4.2 BARLEY

4.2.1 OPTIMISING FUNGICIDE STRATEGIES FOR WINTER BARLEY - GNARWARRE AND LAUNCESTON

Researchers: Nick Poole (FAR New Zealand)
Geoff Dean (TIAR)
Dom Bolton (SFS Ltd)

Funding:
Grains Research and Development Corporation

Location & Variety:

Gnarwarre, Victoria (SFS)	Gairdner (winter malt barley)
Launceston, Tasmania (SFS)	Gairdner (winter malt barley)

Background:
Response to fungicide and in particular the new strobilurin fungicides has been very pronounced in winter barley trials particularly those conducted in Tasmania. With a range of diseases that are more difficult to control with triazoles alone and an earlier grain fill period making the crop less drought prone, this crop could be a potential candidate for strobilurin fungicide application.
This work looks at the impact of these new fungicides to assess yield and influence on disease control.

Objectives:
The project has the overall objective of assessing the optimum barley fungicide strategy for the different climatic regions represented in the project and to determine whether the likelihood of fungicide response can be linked to specific timings, disease and plant available water.

The individual objectives within the trial are as follows:

- To compare the disease control and yield response associated with two different timings of triazole fungicide (Folicur) application and to assess whether two sprays are superior to one. **(Trt 1,7 & 13)**
- To compare the performance of the Tebuconazole (Folicur) and Epoxiconazole (Opus) in two spray programmes with strobilurin addition. **(Trt 3,5,9,11,15 & 17)**
- To examine the disease control, green leaf area retention and yield response from one and two spray programmes of triazole with and without strobilurin inclusion. **(Trt 1-18)**
- To examine the influence of increasing the rate of strobilurin dose (Trifloxystrobin – Flint) from a 62.5g/ha ai to 250 g/ha ai in one and two spray programmes. **(Trt 2-4, 8-10, 14-16)**
- To compare whether the same level of active ingredient was better applied as a one spray or two spray programme and to assess whether the optimum rate of strobilurin is influenced by the number of fungicide applications. **(Trt 1-18)**
- To compare the performance of the triazoles Bumper and Folicur in 2 spray programmes. **(13 & 19)**

Summary:

GNARWARRE
There was no response to fungicide in this trial and few significant effects on grain quality. Disease levels were extremely low and a stem green area score at senescence revealed no consistent preservation of green tissue with the use of fungicides. Both with Gnarwarre and Tasmania the dry finish appeared to curtail the influence of fungicide application

TASMANIA
Again there was no statistically significant response to fungicide in this trial, however with the trial subject to both *Rhynchosporium* (Scald) and leaf rust good disease data was secured on the performance of fungicides against these diseases.

Overall Conclusions:

Other than the clear results on disease control in Tasmania the variable nature of these two trials and drier finish to the grain fill period make it difficult to draw any conclusions on yield. There does not appear to have been any significant response to strobilurin in these trials and where differences have been expressed the response to strobilurin rate has been erratic and difficult to explain.

Treatment List and Trial Design:

Both the Gnarwarre and Tasmanian trial site employed the same 21 treatment list which employed 2 untreated control treatments and was replicated 4 times (Table 46).

The trials employed fungicides at one of two timings GS30-31 (pseudo stem erect – 1st node) and GS39-49 (flag leaf emergence – awn emergence). The individual application dates for each trial were as follows:

Table 45: Individual Application Dates for Each Trial

	Sowing date	GS30-31 application	GS39-49 application
Gnarwarre	10th June 2003	1st October 2003	22nd October 2003
Tasmania	30th May 2003	9th September 2003	24th October 2003

