Developing management practices for septoria tritici blotch in wheat for medium rainfall zones

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Key findings

- Seasonal conditions at Hart in the 2021 growing season were not conducive to septoria tritici blotch disease development.
- Fungicide applications for septoria tritici blotch management were not economical in the trials conducted at Hart in 2021.

Why do the trial?

Septoria tritici blotch (STB) is a foliar fungal (*Zymoseptoria tritici*) disease in wheat that is prevalent in high rainfall environments (GRDC 2020). Septoria tritici blotch survives on wheat stubble, causing disease in wheat crops through the infection of windborne spores in following cropping years. In seasons found to be suitable for the rapid development of STB, wheat yield losses of up to 20 – 60% have been experienced (GRDC 2014, GRDC 2020).

Variety selection has shown a considerable influence on the control of STB in wheat during a given growing season (GRDC 2014). Varieties with higher resistance ratings, like Sunlamb, rated moderately resistant (MR), tend to experience lower levels of wheat grain yield loss than varieties rated susceptible (S), like Scepter. Previous research has shown that varieties with an increased resistance rating to STB will assist in reducing inoculum load and reduce the risk of infection and yield loss in following seasons (Milgate 2020).

Fungicides have proven to be a valuable tool when managing STB in crops, managing the effects of disease on crop yield potential. Current management practices have been developed for the high rainfall zone (HRZ), consisting of multiple fungicide applications within one growing season. Fungicide Mode of Action groups are also commonly rotated to manage disease resistance due to the high potential of mutation for STB, forming resistance to fungicides, similar to other foliar diseases, like rust (CropLife 2021).

More recently, STB prevalence has increased across the low (LRZ) and medium rainfall zones (MRZ). This is likely to have occurred as a result of conducive conditions beginning in the early 2010's, establishing high background levels of inoculum due to high rainfall events across multiple seasons (Milgate 2020). In addition to these higher levels of inoculum, varieties with low levels of genetic resistance to STB that are commonly grown across the low and medium rainfall zones, have contributed to the increase in occurrence of disease infection.

The aim of this trial is to develop integrated disease management strategies for STB in low and medium rainfall zones through variety and fungicide management strategies. Two trials were conducted at Hart in 2021 for this purpose. Trial sites were also located at Booleroo Centre in South Australia, as well as Horsham, Hamilton, Watchupga, and Longerenong in Victoria.

How was it done?

Plot size	1.75 m x 10.0 m	**Fertiliser**	DAP (18:20) + 1% Zn + Impact @ 80 kg/ha
Seeding date	June 1, 2021		Easy N (42.5:0) 70 L/ha on June 12, 2021
Location	Hart, SA		Easy N (42.5:0) 70 L/ha on August 20, 2021
Harvest date	November 29, 2021		

Two trials were conducted at Hart in 2021 to investigate fungicide timing on crop yield losses and variety resistance (Table 1 and 2). Trials were managed with the application of pesticides to ensure a weed and insect free canopy. All plots were assessed for grain yield (t/ha), protein (%), test weight (kg/hL), screenings (%) and disease severity (%).

Trials were inoculated with STB on August 4 and 20 using a hand-held sprayer containing a mixture of water and STB spores. The solution was applied to all + disease plots in the variety resistance trial and all plots in the fungicide timing trial, in cool and damp conditions, conducive for the infection of septoria (GRDC 2020).

The variety resistance trial was a randomized split plot design with six replicates, six varieties and two treatment blocks +/- disease. To reduce the spread of disease across treatment blocks, barley buffer plots were sown between each block of wheat.

Table 1: Varieties trialed in the STB variety resistance trial with maturity and genetic resistance rating.

