6.7 TO ASSESS THE INFLUENCE OF STROBILURIN APPLICATION ON THE NUTRITIONAL REQUIREMENT FOR MALTING BARLEY (INVERLEIGH VIC)

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Location: SFS Inverleigh Research site

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Rainfall (2005): 500.8 mm
GSR: (Apr – Nov) 350.3 mm

Objectives

- The overall objective is to determine the influence of strobilurin fungicide application on the nitrogen requirement for malting barley.
- Within this overall objective there are a number of component objectives that are interrelated
- To assess the impact of strobilurin fungicide over and above conventional triazole fungicides on nitrogen requirement for malting barley, in effect to quantify any interaction between disease management and applied nitrogen.
- To measure the effect of disease management using strobilurins on the yield and quality of winter wheat malting barley.
- To calculate the cost-effectiveness of strobilurin and applied nitrogen in relation to grain quality.

Results

There was no evidence that the use of strobilurin fungicides lowered grain protein relative to untreated crops, despite yield increases of over 30%, contradicting European work where strobilurin application lowered grain protein through yield dilution. In this study strobilurin treatment was associated with either no effect or higher grain protein levels relative to untreated crops fertilised with the same amount of nitrogen. However, there was a slight trend to suggest that strobilurin treated crops utilised higher N rates better than untreated crops since where there was a margin advantage to nitrogen application it tended to be greater with the strobilurin treatments.

Overall yield responses

- In the southern Victoria trial, placed in the high rainfall zone (HRZ), a 2 spray programme based on Tilt (propiconazole) and Tilt plus Amistar (azoxystrobin) gave 21% & 30% yield increases (0.88 t/ha –1.28 t/ha) over the untreated.
- The response to nitrogen in the trial was limited, with no advantage to N rates above 30kg/ha N.

Disease control

- Spot form of Net Blotch (SFNB) was the main disease, however post flowering the symptoms of this disease were obscured by a general leaf blackening on the upper surface only.
- This appeared post flowering and looked to be associated with pollen falling from the head, however, its control was strongly correlated to fungicide treatment.
- Under these conditions, the addition of strobilurin created significant benefits in terms of green leaf retention and disease control.

Interaction of applied nitrogen and fungicide programme

- There was a significant interaction between the fungicide programme and the applied nitrogen application, which illustrated that where barley was fungicide treated, it gave a significant yield response to nitrogen application (but there was no further response to nitrogen levels higher than 30kg/ha N.
- In gross margin there was a cost effective return from fungicide application, however the clear yield advantage of the strobilurin treated crops was eroded by the higher cost of the input (assumed price of $40/ha based on Amistar Xtra). At $140/tonne the yield increase generated by the 2 spray Tilt programme gave a 3:1 benefit to cost ratio at Inverleigh

Influence of applied nitrogen and fungicide programme on quality

- For the same level of fertiliser applied there either was no difference in grain protein due to fungicide treatment.

Methodology:
The trial comprised of 15 treatments replicated 4 times, arranged with fungicide as the main plot and nitrogen level as the sub plot. Individual treatment applications were a combination of applied nitrogen and fungicide programme. There were five levels of applied nitrogen superimposed on three fungicide programmes.

1. Applied nitrogen levels:

0,30,60,90 & 120 kg/ha N was applied as single nitrogen doses at GS30-31 on 6th September at Inverleigh.

2. Fungicide Programmes:

Both fungicide treatments were based on two sprays of triazole (Tilt – propiconazole) without and without the addition of strobilurin chemistry (Amistar – azoxystrobin)

- Untreated
- Propiconazole 62.5g/ha ai (Tilt 250ml/ha) @ GS30-31 followed by Propiconazole 62.5g/ha ai (Tilt 250ml/ha) @ GS39-49
- Propiconazole 62.5g/ha ai + Azoxystrobin 100g/ha ai (Amistar Duo 500ml/ha) @ GS30-31 followed by Propiconazole 62.5g/ha ai + Azoxystrobin 100g/ha ai (Amistar Duo 500ml/ha) @ GS39-49

N.B. Trial was sprayed with an experimental mix of Propiconazole/Azoxystrobin - Amistar Duo, which contains 200g ai/l azoxystrobin and 125g ai/l propiconazole.

