3.2 BARLEY

3.2.1 OPTIMISING FUNGICIDE STRATEGIES FOR MALTING BARLEY CV GAIRDNER (INVERLEIGH, VIC)

Abstract:
Two diseases affected this trial, Scald *(Rhynchosporium)* which started to infect the crop at early stem elongation and leaf rust that infected the crop late season. Under these conditions fungicide strategies that were based on 2 sprays produced better disease control than the equivalent amount of active applied as a single timing. This trend for the 2 sprays to outperform the 1 spray was statistically significant in the final yield as well as the disease control, particularly where higher rates of active ingredient were employed.

However for the degree of infection, yield increases were very small and in most cases not significantly better than the untreated, though most treated yields were positive as opposed to being equally spread around the untreated yield. Single sprays gave an average response of 1-2% over the untreated compared to the 2 spray approaches, which gave a mean yield increase of 4.4%.

In terms of better disease control and green leaf retention, the strobilurin based mixtures performed well, however this did not always translate to yield.

The results pose a dilemma since in order to get the best disease control in barley when there is more than one disease present requires 2 sprays, however this obviously increases cost. It is also apparent with a number of treatments, that whilst the differences were not significant, there was a trend for very low rates to under perform in the 2 spray programmes.

In this trial none of the commercial controls based on either triazoles alone or strobilurin mixtures were cost effective. The highest yield increases (8% and 13%) or 0.3 – 0.4 t/ha were based on products not currently available. The performance of low rate (125ml/ha) Opus with Flint (trifloxystrobin) was very good (one of only 2 treatments to significantly out yield the untreated), indicating that this new triazole has strengths in barley as well as wheat.

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Location: Inverleigh, Geelong, Victoria

Growing Season Rainfall: (April-Nov): 388mm

Background/Objectives:
The objectives of these trials are very similar to those pursued last season, those being to establish guidelines on the use of foliar applied fungicides in barley crops. The treatment list has been set up to evaluate 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 (both project and non project), 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.

Methodology:
Gairdner barley was sown on 24st June 2004 into a moist seedbed on the main Southern Farming Systems site at Inverleigh at a target planting population of 200 plants/m^2. The crop was top dressed with Urea at 217 kg/ha (100 kg/ha N) on the 20th September. Scald *Rhynchosporium* was the principal disease of the trial but it developed very slowly from GS30/31 when it was apparent at very low levels. Leaf rust affected the trial late season but again was present at low levels.

Fungicides were targeted at one of 2 different timings, GS30-31 (pseudo stem erect) and GS39-49, (flag leaf emergence – 1st awns). The actual dates of application were 24th September (GS31) and the 13th October (GS49). The treatments are listed in Table 1.

Table 1. Fungicide Treatment List and Timings

Trt No	GS30 (early stem elongation)	GS39 - 49 (flag leaf emergence- 1st awns emerging)
1 SPRAY (EARLY)		
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	----
1 SPRAY (LATE)		
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
2 SPRAY (EARLY and LATE)		
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 250gai/l propiconazole, thus at 250ml/ha applies 62.5gai/ha.

Flint® 500 WG contains 500gai/kg trifloxystrobin, thus 250gai/ha applies 125gai/ha.

Opus® contains 125gai/l epoxiconazole, thus 250ml/ha applies 31gai/ha.

Az = Amistar Xtra® contains 200gai/l azoxystrobin and 80gai/l cyproconazole thus at 400 ml/ha applies 80gai/ha azoxystrobin and 32gai/ha cyproconazole.

Results and Discussion:

Scald (*Rhynchosporium*) infection built up slowly from GS30/31, at the time of the second application at GS49 levels had reached 17% on leaf 3, compared to a mean level of infection of 0.6% on the plots treated at GS30-31. During grain fill it was apparent that the treatments which gave the best control of Scald, were those plots receiving the fungicide active as a split dose (Table 2.). The split treatments along with the Bumper control also gave the better leaf rust control, along with the single application late.

The single sprays early, whilst giving good control of Scald mid season, faded later in the season and was clearly inferior to the split applications of the same amount of active ingredient. Amistar Xtra was relatively ineffective as a single spray of 400ml/ha, but was very effective as a 2-spray programme (2 x 400ml/ha). Opus mixtures and Amistar Xtra were clearly superior on leaf rust and Scald when applied as 2 spray programmes. With Amistar Xtra, this is explained by the higher rate of active, but with Opus, its reflects less on rate and more on biological activity.

