Best Practice Fungicide Management for Bannister Oats in the Medium and High Rainfall Zones of Western Australia

Ashton Gray[1], Geoff Thomas[2], Garren Knell[1].

[1]ConsultAg, Narrogin; [2]DAFWA, South Perth

Contact: Ashton Gray, Ph. 0429 930 074, Email: ashton@consultag.com.au

Key Messages

- Foliar fungicide can reduce the severity of Septoria blotch in Bannister oats.
- Application at or around flag leaf emergence seems most effective for disease control and yield response.
- Yield responses of up to 600kg/ha were achieved in a high yielding environment.
- Multiple applications of fungicide can add benefit under high disease pressure, with the first application at stem extension allowing some flexibility in the timing of the second application.
- Growers in medium to high yielding environments should consider a two spray strategy if growing Bannister (or other susceptible varieties) oats on oat stubble.
- Seasonal conditions from grain fill to harvest have significant impact on fungal grain staining but applying late fungicides to reduce grain staining was an unreliable method to reduce overall staining on seed.
- An economic return of up to $215/ha was achieved with the improved yield and grain quality achieved from a double fungicide spray at the commencement of stem elongation and flag leaf emergence.

Background and Aims

In 2013 a number of growers who delivered Bannister oats for grain had truck loads rejected due to severe grain discoloration caused by Septoria blotch on the seed. Bannister is rated as susceptible to Septoria. 2013 was the first commercial season for Bannister oats, and growers and consultants observed a great deal of Septoria on the leaves and grain. The Great Southern region experienced a very wet spring in 2013 and these conditions were very conducive for the development and spread of the disease.

The aims of this paper are to:

- Determine the best practice fungicide management for Septoria blotch (Septoria avenae) in Bannister oats in the medium to high rainfall zones where its adoption is expected to increase dramatically.
- Determine if foliar fungicides effectively reduce Septoria blotch on grain.
- To evaluate the economic return from applying fungicide to Bannister oats for the control of Septoria blotch.

Method

Two trial sites were selected in commercial Bannister oat crops in the high (West Highbury) and medium (Wagin) rainfall zones to assess fungicide timing for Septoria control. Both sites were grown on oat stubbles to increase the overall disease pressure. Spray applications (400ml/ha Tilt 250EC) were applied over a 5 week period from the 13th August 2014 through to the 17th September 2014, the plant growth stages were recorded at the time of each application. Single and double spray strategies were adopted to determine to optimum timing. Plots were 15m x 5m and fungicide treatments were applied to each plot in two passes with a 2.5m hand boom with a water rate of 100l/ha.

Septoria severity was assessed on the flag and flag-1 leaves to determine the overall level of disease on the yield contributing leaves. The plots were harvested on the 8 December 2014 using a plot header and individual plot yields recorded and grain quality was assessed on harvested grain. Statistical analysis (ANOVA) was conducted using Genstat to determine differences between treatments

Table 1: Dates and growth stages of treatment application.

Spray Dates	Wagin	Highbury
13/08/2014	Z32-38	Z32-37
27/08/2014	Z43	Z42
17/09/2014	Z57	Z55
Growing season rainfall 2014	298mm	393mm
Historical average growing season rainfall	353mm	410mm

Results

Fungicide timing had a significant impact on the severity of leaf blotching caused by Septoria avenae ($P < 0.05$) at Wagin and Highbury. All treatments reduced severity on Flag-1 and application at Flag leaf or later significantly reduced severity on Flag leaf. The most effective strategy to protect the flag and flag-1 was a double spray approach with the first application at stem elongation and second application between flag leaf emergence to head emergence.

Table 2: Effect of fungicide application on Septoria avenae severity in Bannister oats at Highbury and Wagin in 2014

Fungicide Timing	Wagin: Septoria severity (% leaf area affected)		Highbury: Septoria severity (% leaf area affected)	
	Flag	Flag-1	Flag	Flag-1
Untreated Control (UTC)	16.9	23.9	16.9	29.1
Propiconazole 400mL/ha Z32	14	17.4	15.5	23.3
Propiconazole 400mL/ha Z42	10.4	12.8	9	16.1
Propiconazole 400mL/ha Z32 & Z42	5.9	13.4	1.1	6.2
Propiconazole 400mL/ha Z55	8.8	9.3	9.4	14.3
Propiconazole 400mL/ha Z32 & Z55	3.9	6.7	1.6	4.3
p	<0.001	<0.001	<0.001	<0.001
lsd	3.55	3.87	3.6	3.9

Yield

There was a significant yield response to fungicide timing at the Highbury trial site ($p<0.05$) (Figure 1). All sprays except the single Z55 application significantly increased yield above the UTC (untreated control). There was no significant yield response to fungicide treatment at the lower yielding (UTC 3700kg/ha) Wagin site.