3. Application dates and water rates

Fungicide timing	Inverleigh	
	Application date	Water rate
GS 31	9th September	90 l/ha
GS 39-49	4th October	90 l/ha

Assessment Data:

Soil Nitrogen recorded at GS32
Inverleigh assessed in unfertilised crop (0-60cm) Total N - 22 kg/ha N

Soil Nitrogen recorded at harvest
Inverleigh assessed in unfertilised crop (0-60cm) Total N - 19 kg/ha N

Disease assessment
Spot form of Net Blotch (SFNB) was recorded at low levels at the time of the first fungicide application on the 6th September GS30-31. After ear emergence (GS59) there a marked increase in disease pressure at this site such that 17 days after the October 8th assessment there were considerable visual differences between the different fungicide treatments (Table 6-16. & Figure 6-15)

Table 6-17: GS 71 Assessment 21 Days After GS49 Spray - % Disease Infection (And % Green Leaf Area (GLA) For Flag, Leaf 2 & Leaf 3 - Inverleigh, Victoria, cv Gairdner October 25th 2005

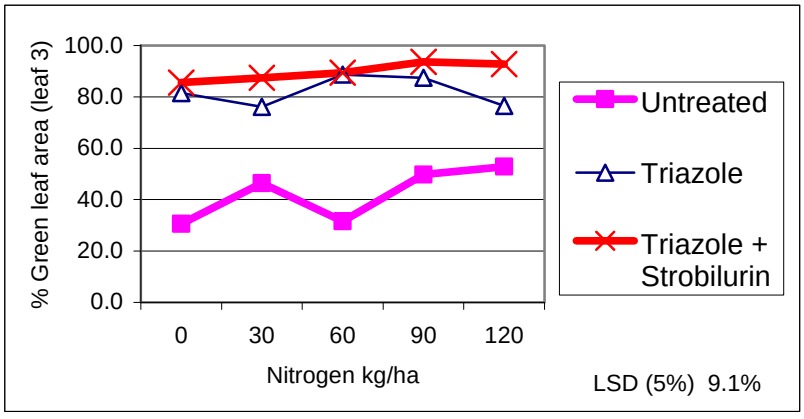
Nitrogen Level kg/ha N/	% Disease infection			% GLA		
Fungicide treatment GS31+49	**Flag**	**L2 (F-1)**	**L3 (F-2)**	**Flag**	**L2 (F-1)**	**L3 (F-2)**
A. Untreated with Fungicide	4.5	15.8	14.0	93.5	69.1	30.6
0	4.4	12.8	11.8	94.6	79.2	46.4
30	3.9	11.7	15.0	95.0	83.5	31.7
60	3.2	11.0	12.1	95.6	82.6	49.8
90	3.2	11.5	13.9	96.2	84.6	52.9
120	3.8	12.6	13.3	95.0	79.8	42.2
Mean	4.5	15.8	14.0	93.5	69.1	30.6
B. Propiconazole 62.5 g/ha ai applied GS31+ 49						
0	2.2	5.6	6.4	97.3	96.8	81.5
30	2.0	5.0	6.7	97.0	96.8	76.1
60	1.9	3.9	6.2	97.8	97.4	88.7
90	1.9	3.9	4.4	97.2	96.5	87.5
120	2.1	5.3	6.5	97.5	95.6	76.5
Mean	2.0	4.7	6.0	97.4	96.7	82.0
C. Propiconazole 62.5 g/ha ai + Azoxystrobin 100g/ha ai applied GS31 + 49						
0	1.8	3.2	4.7	97.7	97.4	85.6
30	1.6	2.8	4.6	97.3	97.5	87.4
60	1.7	2.8	3.9	97.3	97.8	89.5
90	1.5	2.9	3.1	97.9	97.7	93.6
120	1.6	2.8	3.5	97.4	97.6	92.8
Mean	1.6	2.9	3.9	97.5	97.6	89.8
LSD – (p=0.05)						
Fungicide	**0.3**	**1.2**	**1.2**	**0.6**	**2.2**	**4.1**
Nitrogen rate	**0.4**	**1.5**	**1.5**	**0.8**	**2.8**	**5.2**
Fungicide/nitrogen	**0.8**	**2.7**	**2.7**	**1.4**	**4.9**	**9.1**

N.B. Disease infection scores were difficult to ascribe to individual diseases since leaf blackening obscured the symptoms, however three diseases were present: Spot Form of Net Blotch, Scald and Leaf rust.

Averaging the nitrogen treatments revealed a significant benefit to strobilurin addition on all top three leaves, however these benefits over triazole alone were small relative to the difference between the untreated and fungicide treated blocks.