Table 46: Treatment List

Treatment	GS30-31	GS39-49
1	Folicur 145 ml/ha	Nil
2	Folicur 145 ml/ha + Flint 125ml/ha	Nil
3	Folicur 145 ml/ha + Flint 250ml/ha	Nil
4	Folicur 145 ml/ha + Flint 500ml/ha	Nil
5	Opus 250 ml/ha + Flint 250ml/ha	Nil
6	Opus 250 ml/ha + Amistar 500ml/ha	Nil
7	Nil	Folicur 145 ml/ha
8	Nil	Folicur 145 ml/ha + Flint 125ml/ha
9	Nil	Folicur 145 ml/ha + Flint 250ml/ha
10	Nil	Folicur 145 ml/ha + Flint 500ml/ha
11	Nil	Opus 250 ml/ha + Flint 250ml/ha
12	Nil	Opus 250 ml/ha + Amistar 500ml/ha
13	Folicur 72.5 ml/ha	Folicur 72.5 ml/ha
14	Folicur 72.5 ml/ha + Flint 62.5ml/ha	Folicur 72.5 ml/ha + Flint 62.5ml/ha
15	Folicur 72.5 ml/ha + Flint 125ml/ha	Folicur 72.5 ml/ha + Flint 125ml/ha
16	Folicur 72.5 ml/ha + Flint 250ml/ha	Folicur 72.5 ml/ha + Flint 250ml/ha
17	Opus 125 ml/ha + Flint 125ml/ha	Opus 125 ml/ha + Flint 125ml/ha
18	Opus 125 ml/ha + Amistar 250ml/ha	Opus 125 ml/ha + Amistar 250ml/ha
19	Bumper 250ml/ha	Bumper 250ml/ha
20	Untreated	

Disease Assessments:

The disease pressure at the Gnarwarre site was extremely low, with no visible differences in disease control due to treatment. A stem green area assessment was carried at during the late senescence phase (GS85), however this showed no significant difference between treatments.

In Tasmania there were good differences in disease control due to fungicide timing and treatment (Table 47).

Table 47: Influence of Fungicide Timing, Rate and Product on Disease Infection (% disease control) Recorded on Leaf 2 at GS74 – 30th November

Trt	GS30-31	GS39-49	% Scald (% control)		% Leaf rust (% control)	
1	Folicur 145 ml/ha	Nil	3.0	72	2.9	47
2	Folicur 145 ml/ha + Flint 125ml/ha	Nil	1.1	90	2.1	62
3	Folicur 145 ml/ha + Flint 250ml/ha	Nil	1.1	90	1.4	75
4	Folicur 145 ml/ha + Flint 500ml/ha	Nil	0.7	94	1.2	79
5	Opus 250 ml/ha + Flint 250ml/ha	Nil	0.3	97	1.3	76
6	Opus 250 ml/ha + Amistar 500ml/ha	Nil	1.2	89	1.6	72
7	Nil	Folicur 145 ml/ha	5.4	50	2.2	60
8	Nil	Folicur 145 ml/ha + Flint 125ml/ha	4.7	57	1.2	79
9	Nil	Folicur 145 ml/ha + Flint 250ml/ha	[2]10.4	5	1.8	68
10	Nil	Folicur 145 ml/ha + Flint 500ml/ha	2.6	76	0.5	91
11	Nil	Opus 250 ml/ha + Flint 250ml/ha	4.9	55	0.6	90
12	Nil	Opus 250 ml/ha + Amistar 500ml/ha	3.3	70	0.5	91
13	Folicur 72.5 ml/ha	Folicur 72.5 ml/ha	2.1	81	1.5	74
14	Folicur 72.5 ml/ha + Flint 62.5ml/ha	Folicur 72.5 ml/ha + Flint 62.5ml/ha	2.2	80	0.9	85
15	Folicur 72.5 ml/ha + Flint 125ml/ha	Folicur 72.5 ml/ha + Flint 125ml/ha	0.9	92	0.8	86
16	Folicur 72.5 ml/ha + Flint 250ml/ha	Folicur 72.5 ml/ha + Flint 250ml/ha	0.9	92	0.7	87
17	Opus 125 ml/ha + Flint 125ml/ha	Opus 125 ml/ha + Flint 125ml/ha	0.5	95	0.5	91
18	Opus 125 ml/ha + Amistar 250ml/ha	Opus 125 ml/ha + Amistar 250ml/ha	0.2	98	0.4	94
19	Bumper 250ml/ha	Bumper 250ml/ha	0.6	95	1.0	83
20	Untreated		10.9	0	5.5	0

[2] Aberrant Result

Overall the best disease control was provided by the 2 spray split dose applications, since these gave good control of earlier Scald infection and good control of later leaf rust infection. The Opus/Amistar mixture applied twice, which gave 98% control of Scald and 94% control of leaf rust was the best sequence in terms of disease control and yield.