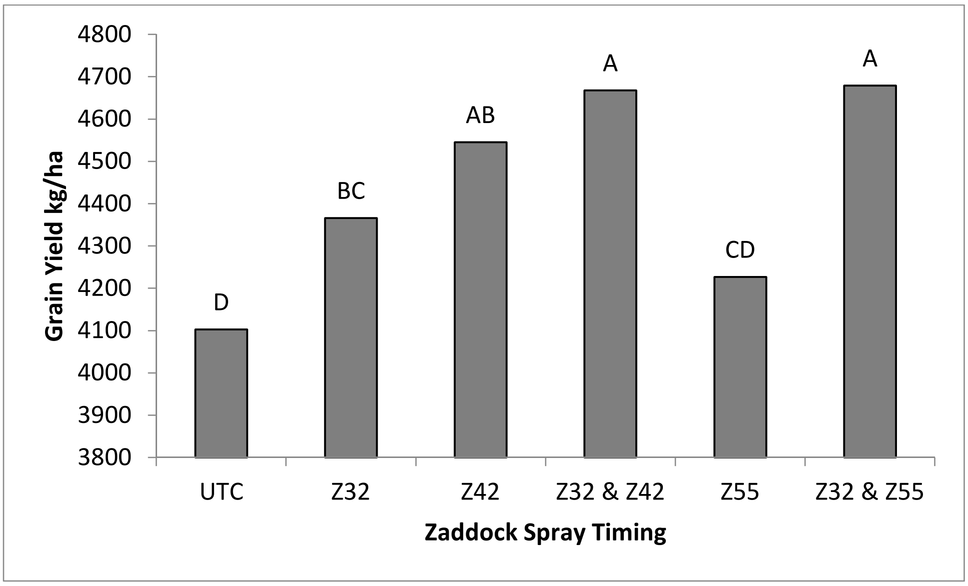

Figure 1. Effect on fungicide on grain yield at Highbury site.

Grain Quality

At the Highbury site there was a significant (*P<0.05*) impact of fungicide timing on grain staining, which reached 3.3% incidence in the untreated control. Flag leaf application and both double fungicide application treatments significantly reduced the incidence of grain staining to meet Oat 1 classification. There was no significant difference in grain staining between fungicide treatments at the Wagin site. The incidence of staining was very high, ranging from 15-25% at this site. Oat grades were based on grain staining standards set by CBH, if stained grain exceeded 15 grain per sample it was downgraded to Oat 2

Table 3: Effect of fungicide application on grain quality in Bannister oats at Wagin in 2014

Treatment Description	Moisture (%)	Protein (%)		% Stained grain	Grade
Untreated Control	12.1	7.9	*a*	16	Oat 2
Propiconazole 400mL/ha Z32	12.1	7.5	*bc*	21	Oat 2
Propiconazole 400mL/ha Z43	12.2	7.5	*bc*	20	Oat 2
Propiconazole 400mL/ha Z32 & Z43	12.2	7.7	*abc*	25	Oat 2
Propiconazole 400mL/ha Z57	12.2	7.8	*ab*	15	Oat 2
Propiconazole 400mL/ha Z32 & Z57	12.3	7.4	*c*	20	Oat 2
l.s.d.	*NS*	*0.32*		*NS*	*As per CBH*
c.v.	*NS*	*2.8*		*NS*	*standards for*
f-prob.	*NS*	*0.019*		*NS*	*Stain*

Table 4: Effect of fungicide application on grain quality in Bannister oats at Highbury in 2014.

Treatment Description	Moisture (%)	Protein (%)	% Stained grain	Grade
Untreated Control (UTC)	10.9	7.6	3.3 a	Oat 2
Propiconazole 400mL/ha Z32	10.9	7.6	2.1 ab	Oat 1
Propiconazole 400mL/ha Z42	11.0	7.5	1.4 b	Oat 1
Propiconazole 400mL/ha Z32 & Z42	10.9	7.4	1.2 b	Oat 1
Propiconazole 400mL/ha Z55	10.8	7.5	2.3 ab	Oat 2
Propiconazole 400mL/ha Z32 & Z55	10.9	7.5	1.2 b	Oat 1
l.s.d.	*NS*	*NS*	*1.3*	*As per CBH*
c.v.	*NS*	*NS*	*46.8*	*standards for*
f-prob.	*NS*	*NS*	*0.028*	*stain*

Economic Analysis

The economic analysis indicated that the two spray approach, at stem elongation and again at flag leaf emergence offered a positive return on investment at both sites even though the yield at Wagin was not significant. At the Highbury site the downgrades of grain into the Oat 2 segregation in the untreated control and Z55 (head flush) penalized the price received for grain, in addition the additional yield coupled with grain quality in the Z32, Z43, Z32 &Z42 and Z32 & Z55 treatments resulted in monetary gains between $140-$215/ha.

