simulated using a push lawn mower.

NB. All seed used in this trial had a base application of Hombre® (imidacloprid and tebuconazole) seed treatment, which is not registered for STB control.

Plant establishment counts were taken (20/07/15) six weeks post sowing. The grazing simulation (defoliation) occurred on the June 29 2015 when the plants reached GS22 (tillering). The first disease assessment was taken on September 10 at GS32 (stem elongation). Opera® was applied on September 24, just before GS39 (flag leaf emergence), covering half of the flag leaf. The final disease assessment was taken on October 27 at GS69 assessing the lower (leaves present at tillering), middle (leave between tillering leaves and upper three leaves), and upper canopy (top three leaves). Disease assessment was undertaken using a 1-9 scale (HGCA 2014) (1 being no disease infection, 9 being 100 per cent infection). The trial was harvested on January 7 2016.

RESULTS AND DISCUSSION

Septoria tritici blotch was observed throughout the tillering stage (GS20+) of the wheat. The initial disease assessment revealed significant ($p<0.05$) differences in STB levels between treatments. The control and simulated grazing treatments had significantly ($p<0.05$) higher disease severities than either chemical control (figure 1). Whilst this was expected in the control, grazing treatments have been shown to reduce STB in previous trials (Jon Midwood pers. comm. 2015).

Grazing removes inoculum through the removal of infected leaves, theoretically reducing disease pressure. This did not occur in this trial and was likely due to a number of factors; the push lawn mower (used to simulate grazing) spread disease and in the absence of chemical control at sowing (seed/fertiliser treatment), any remaining plant tissue was likely to already be infected with STB. This lead to increased disease as the plants recovered and symptoms began to show on the remaining plant tissue. This finding suggests, even with the intention of grazing a wheat crop, it is important to use either treated seed or treated fertiliser at sowing.

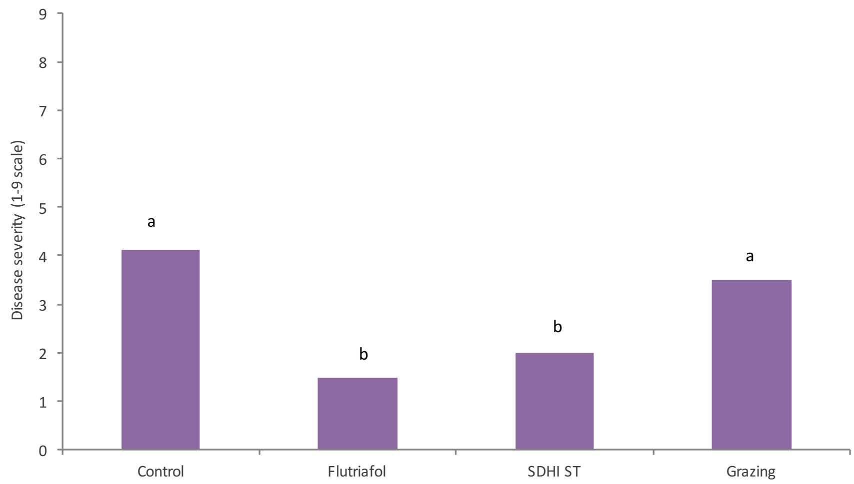

Figure 1. Disease assessments taken using a 1-9 scale (1= no STB, 9= 100% infection) at GS32 before foliar fungicide application at GS39. Means followed by the same letter do not significantly differ (LSD (p<0.05)= 0.7).

The wheat was sown late for a crop with an intended grazing element. Despite this, Beaufort yielded approximately 176 kg DM/ha (results not shown). As the crop was sown late and combined with a dry spring, the grazing treatment was not expected to yield as high as the other treatments. This was not the case, as no significant differences were observed for any yield parameters between the grazing and other treatments. Yields were, however, low for a plot scale trial in the area, yielding on average 4.7 ± 0.3 t/ha. This is reflective of the crop being sown late (for Beaufort) in a dry season. In a higher rainfall year a higher dry matter yield would be expected.