It was very apparent that the single fungicide applications applied at GS30-31 (pseudo stem erect-1st node) gave better control of Scald, whilst the later GS39-49 applications gave better control of leaf rust in the second half of the season.

Opus in general performed better as a partner for Flint (trifloxystrobin) than Folicur. In terms of strobilurin performance, Flint gave similar performance to Amistar (Azoxystrobin) on Scald and leaf rust when mixed with Opus.

In comparison to Folicur alone the strobilurins have significantly improved the disease control performance, however Folicur is not a strong barley triazole when compared to Bumper. The Bumper sequence gave 95% control of Scald and 83% control of leaf rust, being inferior to the strobilurin/triazole mixture (Amistar/Opus) on leaf rust.

Table 48: Influence of Fungicide Application on the Yield and Quality of Gairdner - Gnarwarre

Trt	GS30-31	GS39-49	Yield T/Ha	Test wt. Kg/ha	Protein %
1	Folicur 145 ml/ha	Nil	5.93	66.2	9.3
2	Folicur 145 ml/ha + Flint 125ml/ha	Nil	5.87	65.6	9.1
3	Folicur 145 ml/ha + Flint 250ml/ha	Nil	6.01	65.9	9.3
4	Folicur 145 ml/ha + Flint 500ml/ha	Nil	5.69	66.0	9.4
5	Opus 250 ml/ha + Flint 250ml/ha	Nil	5.65	66.2	9.1
6	Opus 250 ml/ha + Amistar 500ml/ha	Nil	5.88	66.7	9.5
7	Nil	Folicur 145 ml/ha	5.84	65.6	9.1
8	Nil	Folicur 145 ml/ha + Flint 125ml/ha	5.88	66.4	9.4
9	Nil	Folicur 145 ml/ha + Flint 250ml/ha	5.79	66.5	9.1
10	Nil	Folicur 145 ml/ha + Flint 500ml/ha	5.90	66.9	9.7
11	Nil	Opus 250 ml/ha + Flint 250ml/ha	5.83	66.9	9.4
12	Nil	Opus 250 ml/ha + Amistar 500ml/ha	5.57	66.2	9.3
13	Folicur 72.5 ml/ha	Folicur 72.5 ml/ha	5.59	66.3	9.2
14	Folicur 72.5 ml/ha + Flint 62.5ml/ha	Folicur 72.5 ml/ha + Flint 62.5ml/ha	5.95	66.8	9.4
15	Folicur 72.5 ml/ha + Flint 125ml/ha	Folicur 72.5 ml/ha + Flint 125ml/ha	6.21	66.1	9.2
16	Folicur 72.5 ml/ha + Flint 250ml/ha	Folicur 72.5 ml/ha + Flint 250ml/ha	6.02	67.3	9.7
17	Opus 125 ml/ha + Flint 125ml/ha	Opus 125 ml/ha + Flint 125ml/ha	5.45	66.5	9.1
18	Opus 125 ml/ha + Amistar 250ml/ha	Opus 125 ml/ha + Amistar 250ml/ha	5.83	67.0	9.7
19	Bumper 250ml/ha	Bumper 250ml/ha	5.98	65.9	9.5
20	Untreated		5.92	65.8	9.5
		LSD(5%) [Trtd vs Trtd]	**0.48**	**1.0**	**0.5**
		LSD(5%) [Ctrl vs Trtd]	**0.41**	**0.9**	**0.5**
		CV%	**5.7%**		