Table 2: The Influence of Fungicide Application on % Scald Infection, % Leaf Rust and % Green Leaf Area (GLA) at the End of the Season GS80-85 – Inverleigh cv Gairdner

Product	Timing of Applic'n	Rate (ml/ha)	% Scald	% leaf rust	% GLA
			Leaf 2	Leaf 2	Leaf 2
Bumper	GS30-31	250	31.0	3.9	28.9
Bumper + Flint	GS30-31	250 + 125g	20.0	3.0	23.3
Bumper + Flint	GS30-31	250 + 250g	15.8	1.2	41.5
Bumper + Flint	GS30-31	250 + 500g	10.9	1.6	54.0
Opus + Flint	GS30-31	250 + 250g	11.5	2.4	51.2
Amistar Xtra	GS30-31	400	33.6	3.8	37.4
Bumper	GS49	250	15.5	3.5	42.9
Bumper + Flint	GS49	250 + 125g	13.0	1.3	42.1
Bumper + Flint	GS49	250 + 250g	3.1	1.0	59.4
Bumper + Flint	GS49	250 + 500g	13.1	0.6	57.2
Opus + Flint	GS49	250 + 250g	12.8	0.4	52.0
Amistar Xtra	GS49	400	23.6	0.1	49.6
Bumper	GS30 +49	125 x2	5.4	4.7	48.1
Bumper + Flint	GS30 +49	(125 + 62.5) x2	3.9	1.2	55.0
Bumper + Flint	GS30 +49	(125 + 125) x2	8.2	0.6	57.4
Bumper + Flint	GS30 +49	(125 + 250) x2	7.9	0.1	48.4
Opus + Flint	GS30 +49	(125 + 125) x2	1.9	0.3	56.4
Amistar Xtra	GS30 +49	400 x2	0.4	0.0	70.5
Bumper (control)	GS30 +49	250 x2	2.8	1.7	55.6
Untreated			49.0	5.4	15.5
LSD (5%)			**12.6**	**1.2**	**13**

In terms of green leaf retention Amistar Xtra applied twice at 400 ml/ha gave superior results to the majority of other treatments. The better green leaf retention was also shown to correlate (as might be expected) with those treatments receiving a later spray.

Table 3: The Influence of Fungicide Application at Various Rates and Timings on Yield (t/ha and % Untreated Control) and Quality (% Protein and % Screenings 2.2mm, Test Weight kg/hl and TGW Thousand Grain Weight – Selected Treatments Only)