Variety	Maturity	Resistance Rating to STB
LPRB Impala	Mid	SVS
Scepter	Mid	S
Hammer CL Plus	Quick-mid	MSS
LPRB Lancer	Mid-slow	MS
Orion	Mid-slow	MRMS
Sunlamb	Very slow	MR

VS = Very susceptible, SVS = Susceptible – very susceptible, S = Susceptible, MSS = Moderately susceptible – susceptible, MS = Moderately susceptible, MRMS= Moderately resistant – moderately susceptible

The fungicide timing and grain yield loss trial was a randomised complete block design with six replicates and six treatments. Barley buffer plots were included between each plot to reduce the potential drift of fungicide at application. The trial was sown to Scepter, a susceptible variety to STB.

Table 2: Fungicide treatments trialed in the fungicide timing and grain yield loss trial.

Treatment Timing	Fungicide Actives	Fungicide Groups
Nil	-	-
Seed treatment	Fluquinconazole	3
Foliar spray @ GS31	Benzovindiflupyr + Propiconazole	7 + 3
Foliar spray @ GS39	Epoxiconazole	3
Foliar spray @ GS31 + GS39	Benzovindiflupyr + Propiconazole @ GS31 + Epoxiconazole @ GS39	7+3 3
Seed treatment + foliar @ GS39	Fluquinconazole + Epoxiconazole	3 + 3

Results and discussion

2021 season at Hart

The growing season at Hart in 2021 received below average rainfall with a dry start to the season, followed by a dry spring finish (Mesonet rainfall at Hart, Figure 1). This influenced disease pressure as well as crop yield potential and performance.

Throughout many regions of the Mid-North, crops emerged late due to below average rainfall between April – May (41.4 mm). This saw slow crop growth and plant vigour as crops emerged later into cooler conditions.

As opening rains were delayed, so was the STB infection in crops. A conducive environment did not present until July, which provided humid conditions and above average rainfall.

Following the inoculation of trials on August 4 and 20, temperatures were low, which resulted in very slow disease development in trial plots (Tables 3 & 4). In addition to low temperatures, rainfall from mid-August was minimal, resulting in the reduction and spread of STB disease.

Overall, conditions in 2021 were not conducive for the development of STB. Rainfall and temperature trends, in addition to later establishment of crops reflected low disease levels observed.