The middle canopy only had higher disease presence in the control and grazed treatments without a GS39 Opera® application. All other treatments had minimal to no STB (figure 2). This suggests that although the disease pressure was low, STB was still spreading from the lower to middle canopy in the absence of a foliar fungicide application. The SDHI ST and flutriafol treatments had initially low disease pressure, which did not increase throughout the experiment. This suggests that in a dry year using a SDHI seed treatment or flutriafol on the fertiliser will reduce the need for foliar fungicide applications throughout the season. However the season was well below average in terms of rainfall, so results would vary in a higher rainfall year.

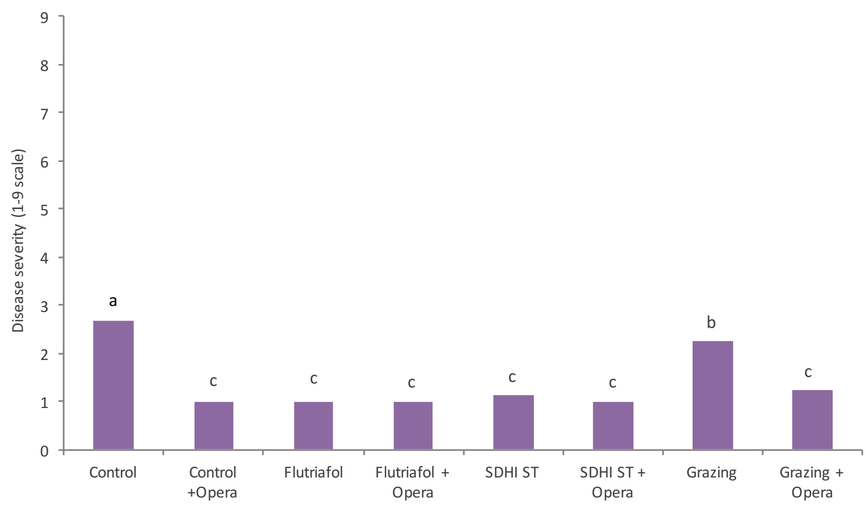

Figure 2. Disease assessments taken using a 1-9 scale (1= no STB, 9= 100% infection) at GS69 after the foliar fungicide application at GS39. Means followed by the same letter do not significantly differ (LSD (p<0.05)=0.4).

The SDHI ST treatment was not significantly different from the flutriafol fertiliser treatment for any measurements taken throughout the trial. This suggests, in this particular season, the SDHI seed treatment performed as well as the commonly used flutriafol fertiliser treatment. If the SDHI seed treatment (group 7) is released for use against STB in wheat, it could provide an extra active group to alleviate fungicide resistance pressure of group 3 (triazole) fungicides.

CONCLUSION

Low STB was observed across all treatments, which was a reflection of the below average rainfall during the growing season at Hamilton in 2015. Despite the control and grazing treatments having higher disease pressure, the three upper leaves were never infected and therefore no grain yield differences were observed. The trends observed in this experiment might be similar in a higher rainfall year, thus a similar trial should be replicated to see any true effects of the early disease control measures.

The biomass harvested from the trial at the time of simulated grazing (GS22) was low. This is because the mid-long season wheat variety Beaufort was sown too late (late May) for a dual purpose wheat. In an ideal situation, a dual-purpose wheat should be sown early (around April) using a long season wheat. Trends in disease prevalence also suggest using a seed or fertiliser treatment may be necessary even when the crop is going to be grazed during tillering.

Finally, the SDHI seed treatment had similar performance to the flutriafol on the fertiliser at sowing. If this chemistry becomes available to control STB in wheat, it will provide an extra active group chemistry to help prevent fungicide resistance developing in STB. The application of a foliar fungicide (Opera®) at GS39 also reduced observable disease. In a higher rainfall season its effects may be greater. This suggests that multiple fungicides applications throughout the season may be necessary to reduce STB spread through the canopy.

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