2.2.1 Interaction of Nitrogen management with disease management in winter barley Inverleigh

Location of Trial: SFS Inverleigh Main Research site, Project No. SFS00015

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Summary:
Despite an exceptionally dry growing season (GSR Apr – Nov 235mm) first cereal barley averaged 3.6 t/ha, with Gairdner giving a mean yield of 3.50t/ha and Baudin 3.71t/ha. As a consequence of the season, disease did not develop in this trial (irrespective of variety susceptibility), meaning that it was not possible to examine the interaction between nitrogen timing and fungicide requirement.

In terms of nitrogen timing, crops treated with 75 kg/ha N at GS31 were significantly higher yielding than crops receiving the same amount of nitrogen in the seedbed. In part this may have been due to the detrimental effect of nitrogen applied upfront, since from neighbouring trials in the same rotation position (where zero N plots produced similar yields), it is unlikely that applied nitrogen was required to produce these yields. If this was the case then it might be concluded that the GS31 application was less detrimental than the seedbed applications in a situation where soil nitrogen reserves were sufficient to supply the needs of the crop. In addition, if soil nitrogen was sufficient (28mg/kg nitrate nitrogen 0-10cm), it cannot be ruled out that a possible reason for higher yields from the later nitrogen was that less was taken up by the crop. However set against this, was the fact that 5th September GS31 nitrogen application was followed by 15 and then 6.5mm of rain on the following two days after application.

Commercially the results illustrate two potential benefits of nitrogen application at the GS30-31 timing in barley, the first is that the application can reviewed in light of the season so far and the second is that if applied and the season turns dry following then the effects on the crop maybe less detrimental (see canopy management trial in barley for other results relevant to this subject).

With no disease fungicide treatments only served to lose money in this trial.

Of course the considerable downside could be that later nitrogen increases the protein levels taking into the feed category (see canopy management trial in barley for other results relevant to this subject).
In this trial, all treatments produced protein levels in excess of 13%, so was classed as feed barley. With no response to fungicide, the best margins in the trial were produced

by untreated crops treated with nitrogen at GS31; however it should be emphasised that no applied nitrogen may have been needed.

Background and objectives: To quantify how 'upfront' nitrogen application versus stem elongation (GS30-31) nitrogen influences the need for disease control in winter barley varieties of differing disease resistance.

Growing Season Rainfall (Apr – Nov): 235 mm (compared to 350 mm in 2005)
Soil Nutrition: Silty Loam, pH 5.8, Nitrate Nitrogen 28 mg/kg 0-10cm pre sowing
Sowing Date: 1st June 2006
Sowing Rate: 200 plants/m^2
Harvest Date: 7th December 2006
Seed Treatment: Hombre
Fertiliser Treatment: 150kg/ha of MAP at sowing.

Methodology: 2 cultivars (Baudin and Gairdner Barley), four fungicide management strategies and 2 nitrogen regimes replicated four times.

Fungicide Treatment:

Trt No.	Seeding GS30-31	GS45-49 (Booting – 1st awns)
1	Untreated	---
2	Tilt 250ml/ha	---
3	---	Tilt 250ml/ha
4	Tilt 250ml/ha	Tilt 250ml/ha

Nitrogen Timing:
Two nitrogen regimes: one in seedbed 1st June and the other at GS30-31 5th September both are based on a 75kg/ha N application (Urea 46% N).

Weed Control:
Pre emergence – Sprayseed @ 2L/ha and Triflan @1.5L/ha
Post sowing – Dual gold @ 250ml/ha and Diuron @ 500ml/ha

Results & Discussion:
Initial establishment was not affected by seedbed nitrogen with both varieties establishing between 150 – 200 plants/m2 (Table 2).

Table 2: Plant populations (plants/m^2) in Baudin and Gairdner assessed at GS22 – 18th July.

	Variety	
N_Timing	Baudin	Gairdner
Untreated	157	161
75 kg/ha N Seedbed	170	195
Mean	164	178

As might be expected tiller numbers recorded in August were slightly higher where seedbed nitrogen was applied, however considering the dose of 75kg/ha N in the seedbed the difference was small, 196 tillers/m^2 from seedbed N application and 179 tillers/m^2 from GS30-31 applications.

There were only small differences in final ear numbers due to nitrogen treatment were recorded; however there was a larger difference as a result of variety, with Gairdner producing significantly less ears/m2, a factor likely to have been linked to the grain size recorded with this variety (table 3).

Yields

Influence of variety

When all treatments of fungicide and nitrogen timing were averaged there was no statistical difference in yield between the two varieties in this trial, however Baudin tended to be higher yielding with both nitrogen in the seedbed and applied at early stem elongation.