Significance of contrasts:				
Fungicide (trts 1-18) vs Control		ns	ns	ns
Time T1 (trts 1-6) vs T2 (trts 7-12)		ns	ns	ns
Splitting effect (trts 1-12 vs 13-18)		ns	*	ns
Flint effect (trts 1,7,13 vs 2-4, 8-10, 14-16)		ns	ns	ns
Flint x T1vT2		ns	*	ns
Flint x Split		*	ns	ns
Flint linear trend (trts 2-4, 8-10, 14-16)		ns	ns	*
Flint-linear x T1vT2		ns	ns	ns
Flint-linear x Split		ns	ns	ns
Folicur vs Opus (trts 3,9,15 vs 5,11,17)		**	ns	ns
Fol-Opus x T1vT2		ns	ns	ns
Fol-Opus x Split		*	ns	ns
Amistar vs Flint (trts 5,11,17 vs 6,12,18)		ns	ns	ns
Ami-Flint x T1vT2		ns	ns	ns
Ami-Flint x Split		ns	ns	ns
Bumper vs Folicur (trt 19 vs 13)		ns	ns	ns

Note: ns=not significant; *=5% sig; **=1% sig; ***=0.1% sig.

There was no response to fungicide in this trial and few significant effects on grain quality. Of those interaction that were significant, Opus appeared to be outperformed by Folicur in terms of yield, a result that should be treated with caution since it was not the case in other trials and there was no evidence of disease in this trial. There was some evidence that test weight was improved by splitting fungicides, however differences were extremely small.

Table 49: Influence of Fungicide Application on the Yield of Gairdner - Launceston

trt	GS30-31	GS39-49	Yield t/ha
1	Folicur 145 ml/ha	Nil	4.49
2	Folicur 145 ml/ha + Flint 125ml/ha	Nil	4.74
3	Folicur 145 ml/ha + Flint 250ml/ha	Nil	4.50
4	Folicur 145 ml/ha + Flint 500ml/ha	Nil	4.39
5	Opus 250 ml/ha + Flint 250ml/ha	Nil	4.43
6	Opus 250 ml/ha + Amistar 500ml/ha	Nil	4.57
7	Nil	Folicur 145 ml/ha	4.62
8	Nil	Folicur 145 ml/ha + Flint 125ml/ha	4.16
9	Nil	Folicur 145 ml/ha + Flint 250ml/ha	4.48
10	Nil	Folicur 145 ml/ha + Flint 500ml/ha	4.55
11	Nil	Opus 250 ml/ha + Flint 250ml/ha	4.54
12	Nil	Opus 250 ml/ha + Amistar 500ml/ha	4.49
13	Folicur 72.5 ml/ha	Folicur 72.5 ml/ha	4.84
14	Folicur 72.5 ml/ha + Flint 62.5ml/ha	Folicur 72.5 ml/ha + Flint 62.5ml/ha	4.64
15	Folicur 72.5 ml/ha + Flint 125ml/ha	Folicur 72.5 ml/ha + Flint 125ml/ha	4.63
16	Folicur 72.5 ml/ha + Flint 250ml/ha	Folicur 72.5 ml/ha + Flint 250ml/ha	4.44
17	Opus 125 ml/ha + Flint 125ml/ha	Opus 125 ml/ha + Flint 125ml/ha	4.43
18	Opus 125 ml/ha + Amistar 250ml/ha	Opus 125 ml/ha + Amistar 250ml/ha	4.81
19	Bumper 250ml/ha	Bumper 250ml/ha	4.58
20	Untreated		4.43
		LSD(5%)[Trtd vs Trtd]	**0.34**
		LSD(5%)[Ctrl vs Trtd]	**0.30**
		CV%	**5.3%**