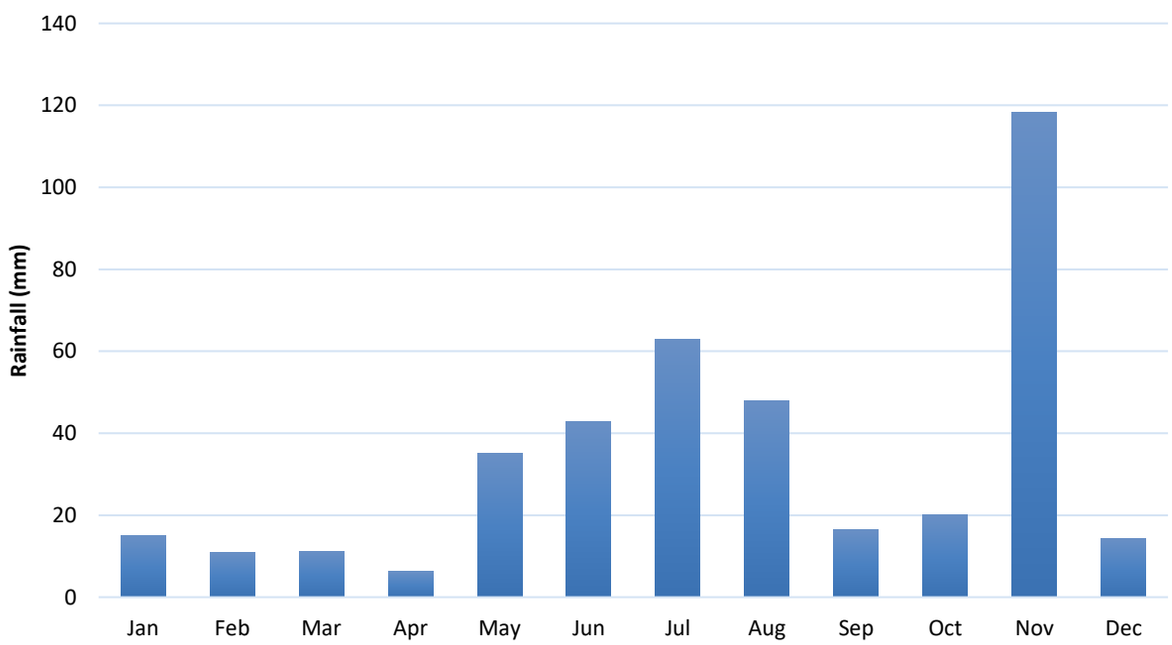

Figure 1: Hart rainfall data from Mesonet station, total annual rainfall 401 mm, growing season rainfall April-October 231.6 mm.

Variety resistance

Susceptible variety Scepter and SVS variety Impala had the highest disease severity levels in the variety resistance trial (Table 2). Despite whole plant severity averaging out to 11.3% in Impala and 8.7% in Scepter there was no infection on the flag leaves and less than 0.1% infection on flag-1 leaves for + disease plots.

Grain yields at Hart were slightly higher in the -disease plots compared to +disease plots (Figure 1). However, no significant differences were found in the GenStat data analysis. Therefore, the disease development of STB throughout the 2021 growing season at Hart was not at a high enough level to cause yield losses in any of the varieties in the trial regardless of resistance rating.

Table 3: STB average disease severity of whole plants at Hart Field Site in 2021.

Rating	Variety	Average disease severity %	
		+ Disease	- Disease
SVS	Impala[a]	11.3	0.0
S	Scepter[a]	8.7	0.0
MSS	Hammer CL Plus[a]	2.2	0.0
MS	LRPB Lancer[a]	1.7	0.0
MRMS	Orion[a]	1.1	0.0
MR	Sunlamb[a]	0.1	0.0

Varieties with the same letters are not significantly different.

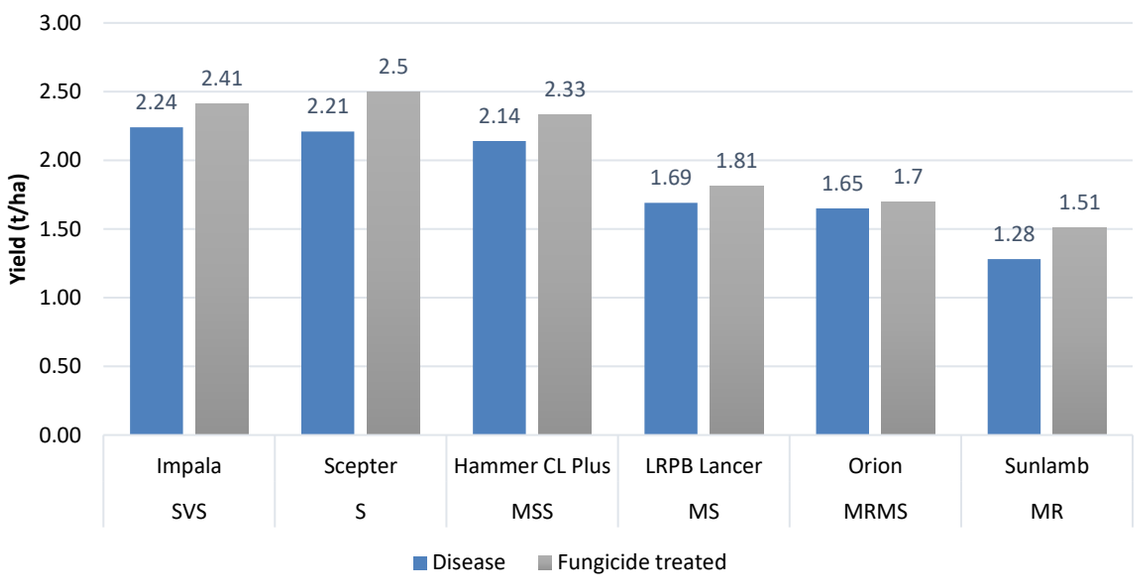

Figure 2. Average yield losses associated with STB at the Hart Field Site in 2021, no significant differences were detected.

