Fungicide strategies in barley

BCG and Nick Poole, FAR, NZ

The following trial is part of a GRDC funded project (SFS 00006) examining the role of disease management and canopy management in cereal crops of southeast Australia. These trials had the aim of examining the value of foliar fungicides for winter barley in the Mallee and Wimmera environments.

Summary

- Severe moisture stress was a key feature of both barley fungicide trials this season with the Mallee trial yields ranging from 0.49 – 0.72 t/ha and Wimmera yields from 1.85 – 2.09 t/ha
- In a season with low disease pressure (spot form of net blotch-SFNB), there was no evidence that fungicides gave any cost effective yield advantage
- There was no evidence that the new strobilurin fungicides gave any increased green leaf retention or yield advantage in these two trials
- From quality data so far analysed there was no consistent effect on protein and screenings from the use of fungicides in these trials
- In two seasons and four winter barley trials, the only consistent fungicide responses have come from the Murtoa site in the 2003 season, with a maximum 9% response in the presence of moderate SFNB. This trial unlike the other three was characterised by higher levels of disease (5% infection) at early stem elongation GS30, the point when foliar fungicides are first considered for most disease management strategies in barley.

Background

The objective of the trials this year are very similar to those pursed last season, those being to establish guidelines on the use of fungicides in barley crops. In the 2003 season trials in the Wimmera and Mallee, spot form of net blotch (Pyrenophora teres f. maculata) was the principal disease, particularly at Murtoa where the barley crop had followed a Gairdner crop 2 years previously.

The treatment list has been set up to examine the timing of commonly established standard fungicides such as Tilt/Bumper (propiconazole) in relation to the new strobilurin products such as Amistar Xtra (containing azoxystrobin) and Flint (trifloxystrobin).

Some of the evidence from 2003 trials suggested that strobilurins such as Amistar Xtra might have greater potential for use in barley than in wheat, though this still has to be confirmed. There are a number of factors that may support these initial findings, the first is that in general, barley diseases are harder to control with existing triazole products than prevalent wheat diseases, the second is that the most important leaves in the barley canopy occur earlier in the crops development and could potentially be expected to derive benefit from a fungicide that persists for longer, as the strobilurins have been proven to do.

Methods

Mallee - Birchip

Gairdner barley was sown dry on the 4th June 2004 on the main Birchip trial site at a target planting population of 150 plants/m^2. The crop was top dressed with Urea 60 kg/ha (28 kg/ha N) on the 12th of August. Water stress was a constant feature of this trial, being acute at the end of May and then from mid August onwards. With little rainfall in September and October crop canopy was severely reduced and disease inoculum was limited to traces of spot form of net blotch.

Fungicides were targeted at one of two different timings, GS30-31 (early stem elongation) and GS39-49, (flag leaf emergence – 1st awns). The actual dates of application were 2nd August (GS30) and the 29th September (GS49). The treatments are listed in Table 1.

Wimmera - Lubeck

At the Wimmera site Gairdner barley was sown on the 17th June at plant population of 106 plants/m^2. Water stress was again a constant feature of this trial. Fungicides were applied at one of two timings: early stem elongation GS30-31 – on the 6th of September and 1st awns emerging GS49 – on the 6th of October. Individual treatments were applied as in Table 1.

Table 1. Products and timings for foliar fungicide evaluation (ml/ha unless otherwise stated)

Trt No.	GS30 - (early stem elongation)	GS39 - 49 (flag leaf emergence- 1st awns emerging)
1.	Bumper 250	----
2.	Bumper 250 + Flint 125g/ha	----
3.	Bumper 250 + Flint 250g/ha	----
4.	Bumper 250 + Flint 500g/ha	----
5.	Opus 250 + Flint 250g/ha	----
6.	Amistar Xtra 400	----
7.	----	Bumper 250
8.	----	Bumper 250 + Flint 125g/ha
9.	----	Bumper 250 + Flint 250g/ha
10.	----	Bumper 250 + Flint 500g/ha
11.	----	Opus 250 + Flint 250g/ha
12.	----	Amistar Xtra 400
13.	Bumper 125	Bumper 125
14.	Bumper 125 + Flint 62.5g/ha	Bumper 125 + Flint 62.5g/ha
15.	Bumper 125 + Flint 125g/ha	Bumper 125 + Flint 125g/ha
16.	Bumper 125 + Flint 250g/ha	Bumper 125 + Flint 250g/ha
17.	Opus 125 + Flint 125g/ha	Opus 250 + Flint 125g/ha
18.	Amistar Xtra 400	Amistar Xtra 400
19.	Bumper 250	Bumper 250 (control)
20.	Untreated	