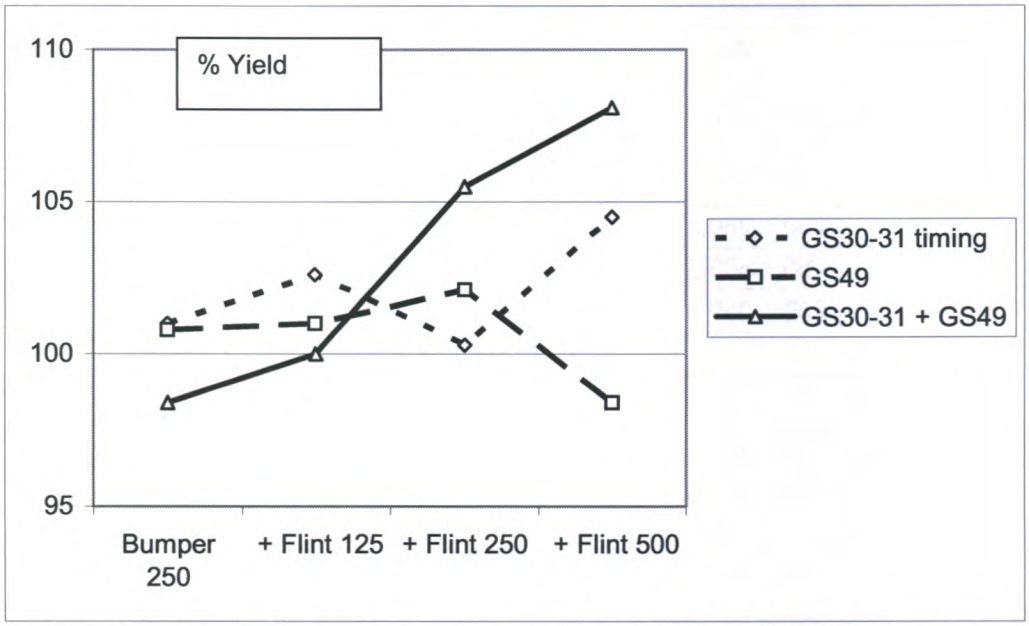
Product	Timing of applic'n	Rate (ml/ha)	Yield data			Quality data		
			t/ha	%	% P	% Sc	Kg/hl	TGW
Bumper	**GS30-31**	250	3.86	101.0	11.5	1.5	63.8	50.7
Bumper + Flint	**GS30-31**	250 + 125g	3.92	102.6	11.2	1.2	64.6	*
Bumper + Flint	**GS30-31**	250 + 250g	3.83	100.3	11.2	1.4	64.1	*
Bumper + Flint	**GS30-31**	250 + 500g	3.99	104.5	10.6	1.4	64.0	50.1
Opus + Flint	**GS30-31**	250 + 250g	3.96	103.7	11.1	1.9	62.9	*
Amistar Xtra	**GS30-31**	400	3.72	97.4	11.6	2.1	62.6	*
Bumper	GS49	250	3.85	100.8	11.5	1.7	63.4	50.9
Bumper + Flint	GS49	250 + 125g	3.86	101.0	11.3	1.9	63.1	*
Bumper + Flint	GS49	250 + 250g	3.90	102.1	11.1	1.5	63.0	*
Bumper + Flint	GS49	250 + 500g	3.76	98.4	11.3	2.2	61.7	*
Opus + Flint	GS49	250 + 250g	3.88	101.6	11.6	1.7	63.6	*
Amistar Xtra	GS49	400	3.95	103.4	11.3	1.6	63.2	*
Bumper	GS30 +49	125 x2	3.76	98.4	11.6	1.8	62.7	50.2
Bumper + Flint	GS30 +49	(125 + 62.5) x2	3.82	100.0	11.7	1.8	62.8	*
Bumper + Flint	GS30 +49	(125 + 125) x2	4.03	105.5	10.9	1.4	64.0	*
Bumper + Flint	GS30 +49	(125 + 250) x2	4.13	108.1	11.5	1.7	63.5	49.5
Opus + Flint	GS30 +49	(125 + 125) x2	4.33	113.4	11.1	1.3	63.3	*
Amistar Xtra	GS30 +49	400 x2	3.86	101.0	11.5	1.7	63.2	*
Bumper (control)	GS30 +49	250 x2	3.92	102.6	10.7	1.7	63.4	50.5
Untreated			3.82	100.0	11.3	1.8	63.6	50.9
LSD (5%) [Trtd vs Trtd]			**0.33**		**0.7**	**0.7**	**1.7**	**1.8**
LSD (5%) [Untreated vs Trtd]			**0.28**		**0.6**	**0.6**	**1.4**	**1.8**
CV 5.9%								

The split timings in this barley trial significantly out yielded the single applications of the same active ingredient. This effect was most pronounced at the higher rates of strobilurin (graph 1) and with Opus/Flint mixture. Overall, the single early spray gave a 1.5% yield increase and the later single spray 1%, this compared to 4.4% with the split application of the same active ingredient. However, only 2 of the individual treatment effects were statistically significant compared to the untreated control.

Whilst there was a general correlation between the better treatments and higher yields, there are exceptions, the most notable being the 2 spray Amistar Xtra treatment which gave excellent disease control and green leaf retention, but only a 1% yield increase.

The highest yielding treatment was the 2 spray Opus/Flint approach, which whilst not available as yet, indicates epoxiconazole's (Opus) potential in barley as well as wheat.

Graph 1: Influence of Strobilurin (Flint – Trifloxystrobin) Addition to Bumper (Triazole – Propiconazole) on % Yield Relative to Untreated Yield Equal to 100.



Note: At each rate of strobilurin on the graph the same amount of active ingredient has been employed, whether it is 2 split or a single application.

Conclusion:

Again the majority of individual treatment responses to fungicide are positive but not statistically significant, indicating that there is a trend but it is small. Barley however, poses a dilemma in that the single spray options early and late do not optimise performance against early Scald and late leaf rust infection, as such it is difficult to avoid spraying twice if both diseases pose a threat. In addition, if the rate of both sprays are cut to a bare minimum the results are inferior in terms of disease control. Triazoles are generally not as effective against Scald and diseases such net blotch, by comparison to the rusts.