Fungicide timing and grain yield loss

Disease severity in the fungicide timing trial was at a similar level to the variety trial with treatments varying from 1.6% in the foliar spray @ GS31 + GS39 and 9.5% in the nil treatment and foliar spray at GS39 (Table 3). Grain yields from the trial had no significant differences between treatments, indicating that in the 2021 growing season at Hart, fungicide timing was not critical for disease control.

Table 4. STB average disease severity of whole plants in fungicide timing trial at Hart 2021.

Treatment	Average disease severity %
Nil	9.5
Seed treatment	9.0
Foliar spray @ GS31	2.8
Foliar Spray @ GS39	9.5
Foliar spray @ GS31 + GS39	1.6
Seed treatment + foliar @ GS39	7.2

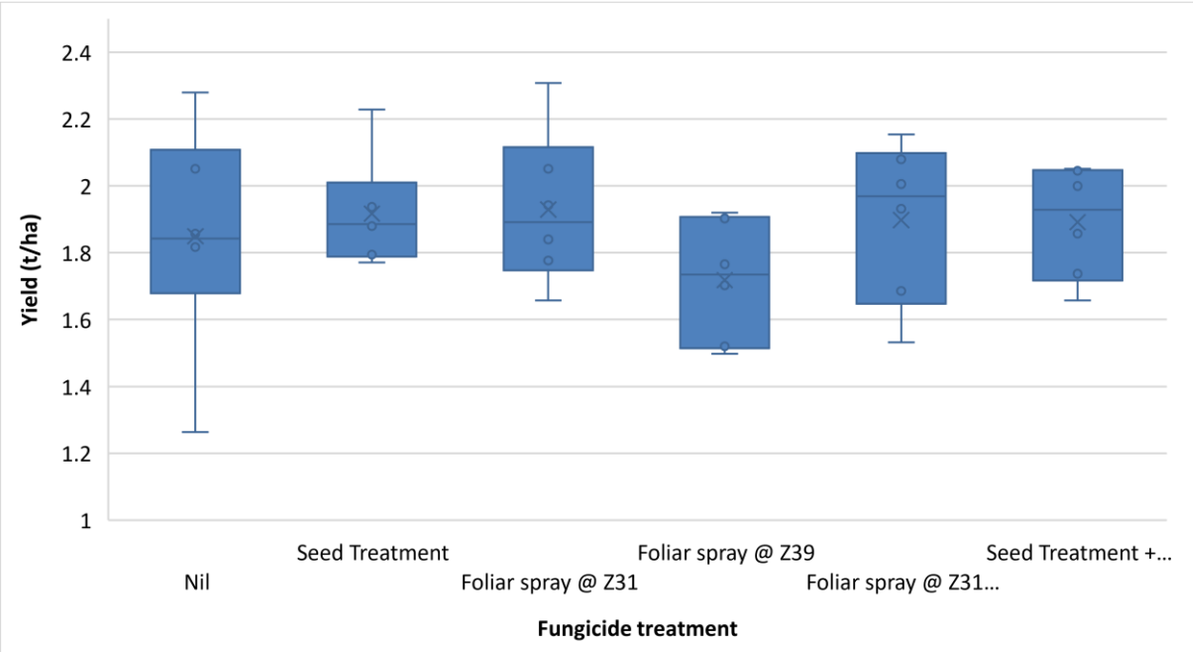

Figure 3: Grain yield of the STB fungicide timing trial at Hart 2021 yield data. No significant differences were detected.

Summary

Overall, the data from the 2021 trials at Hart illustrated that the growing season was not conducive for disease development and that fungicide applications were not an economical management strategy. These trials will continue for another two seasons at the Hart Field Site and provide insight into the economics of fungicide sprays over multiple seasons.

Acknowledgements

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