Explanatory notes on new fungicides: Bumper® 250EC contains 250g/l propiconazole, thus at 250ml/ha applies 62g/ha active ingredient. Flint® 500 WG contains 500g/kg trifloxystrobin, thus 250g/ha applies 125g/ha active ingredient. Opus® contains 125g/l epoxiconazole, thus 250ml/ha applies 31g/ha active ingredient. Amistar Xtra® contains 200g/l azoxystrobin and 80g/l cyproconazole thus at 400 ml/ha applies 80g/ha azoxystrobin active ingredient and 32g/ha cyproconazole active ingredient.

Results

There were small differences (Table 2) in disease at the Birchip site due to treatment, but overall, disease remained at low levels for the entire season. These small differences in disease (traces of spot form of net blotch) between the treatments applied at the GS30-31 did

not influence the final yields (Table 3). The yield results are a reflection of the water stress in the trial and do not show any significant differences due to fungicide effect.

Table 2. Birchip, Mallee - The influence of fungicide application at GS30 on % spot form of net blotch (SFNB) assessed at GS49 – 6th October (65 days after application)

Product	Timing of application	Rate (ml/ha)	% SFNB infection @ GS49		
			Leaf 2	Leaf 3	Leaf 4
Bumper	GS30-31	250	1.1	3.4	7.4
Bumper + Flint	GS30-31	250 + 125g	0.4	1.3	2.5
Bumper + Flint	GS30-31	250 + 250g	0.3	1.0	1.9
Bumper + Flint	GS30-31	250 + 500g	0.2	0.9	2.1
Opus + Flint	GS30-31	250 + 250g	0.4	1.4	2.2
Amistar Xtra	GS30-31	400	0.4	2.0	3.9
Untreated			1.2	3.7	7.5

Table 3. Birchip, Mallee - The influence of fungicide application at various rates and timings on yield (t/ha & % control) and quality (% Protein & % Screenings 2.2mm)

Product	Timing of applic'n	Rate (ml/ha)	Yield		Grain Quality	
			t/ha	%control	%Protein	%Screen
Bumper	GS30-31	250	0.52	80	16.5	45
Bumper + Flint	GS30-31	250+125g	0.61	95	16.3	40
Bumper + Flint	GS30-31	250+250g	0.69	108	16.2	36
Bumper + Flint	GS30-31	250+500g	0.53	83	16.1	40
Opus + Flint	GS30-31	250+250g	0.67	104	16.6	35
Amistar Xtra	GS30-31	400	0.52	81	16.5	39
Bumper	GS49	250	0.49	76	16.3	42
Bumper + Flint	GS49	250+125g	0.60	93	16.8	39
Bumper + Flint	GS49	250+250g	0.57	89	16.8	40
Bumper + Flint	GS49	250+500g	0.65	102	16.1	43
Opus + Flint	GS49	250+250g	0.68	105	16.4	38
Amistar Xtra	GS49	400	0.55	85	16.3	41
Bumper	GS30 +49	125 x2	0.58	89	16.4	39
Bumper + Flint	GS30 +49	125+62.5 x2	0.54	84	16.5	35
Bumper + Flint	GS30 +49	125+125 x2	0.50	78	16.6	37
Bumper + Flint	GS30 +49	125+250 x2	0.72	111	16.3	37
Opus + Flint	GS30 +49	125+125 x2	0.61	95	16.6	37
Amistar Xtra	GS30 +49	400 x2	0.53	82	16.8	38
Bumper (control)	GS30 +49	250 x2	0.55	86	16.4	42
Untreated			0.64	100	16.8	41
LSD (5%) cv 10.3%			**0.21**		**0.5**	**5.7**

At the Wimmera site at Lubeck there were traces of spot form of net blotch present prior to the first spray, this measured about 1% leaf coverage on flag minus 6. Disease levels remained low all season with the untreated disease levels staying below 2% on leaf 4 (flag minus 3). The untreated disease levels on leaf 2 were 0.2%, leaf 3 0.7% and leaf 4 1.4% when assessed at 1st awns emerging – GS49. There were no differences between the treated plots. Growing season rainfall at the site was well below the average of approximately 320mm with 210mm falling between April and October. The site was under severe moisture stress from mid September until early November with only 7.5mm falling in October. These climatic conditions are reflected in the low yields (Table 4), which do not show any significant yield differences due to fungicide application.