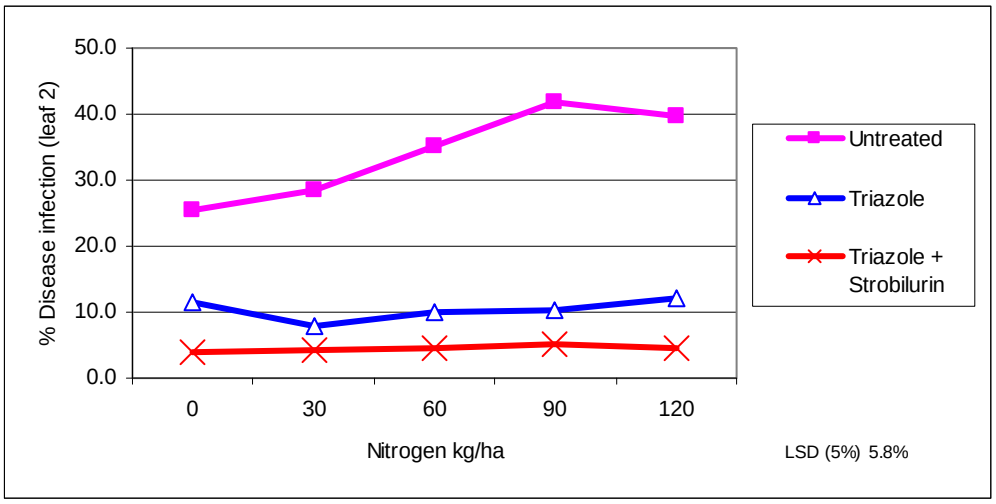
There was a slight trend for strobilurin addition to improve green leaf area relative to the Tilt only treatment but only at the higher nitrogen level (120kg/ha N).

Figure 6-15: Influence Of Nitrogen Level And Fungicide Treatment On % Green Leaf Retention Assessed On Leaf 3 At GS71, 21 Days After Second Application Of Fungicide At GS49



The final assessment on November 7th, which was again made difficult by the presence of leaf blackening, revealed significant disease control benefits from strobilurin fungicide application (Figure 6-16). This benefit was observed in both reduced disease infection and increased green leaf area. The triazole 2-spray programme gave 59% disease control 34 days after the GS49 spray whilst the triazole plus strobilurin gave 83% control, a difference that was statistically significant. On the principal leaf (flag-1) there was an indication that higher N levels were associated with greater disease pressure, a result similar to the findings in 2004.

Figure 6-16: Influence Of Nitrogen Level And Fungicide Treatment On % Disease Infection Assessed On Leaf 2 At GS76 34 Days After Second application of fungicide at GS49



Yield & Quality data

Table 6-18: Influence Of Nitrogen Level (kg/ha N) And Fungicide Regime On Yield (T/ha, % Relative To Zero N Untreated With Fungicide) – Inverleigh, Victoria cv Gairdner

N Level kg/ha N	Untreated		2 Spray triazole GS31 + 49		2 Spray triazole + strobilurin GS31 + 49		Mean	
	t/ha	%	t/ha	%	t/ha	%	t/ha	%
0	4.19	100.0	4.81	114.8	5.22	124.6	**4.74**	**100**
30	4.08	97.4	5.08	121.2	5.55	132.5	**4.90**	**103.4**
60	4.24	101.2	5.08	121.2	5.44	129.8	**4.92**	**103.8**
90	4.27	101.9	5.18	123.6	5.53	132.0	**4.99**	**105.3**
120	4.15	99.0	5.18	123.6	5.61	133.9	**4.98**	**105.1**
Mean	**4.19**	**100.0**	**5.07**	**121.0**	**5.47**	**130.5**		
LSD (p=0.05)								
Fungicide	**0.41**							
Nitrogen	**0.14**							
N/Fungicide	**0.44**							
CV %	**3.50**							

Averaging nitrogen levels both fungicide programmes significantly out yielded the untreated, creating yield advantages of 21-30% over the untreated control. There was a yield advantage of 0.4 t/ha (significant at p=0.1) from using Amistar Duo (Tilt plus Amistar (triazole + strobilurin) over the equivalent triazole only programme (Tilt). There was a significant response to nitrogen but no advantage over 30kg/ha N, which gave an average yield increase of 0.16t/ha. There was a significant interaction (5% significance level) between fungicide application and the influence of applied nitrogen, since where barley was treated with fungicide there was no response to nitrogen but with fungicide application the response to nitrogen was significant.