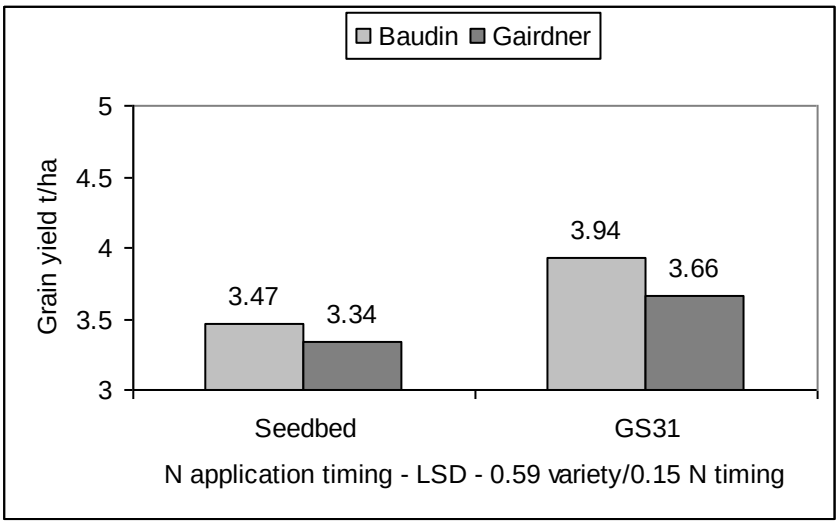

Figure 1: Influence of variety and nitrogen timing (75kg/ha N) on the yield (t/ha) of Baudin and Gairdner – SFS Inverleigh 2006

Influence of nitrogen timing

Irrespective of variety there was a significant yield increase associated with moving nitrogen timing from seedbed to GS30-31. With Baudin the yield increase was 0.47t/ha and with Gairdner 0.32t/ha when meaned over all the four fungicide regimes.

Influence of fungicide strategy

There were no significant yield differences due to fungicide in this trial, principally since disease infection never developed.

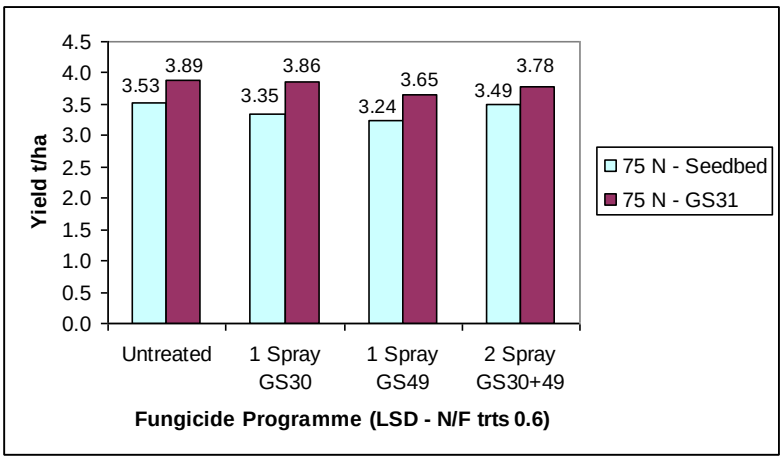

Figure 2: Influence of Fungicide strategy and nitrogen timing (75kg/ha N) on the yield (t/ha) mean of two varieties Baudin and Gairdner – SFS Inverleigh 2006

Nitrogen timing fungicide interaction in individual varieties
There was no interaction between fungicide application and nitrogen timing in the trial, since disease did not develop.

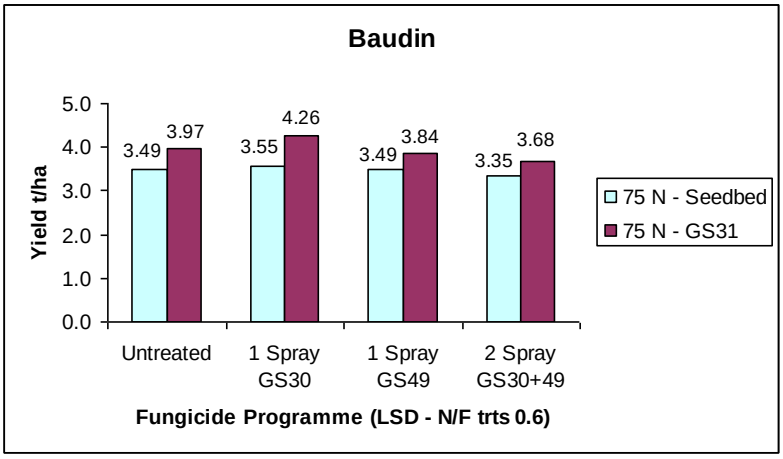

Figure 3: Influence of Fungicide strategy and nitrogen timing (75kg/ha N) on the yield (t/ha) Baudin – SFS Inverleigh 2006