Table 4. Lubeck, Wimmera - The influence of fungicide application at various rates and timings on yield (t/ha & % control) and quality (% Protein)

Product	Timing of applic'n	Rate (ml/ha)	Yield t/ha	Yield % control	% Protein
Bumper	GS30-31	250	2.09	111	13.0
Bumper + Flint	GS30-31	250+125g	1.90	101	13.3
Bumper + Flint	GS30-31	250+250g	1.99	105	12.4
Bumper + Flint	GS30-31	250+500g	1.85	99	13.0
Opus + Flint	GS30-31	250+250g	1.71	91	12.9
Amistar Xtra	GS30-31	400	1.98	105	13.0
Bumper	GS49	250	1.98	105	12.7
Bumper + Flint	GS49	250+125g	1.96	104	12.8
Bumper + Flint	GS49	250+250g	2.04	108	12.6
Bumper + Flint	GS49	250+500g	1.94	103	13.1
Opus + Flint	GS49	250+250g	2.00	106	13.3
Amistar Xtra	GS49	400	1.84	98	13.0
Bumper	GS30+49	125 x2	1.85	98	13.1
Bumper + Flint	GS30+49	125+62.5 x2	2.07	110	12.0
Bumper + Flint	GS30+49	125+125 x2	1.97	104	13.4
Bumper + Flint	GS30+49	125+250 x2	1.96	104	12.8
Opus + Flint	GS30+49	125+125 x2	1.89	100	12.8
Amistar Xtra	GS30+49	400 x2	1.93	102	13.3
Bumper (control)	GS30+49	250 x2	1.86	98	12.5
Untreated			1.89	100	12.9
LSD (5%) cv – 9%			**0.25**		**1.0**

Interpretation

At both the Birchip and Wimmera sites low spring rainfall combined with heat stress during October (and frost in the Wimmera) reduced potential yields. Disease levels in both trials were limited to low levels of spot form of net blotch, which did not develop in the 2004 season. As a consequence there are few conclusions that can be drawn from this work in terms of product performance, timings and rates.

The key message to emerge from the barley trials over the last two seasons is that under low disease pressure in the Mallee environment fungicides are not cost effective, with no evidence that the new strobilurin fungicides are any different to the existing triazoles such as Bumper/Tilt.

In project trials carried out in the Wimmera last season, there were small yield responses (max 9%) that correlated with moderate levels of spot form of net blotch (SFNB). Last year's Wimmera site had only a 1-year break (failed lentil crop) from the previous Gairdner barley, this season the trial site paddock had had a 5-year break from barley. Against this cropping history the levels of SFNB were considerable higher at the time of the first fungicide application at GS30 in 2003 compared to 2004, emphasising that rotation position for barley is a key factor in dictating disease severity (particularly diseases such as net blotch and to lesser extent Rhynchosporium – Scald). Therefore, likely responses to fungicides for control of diseases such as net blotch are likely to be greater following barley on barley or in situations where there has only been a 1-year break from barley.

Even in these higher risk rotations the evidence from the trials is that crop monitoring will be a good early "warning system" of disease, since higher infection levels have already been a

characteristic of the crop by the time the first foliar fungicides should be considered GS30-33 (early stem elongation to third node).

Commercial Practice

Rotation is the key method for controlling diseases such as Spot Form of Net Blotch (SFNB) and Scald in barley. Disease pressure will increase if stubble from previous barley crops is still present when the new crop is sown.

In the Mallee it is unlikely that fungicide application will be worthwhile for the control of SFNB. In the Wimmera, it is possible to get an economic return on the control of SFNB, however, the disease incidence would have to be severe. Early control (GS30) is likely to be the most cost effective.