Figure 6-17: Interaction Of Nitrogen Level And Fungicide Treatment On Yield T/ha – Inverleigh, Vic cv Gairdner

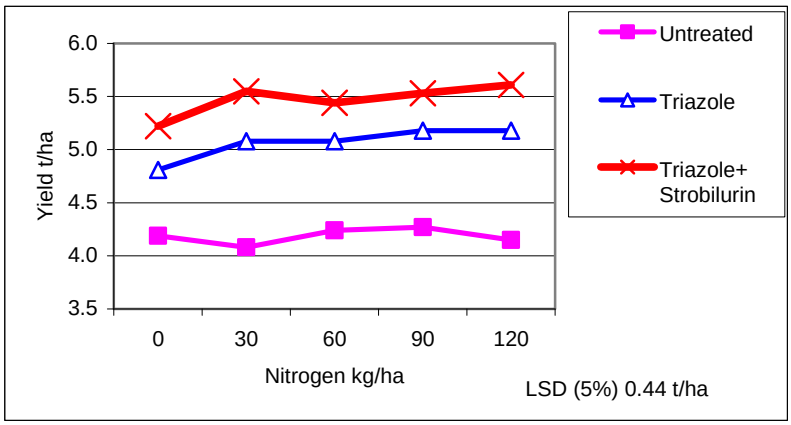


Table 6-19: Influence Of Nitrogen Level (kg/ha N) And Fungicide Regime On % Protein & % Screenings (2.2 mm) – Inverleigh, Victoria cv Gairdner

N Level kg/ha N	Untreated		2 Spray triazole GS31 + 49		2 Spray triazole + strobilurin GS31 + 49		Mean	
	% Protein	% Screen	% Protein	% Screen	% Protein	% Screen	% Protein	% Screen
0	10.7	1.5	11.0	1.3	11.1	0.9	**10.9**	**1.2**
30	11.2	2.1	11.5	1.5	11.6	1.8	**11.4**	**1.8**
60	11.8	1.9	11.4	1.6	11.5	3.0	**11.6**	**2.2**
90	11.4	1.8	11.3	2.0	11.8	1.0	**11.5**	**1.6**
120	11.7	1.5	11.8	2.1	11.1	1.7	**11.5**	**1.8**
Mean	**11.4**	**1.8**	**11.4**	**1.7**	**11.4**	**1.7**		
LSD (p=0.05)								
Fungicide	**0.6**	**0.6**						
Nitrogen	**0.5**	**0.8**						
N/Fungicide	**0.9**	**1.3**						

The application of nitrogen significantly increased protein content, but there was no evidence to suggest that fungicide application reduced grain protein even though yields were increased by 1-1.5 t/ha. Small screening differences (all at levels below 3%) revealed no significant trends in this quality parameter.

Table 6-20: Influence Of Nitrogen Level (kg/ha N) And Fungicide Regime On Test Weight kg/hl & Thousand Seed Weight (TSW) g – Inverleigh, Victoria cv Gairdner

N Level kg/ha N	Untreated		2 Spray triazole GS31 + 49		2 Spray triazole + strobilurin GS31 + 49		Mean	
	TSW g	Kg/hl	TSW g	Kg/hl	TSW g	Kg/hl	TSW g	Kg/hl
0	46.1	65.9	50.6	65.6	51.2	66.3	**49.3**	**65.9**
30	46.0	64.6	50.4	66.0	51.0	64.7	**49.1**	**65.1**
60	45.0	65.8	50.8	65.3	50.6	64.6	**48.8**	**65.2**
90	46.0	65.3	50.6	65.2	46.6	66.9	**47.7**	**65.8**
120	46.2	65.6	48.0	65.3	49.8	65.6	**48.0**	**65.5**
Mean	**45.9**	**65.4**	**50.1**	**65.5**	**49.8**	**65.6**		
LSD (p=0.05)								
Fungicide		**1.0**						
Nitrogen		**1.1**						
N/Fungicide		**1.9**						

Margin Analysis

Table 6-21: Influence Of Nitrogen Level (kg/ha N) And Fungicide Regime On Gross Output & Margin After Nitrogen And Fungicide ($/ha) – Inverleigh, Vic cv Gairdner

N Level kg/ha N	Untreated		2 Spray triazole GS31 + 49		2 Spray triazole + strobilurin GS31 + 49		Mean	
	Output $/ha	Output minus N/F cost $/ha	Output $/ha	Output minus N/F cost $/ha	Output $/ha	Output minus N/F cost $/ha	Output $/ha	Output minus N/F cost $/ha
0	578	578	664	631	720	625	654	611
30	563	524	701	629	766	632	677	595
60	585	515	701	598	751	585	679	566
90	589	487	715	580	763	566	689	544
120	573	439	715	548	774	546	687	511
Mean	**578**	**509**	**699**	**597**	**755**	**591**		

Despite three samples falling just below 65kg/hl at this site, since the differences were not statistically significant and all samples had very low screening levels all grain was priced at $138/t for GA1 grade. (Gairdner grade 1)

Triazole (Tilt) cost @ $9/ha per application plus $7.50/ha per application. Assumed price for Strobilurin plus triazole @ $40/ha plus $7.50/ha per application.

Nitrogen costed $1.05 kg/ha N.