Significance of contrasts:		
Fungicide (trts 1-18) vs Control		ns
Time T1 (trts 1-6) vs T2 (trts 7-12)		ns
Splitting effect (trts 1-12 vs 13-18)		*
Flint effect (trts 1,7,13 vs 2-4, 8-10, 14-16)		ns
Flint x T1vT2		ns
Flint x Split		ns
Flint linear trend (trts 2-4, 8-10, 14-16)		ns
Flint-linear x T1vT2		**
Flint-linear x Split		ns
Folicur vs Opus (trts 3,9,15 vs 5,11,17)		ns
Fol-Opus x T1vT2		ns
Fol-Opus x Split		ns
Amistar vs Flint (trts 5,11,17 vs 6,12,18)		ns
Ami-Flint x T1vT2		ns
Ami-Flint x Split		ns
Bumper vs Folicur (trt 19 vs 13)		ns

Note: ns=not significant; *=5% sig; **=1% sig; ***=0.1% sig.

Taking all fungicide treatments, there was no statistically significant benefit from applying fungicide in this trial, however individual treatments have outperformed the untreated and in some cases these higher yielding treatments corresponded with the best observed disease control e.g. Opus 125ml/ha + Amistar 250 ml/ha applied at GS30-31 followed by a second spray at GS39-49.

The variable nature of the plots at this site make it difficult to draw significant conclusions, it is also difficult to explain why there was a negative effect from increasing rates of trifloxystrobin (Flint) at T1 (GS30-31) when there was a slightly positive effect at T2 (GS39-49).

4.2.2 BARLEY FOLIAR FUNGICIDE TRIALS - SOUTH AUSTRALIA (SARDI)

Researcher: Trent Potter (SARDI)

Acknowledgements:
Cooperating farmers:
Peter Hannaford, Frances
Lockie Seears, Conmurra
Paul Longbottom, Mount Benson
Agribusiness:
Syngenta Australia

Objective:
The aim of these trials was to assess both yield and grain quality responses to a number of foliar fungicide products.

Key Outcomes:
In the absence of disease at all three sites, some fungicide treatments still gave a significant yield increase over the nil treatment.

Sowing Dates: 19 June 2003 Frances
25 June 2003 Conmurra
10 June 2003 Mt Benson

Sowing Rates: 160 seeds/m² Frances
160 seeds/m² Conmurra
80 kg/ha Mt Benson
Gairdner barley (all sites)

Fertiliser Applications:
140 kg/ha 13N:16P:0K:7S:1.5Zn (F & C)
90 kg/ha 18N:20P:0K:0S:0Zn (MB)
50 kg/ha Urea 48N

Pesticide Applications:
Foliar fungicide application timings were as listed by Zadok scores below.
Foliar fungicide treatments listed below.

Results:

Table 50: Barley Foliar Fungicide Trial Results - Frances

Fungicide Product and timing	Application rate	Frances	
		Yield (t/ha)	% site mean
Amistar Xtra (39) + Triad (55)	800 ml/ha + 500 ml/ha	7.354	107
Tilt Xtra (39)	500 ml/ha	7.252	105
Amistar Xtra (39) + (55)	400 ml/ha + 400 ml/ha	7.224	105
Amistar Xtra (39)	800 ml/ha	7.201	105
Tilt (39) + (55)	250 ml/ha + 250 ml/ha	7.152	104
Tilt Xtra (39)	250 ml/ha	7.095	103
Amistar Xtra (39)	400 ml/ha	7.083	103
Amistar Xtra (39) + Triad (55)	400 ml/ha + 500 ml/ha	6.989	102
Tilt (55)	500 ml/ha	6.944	101
Triad (39) + (55)	500 ml/ha + 500 ml/ha	6.883	100
Triad (39)	1 l/ha	6.858	100
Folicur (55)	300 ml/ha	6.805	99
Folicur (39)	300 ml/ha	6.804	99
Triad (55)	1 l/ha	6.791	99
Tilt Xtra (39) + (55)	250 ml/ha + 250 ml/ha	6.776	99
Tilt (39)	250 ml/ha	6.578	96
Nil		6.493	94
Tilt (39)	500 ml/ha	5.528	80
Site Mean (t/ha)		**6.878**	
CV %		**6.170**	
LSD (t/ha)		**0.723**	