Management strategies for Septoria tritici blotch (STB) in wheat in the medium and low rainfall zones of Southern Australia: Variety selection

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A major tool in the management of STB is the selection of resistant cultivars. An improved understanding of the relative risk posed by wheat cultivars with contrasting resistance /susceptibility to STB will enhance in-crop decision making regarding the economics of fungicide use and assist growers in at risk areas/seasons in selecting the most suitable cultivars to minimise disease.

Aim

To evaluate the impact of Septoria tritici blotch on wheat of different resistant ratings and determine yield loss in the MRZ and LRZ of the Southern Australia

Methods

Four field experiments were conducted during 2021 to evaluate yield and quality loss in wheat cultivars with contrasting resistance/susceptibility to STB. One experiment each was conducted in the MRZ and LRZ regions of both Victoria and South Australia. Each experiment had six commercial wheat varieties with different resistance/susceptibility to STB. Two treatments; 1) Maximum disease and 2) Minimum disease were applied to each wheat variety with six replications and arranged in split plot designs with treatment considered as the main plot and varieties as subplots.

Plots were visually assessed for STB severity on multiple occasions during the growing season. Grain was harvested at the end of season using a plot harvester. A sub-sample from each plot was used for grain quality testings such as protein percentage, screenings (percentage of grain less than 2.2 mm in width), retentions (percentage of grain greater than 2.5 mm width) and grain weight. All data was analyzed by ANOVA using Genstat.

Trial details

Locations:

Location	Rainfall zone	Soil type	Growing season rainfall (mm)
Longerenong (VIC)	MRZ	Clay	262
Hart (SA)	MRZ	Clay loam	231
Watchupga (VIC)	LRZ	Sandy clay	172
Booleroo (SA)	LRZ	Red loam	217

Treatments:

1. Minimum disease – Seed + foliar applied fungicides at Z31 and Z39
2. Maximum disease - No disease control with 1 Kg STB infected wheat stubble or inoculated with spore inoculum at a concentration of > 10,000 spores/mL

Varieties:

Variety	Rating[#]
Sunlamb	MR
Orion	MRMS
LRPB Lancer	MS
Hammer CL Plus	MSS
Scepter	S
LRPB Impala	SVS

[#]*MR: Moderately resistant; MRMS: Moderately resistant to moderately susceptible; MS: Moderately susceptible; MSS: Moderately susceptible to susceptible; S: Susceptible; SVS: Susceptible to very susceptible*

Trial design: Split plot design
Replicates: 6

Sowing and harvest details:

Location	Rainfall zone	Sowing date	Sowing rate (plants/m^2)	Harvest date	Trial average yield (t/ha)
Longerenong (VIC)	MRZ	29th April 2021	150	21st December 2021	5.5
Hart (SA)	MRZ	1st June 2021	150	29th November 2021	2
Watchupga (VIC)	LRZ	7th May 2021	150	29th November 2021	3
Booleroo (SA)	LRZ	29th May 2021	150	30th November 2021	1

Trial inputs: UREA and MAP applied and managed as per best practice and kept weed and pest free.

Chemical applications:

Fungicide application timing	Product	Active ingredient (gai/L)[#]	Rate
Seed	Jockey Stayer®	Fluquinconazole 167g/L	300 mL/100 Kg seed
Foliar at Z31	Elatus Ace® *	Benzovindiflupyr 40g/L + Propiconazole 250 g/L	500 mL/ha
Foliar at Z39	Opus 125® [a]	Epoxiconazole 125 g/L	500 mL/ha

[#] gai = grams active ingredient

**Aviator® Xpro® (Prothioconazole 150 g/L + Bixafen75 g/L) at the rate 500 mL/ha at Z31 and Elatus ace® at Z39 was foliar applied at Watchupga*

[a]Opus 125® is not registered for Septoria tritici blotch control and is used for trial purpose only

Results

Relative STB severity in each variety corresponded with resistance status in all locations except at Booleroo, LRZ of SA where no STB developed (Tables 1, 3, 4 & 5). The suppression in STB levels in the partially resistant varieties demonstrates that avoiding susceptible varieties in these regions would be adequate to manage STB.

STB severity also varied with the locations during 2021. Moderate to severe STB developed in the MRZ regions of Vic (Longerenong) and SA (Hart) whereas the LRZ regions (Watchupga, Vic and Booleroo, SA) recorded very low to zero levels of STB.

At Longerenong site, higher severity in the susceptible varieties Scepter and LRPB Impala caused 8 and 7% of grain yield losses, respectively (Table 1). Further, grain quality of LRPB Impala, Hammer CL Plus and LRPB Lancer was marginally affected (Table 2). Grain screenings of the resistant variety Sunlamb increased, however, the reason for this was unclear as there was no significant difference between treatments for STB severity. Severity levels at Hart site were not sufficient to cause yield or quality loss (Table 4).

Above average rainfall during the spring at Longerenong provided suitable conditions for STB development and infection on the top three leaves during the grain fill (Figure 1) hence the yield and quality losses. In contrast, conditions were not very conducive for STB infection in the LRZ regions in either state where only low levels of STB developed and no yield or quality loss measured, even in the susceptible varieties Scepter and LRPB Impala (Table 3 & 5). Data on quality from LRZ trials was not shown as treatments showed no significant difference.

Figure 1: Images displaying the symptoms of Septoria tritici blotch in Wheat at Hamilton (HRZ), Victoria during 2021. The infection on top three leaves can result in yield reductions.