Table 5. Economic analysis of fungicides for Septoria control at Wagin & Highbury site.

Treatment	Wagin				Highbury			
	Grade	Yield	Net $/ha	Gain $/ha	Grade	Yield	Net $/ha	Gain $/ha
Untreated Control	Oat 2	3.7	814.2	0	Oat 2	4.1	902.5	0
Propiconazole 400mL/ha Z32	Oat 2	3.7*	813.8	-0.4	**Oat 1**	4.2*	1050.7	148.2
Propiconazole 400mL/ha Z43	Oat 2	3.7*	806.9	-7.4	**Oat 1**	4.4*	1094.1	191.6
Propiconazole 400mL/ha Z32 & Z43	Oat 2	3.8*	825.7	11.5	**Oat 1**	4.5*	1115.9	213.4
Propiconazole 400mL/ha Z57	Oat 2	3.4*	736.4	-77.8	Oat 2	4.1*	894	-8.5
Propiconazole 400mL/ha Z32 & Z57	Oat 2	3.6*	773.9	-40.3	**Oat 1**	4.5*	1118.7	216.2

There was a high level of disease potential at both sites given they were grown on oat stubbles which would have been hosting inoculum. The efficacy of double spray strategy in these trials suggests that where oats are grown under high disease pressure (oats on oats) and infection occurs from stem extension, a two spray strategy at stem extension followed by a second spray at flag emergence can be an economic practice. In lower disease situations where disease enters the canopy later in the season then an application at flag leaf will protect these leaves and can provide a yield benefit. Greater rain following flag leaf spray meant more available moisture to favour the development of the disease on unprotected leaves.

Fungicide had a significant impact on disease expression on the Flag and Flag-1 leaves at both sites, although disease severity on these leaves was low-moderate at the time of rating. All applications reduced disease with later applications (Z43-57) or multiple applications giving greatest level of disease suppression on these leaves. Rainfall patterns at both sites suggest that the period of most significant rainfall was following the flag leaf application, in which case both the stem extension and flag leaf sprays would have provided protection against infection developing in the lower and mid-canopy. The later sprays limited disease build-up during grain fill, however seasonal conditions were drier at this time and this was not reflected in yield response.

Similar trends in yield response to fungicide application were evident at both sites, although the results were significant only at Highbury, which received slightly more in-season rainfall, particularly after flag leaf fungicide application. The softer finish at the Highbury site enabled the fungicide protected leaves to contribute to yield, and a 600kg/ha yield response was achieved at this site. Greatest yield response was evident in the flag leaf application or multiple fungicide applications. The single spray at half head emergence was not effective in providing significant yield benefit. The relative yield benefit accrued by the Z32 or Z43 sprays suggests that mid-canopy disease levels were significant and that the final rating timing did not recognize these differences.

Staining occurred at both sites, although incidence was 5-10 times greater at Wagin than Highbury. Significant rainfall occurred at both sites prior to harvest, however the crop at Wagin was mature by this time while Highbury was in late grain fill. At Wagin no fungicide treatment had a significant effect on gran staining, while at Highbury a small but significant effect was evident. As the Wagin site senesced earlier it is likely that staining at Wagin was due to secondary weather damage as well as fungal staining. Grain analysis is continuing. However it is important to note that the application after head emergence was ineffective at both sites.

There were a few anomalies with the Wagin site. Firstly the poor sandy textured soil has low water holding capacity resulted in the canopy prematurely senescing reducing potential benefit of fungicide treatment compared to the Highbury site. Secondly the crop had inadequate nutrition and was very responsive to nitrogen and as a result there was large site variability.

Conclusion

- Application of foliar fungicide can reduce the severity of Septoria blotch in Bannister oats and result in a profitable yield response when spring rain is sufficient to achieve high yields.
- Application at or around flag leaf emergence seems most effective for disease control and yield response
- Multiple application of fungicide can add benefit, with the first application at stem extension allowing some flexibility in the timing of the second application.
- It appears difficult to prevent fungal staining of grain with foliar fungicides in seasons where there is significant rainfall between grain fill and crop senescence

Key words

Bannister Oats, Fungicide, Septoria blotch

Acknowledgments

This project is GRDC funded through the Kwinana west Regional Cropping Solutions Network (RCSN), carried out by ConsultAg (Narrogin), in collaboration with Geoff Thomas DAFWA.

GRDC Project Number: Tar 00003

Paper reviewed by: Doug Sawkins (DAFWA, Narrogin)