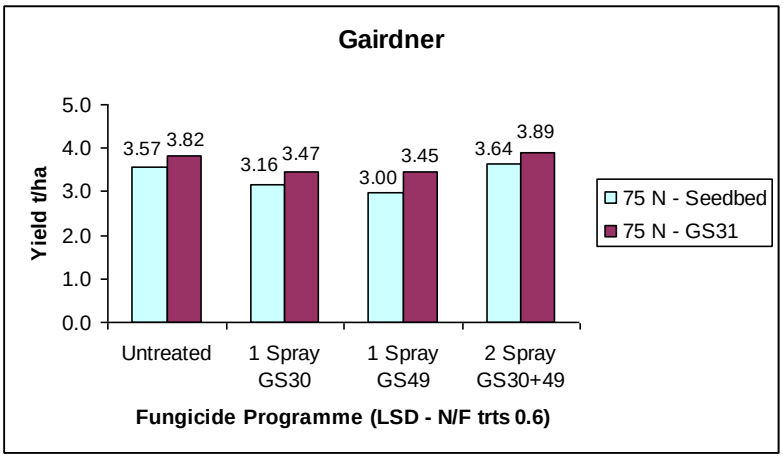

Figure 4: Influence of Fungicide strategy and nitrogen timing (75kg/ha N) on the yield (t/ha) Gairdner – SFS Inverleigh 2006

Quality

Treatment influence on quality was relatively small with the exception of grain size T.S.W (g), which revealed a significant advantage to Gairdner over Baudin. There were no other significant effects on grain quality.
Table 3. Influence of cultivar, nitrogen timing and fungicide on yield (t/ha) and quality (% Protein, % screenings & test weight kg/hl)

Treatment		Yield	Quality			
Fungicide	Nitrogen Timing	t/ha	T.W. kg/hl	% Screen	TSW (g)	% Protein
i) Baudin						
Untreated	Seedbed	3.49	65.6	14.5	32.0	14.1

Tilt GS30		3.55	66.0	11.5	32.1	13.4
Tilt GS49		3.49	64.4	16.7	30.0	14.1
Tilt GS30 + GS49		3.35	65.5	15.3	32.3	13.9
Untreated	GS31	3.97	65.2	15.0	30.7	13.6
Tilt GS30		4.26	65.6	12.5	32.7	13.5
Tilt GS49		3.84	64.8	14.4	33.4	13.4
Tilt GS30 + GS49		3.68	66.0	12.5	33.9	13.5
ii) Gairdner						
Untreated	Seedbed	3.57	68.0	12.2	36.7	13.8
Tilt GS30		3.16	67.5	12.8	36.6	14.3
Tilt GS49		3.00	67.5	15.2	35.8	14.5
Tilt GS30 + GS49		3.64	67.2	12.7	35.6	13.9
Untreated	GS31	3.82	67.1	13.4	36.5	14.1
Tilt GS30		3.47	65.9	19.4	34.6	14.4
Tilt GS49		3.45	66.6	14.7	35.7	14.2
Tilt GS30 + GS49		3.89	67.1	14.2	35.9	14.0
	Mean	**3.60**	**66.2**	**14.2**	**34**	**13.9**
LSD - 5%	5%					
Cultivar		0.59	1.80	7.79	1.72 **	0.83
Fungicide		0.38	1.07	3.38	1.53	0.45
Nitrogen Timing		0.15 ***	0.74	1.92	0.88	0.28
Cultivar/nitrogen/fungicide interaction		0.67	2.27	7.87	2.73	0.95

*** Highly Significant

Conclusions:

75kg/ha nitrogen timed at GS30-31 (start of stem elongation) generated significantly better crop yields than the same quantity of nitrogen applied in the seedbed. However it is not possible to conclude whether there was a response to nitrogen since there no untreated control. From the neighbouring canopy management trial in Gairdner Plus, plots untreated with nitrogen were yielding in the range of 3.5 - 3.8 t/ha, indicating that the available nitrogen in the soil (28mg/kg nitrate N pre sowing 0-10cm) may have been sufficient to provide much of the nitrogen nutrition for the trial. In this trial yields ranged from approximately 3 – 4 t/ha with few differences due to treatment with the exception of nitrogen timing.

Since the yield response to nitrogen is likely to have been small in the trial it is probable that 75 kg/ha N was not required to generate this yield potential and that timing was a more a factor of what was less detrimental to yield, rather than which treatment generated the greatest yield response. Thus excessive nitrogen at seedbed may have been more detrimental than GS30-31 applied nitrogen. Another consideration might be that the GS30-31 timing was not fully taken up by the crop, thus being less detrimental as a consequence of a lower nitrogen rate rather than a later timing being applied. However weather records would suggest that nitrogen was taken up at GS30-31, since 20mm of rainfall fell in the 2 days following application.

It was not possible to look at the interaction between applied nitrogen and subsequent response to fungicide since disease infection did not develop in either Baudin or Gairdner. Fungicide treatments only served to lose money in this trial.