Table 1: Septoria tritici blotch severity (% leaf area affected) and grain yield (t/ha) of six wheat varieties treated with low and high disease levels at Longerenong (MRZ), Victoria during 2021

Variety	Rating	Severity (%LAA) in Max.^ treatment			Grain yield (t/ha)		Yield loss %
		29-Jul, Z25-31#	31-Aug, Z37	25-Oct, Z69-75##	Min.	Max.	
Sunlamb	MR	0^{a}	5^{b}	0^{a}	5.1	5.2	-
Orion	MRMS	1^{ab}	1^{a}	8^{bc}	5.3	5.3	-
LRPB Lancer	MS	1^{bc}	7^{c}	6^{b}	5.8	5.6	-
Hammer CL Plus	MSS	2^{c}	12^{d}	11^{c}	5.3	5.3	-
Scepter	S	2^{d}	24^{e}	49^{d}	6.8	6.2**	8
LRPB Impala	SVS	2^{d}	27^{f}	56^{e}	5.8	5.4**	7
P		<0.001	<0.001	<0.001	-	-	
LSD (0.05)		0.4	1.2	2.4	-	-	

*** = statistically significant at 1%; ^Max = Maximum disease; Min. = Minimum disease*

 # Average of single plot assessments; ## Average of the top three leaves of ten tillers per plot

Table 2: Grain quality of six wheat varieties treated with low and high levels of STB at Longerenong (MRZ), Victoria during 2021

Variety	Rating	Protein (%)		Screenings (%)		Retention(%)		1000GW	
		Min.	Max.^	Min.	Max.	Min.	Max.	Min.	Max.
Sunlamb	MR	13	13	5.1	5.9*	72.1	70.7	32.4	32.2
Orion	MRMS	11	11	7.0	7.4	78.0	77.1	35.3	34.9
LRPB Lancer	MS	12	12	6.5	7.3	83.5	80.7*	36.4	33.8**
Hammer CL Plus	MSS	13	13	3.8	4.2	90.8	89.5*	40.6	39.2
Scepter	S	12	12	8.4	8.8	87.9	86.6	42.4	40.1
LRPB Impala	SVS	13	13	3.6	4.4*	88.5	86.0	41.8	41.2

** = statistically significant at 5%; ** = statistically significant at 1%*

^Max. = Maximum disease; Min. = Minimum disease

Table 3: Septoria tritici blotch severity (% leaf area affected) and grain yield (t/ha) of six wheat varieties treated with low and high disease levels at Watchupga (LRZ), Victoria during 2021

Variety	Rating	Severity (% LAA) in Max.^ treatment			Grain yield (t/ha)	
		28-July, Z25-31#	2-Sep, Z39-49	06-Oct, Z61-71##	Min.	Max.
Sunlamb	MR	0	1^{a}	0^{a}	3.2	3.0
Orion	MRMS	0	0^{a}	1^{b}	3.0	2.7
LRPB Lancer	MS	0	2^{b}	1^{ab}	2.5	2.7
Hammer CL Plus	MSS	0	4^{c}	2^{b}	3.0	2.8
Scepter	S	1	9^{d}	4^{c}	3.2	3.0
LRPB Impala	SVS	1	10^{e}	4^{c}	2.8	2.9
P		-	<0.001	<0.001	-	-
LSD (0.05)		-	0.5	0.9		

 # Average of single plot assessments; ## Average of the top three leaves of ten tillers per plot

^ Max. = Maximum disease; Min. = Minimum disease

Table 4: Septoria tritici blotch severity (% leaf area affected) and grain yield of six wheat varieties treated with low and high disease levels at Hart (MRZ), SA during 2021

Variety	Rating	Severity (% LAA) in Max.^ treatment	Grain yield (t/ha)	
		21 Sep Z33-71#	Min.	Max.
Sunlamb	MR	0[a]	1.5	1.3
Orion	MRMS	1[a]	1.7	1.7
LRPB Lancer	MS	2[a]	1.9	1.7
Hammer CL Plus	MSS	2[a]	2.3	2.1
Scepter	S	9[b]	2.5	2.2
LRPB Impala	SVS	12[c]	2.4	2.2
P		<0.001	-	-
LSD (0.05)		1.1	-	-

#Average of ten tillers per plot; ^Max. = Maximum disease; Min. = Minimum disease

Table 5: Septoria tritici blotch severity (% leaf area affected) and grain yield of six wheat varieties treated with low and high disease levels at Booleroo (LRZ), SA during 2021

Variety	Rating	Severity (% LAA) in Max.^ treatment	Grain yield (t/ha)	
		12 Oct Z55-71#	Min.	Max.
Sunlamb	MR	0	0.5	0.4
Orion	MRMS	0	0.6	0.6
LRPB Lancer	MS	0	0.7	0.7
Hammer CL Plus	MSS	0	1.7	1.6
Scepter	S	0	1.6	1.5
LRPB Impala	SVS	0	1.6	1.7
P		-	-	-
LSD (0.05)		-	-	-

 # Average of ten tillers per plot; ^Max. = Maximum disease; Min. = Minimum disease

Conclusion

STB has become a common foliar disease of wheat in both the MRZ and LRZ of both Vic and SA supported by both susceptible cultivars and stubble retention. In the Victorian MRZ yield losses of up to 8% were measured in susceptible varieties due to STB. No loss was measured in the four cultivars that had STB ratings better than susceptible showing the benefit in avoiding highly susceptible cultivars. No yield loss was measured in the SA MRZ or in the LRZ in either Vic or SA. However, in these experiments the disease development was lowest when susceptible varieties were avoided. Therefore, avoiding susceptible and very susceptible varieties in the MRZ and LRZ would be adequate to reduce the potential loss from STB should suitable conditions occur.

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