

4.3.6 Defining Guidelines For Canopy Management In Barley For The Different Climatic Regions Of Australia - June Sown Gairdner - Inverleigh, Vic

Location and Trial: Inverleigh

Researchers:

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Growing Season Rainfall (Apr – Nov): 393 mm

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Grains Research and Development Corporation
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Summary:

June 13th sown Gairdner produced yields in the range of 4.86 – 5.69 t/ha following canola stubble. With high soil nitrogen reserves (203 kg/ha N, 0-90cm) recorded at sowing, there was a small but significant response to applied nitrogen (0.21 t/ha at 50 kg/ha N & 0.23 t/ha at 100 kg/ha N). There was a significant advantage to nitrogen timed during stem elongation (GS31-33) over nitrogen applied in the seedbed.

There was a non significant trend for the higher populations (193 plants/m²) to be higher yielding than 100 plants/m² (0.21 t/ha mean advantage), with the highest yields in the trial recorded when the higher plant population was combined with GS31- 33 nitrogen timings. At 50 kg/ha N these timings produced malting grade qualities with the exception of test weight which was below 65 kg/hl in all treatments in the trial.

The best margins (after nitrogen and seed costs had been deducted) came from 190 plants/m² with nitrogen timed at GS31-33 at 50kg/ha N. Interestingly, there was a greater response to 100 kg/ha N over 50 kg/ha N with the thinner crop canopy, leading to a significant interaction between N rate and plant population ($p < 0.05$). However, higher plant populations with 50 kg/ha N still produced better margins. This may have correlated to a need to boost tillers in the lower plant population but not in the higher population.

At the start of August Yield Prophet®, which was run to test its accuracy for this long season HRZ scenario, predicted that there would be little difference between any of the treatments in the trial. With less than 1t/ha covering the differences in yield this forecast was reasonably accurate. In early November the forecast was for yields between 5-6 t/ha, a result that was achieved. Where Yield Prophet was less accurate, was in not forecasting a difference in yield due to nitrogen timing and, as seen in the wheat trial, predicted growth stages lagged behind actual stages in the field.

Background:

Trial work in 2004 showed that in crop nitrogen applications for barley gave significant benefits over seedbed applications despite greater risks of high proteins, this work and last seasons trial (when there was no yield response to applied N) builds on the work started in 2004.

Objectives:

- To determine whether nitrogen timing and dose interacts with plant populations in terms of yield, crop structure and predisposition to lodging.
- To determine the influence of N application at stem elongation versus up front N in terms of crop structure, yield components and quality parameters.
- To examine how nitrogen timing and rate influences green area and green leaf retention during grain fill (*not reported in this summary*).

▼ Table 4.24: Trial Inputs

Sowing Date:	13 th June 2007
Variety:	Gairdner
Sowing Rate:	Targeting 100 and 200 plants/m ²
Harvest Date:	31 st December 2007
Seed Treatment:	Hombre
Fertiliser Treatment:	100kg/ha MAP + Cu Zn at seeding.

Methodology:

Two different plant populations targeting 100 and 200 plants/m² were treated with five different nitrogen timing at two different nitrogen rates 50 and 100 kg/ha N. The five nitrogen timings were applied at one of three timings as outlined in Table 4.24.

▼ Table 4.25: Nitrogen timing and rate (kg/ha N applied)

Trt No.	Seedbed (pre sowing) 13th June	GS 31 (pseudo stem erect – 1 st node) 10 th September	GS 33 (3rd node) 26 th September
1	Untreated (zero N)	---	---
2	100% N	---	---
3	---	100% N	---
4	---	---	100% N
5	50% N	50% N	---

Each nitrogen timing except zero N was applied with either 50 and 100 kg/ha N (46% N).

Weed Control:

- Knockdown pre sowing – Roundup 1.2 l/ha + Striker 100ml/ha,
- Pre-emergent incorporated by sowing– Spray seed @ 1.5L/ha and Trifluralin @ 1.2L/ha,
- Post sowing – Dual gold 250ml/ha and Diuron 500ml/ha,
- Post emergence – Axial 300ml/ha + Adigor 500ml/ha and Tigrex 500mls/ha.



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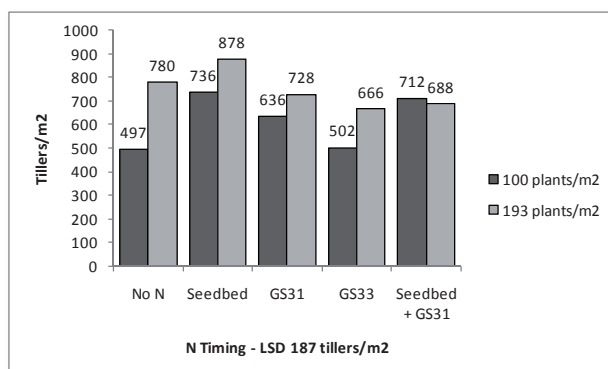
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Results:**i) Crop Structure**

Plant populations were targeted to produce approximately 100 and 200 plants/m²; the actual figures established were 100 and 193 plants/m².

Recorded at GS31 on 6th September higher plant population and seedbed nitrogen increased tiller numbers significantly. The increase in tiller number was more pronounced at the lower plant population (Figure 4.5)



▲ Figure 4.5: Influence of different nitrogen timings and plant population on tillers/m² – Gairdner Plus sown 13th June.

ii) Yield***Influence of nitrogen rate and timing on yield***

There was a significant ($p < 0.01$) increase in yield associated with nitrogen application (averaging all N treatments), but there was no significant benefit increasing nitrogen rate from 50kg/ha N to 100kg/ha N.

▼ Table 4.26: Plant population and nitrogen

	No nitrogen	50 kg/ha N	100 kg/ha N
Yield (t/ha)	5.07	5.28	5.30
Difference to control	0	+0.21	+0.23

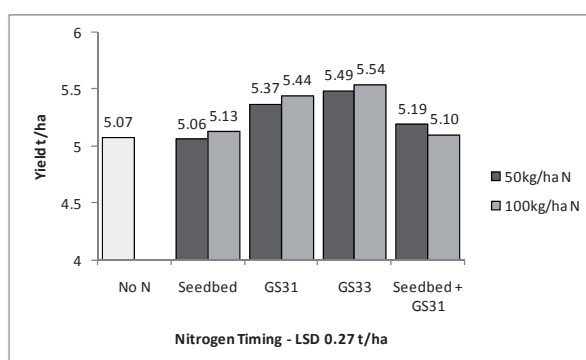
The small response to applied nitrogen is likely to have been the result of very high soil nitrogen reserves present at sowing (203 kg/ha N 0-90cm). There was a significant increase in yield associated with nitrogen applied at GS31 (1st node) and GS33 (3rd node) (Figure 4.6). The seedbed applied nitrogen gave no advantage over the zero N control with the split treatments significantly inferior to the mean of the two timings (seedbed and GS31). There was no significant difference between GS31 and GS33 timings. At the lower plant population there was a greater response to the higher nitrogen level resulting in a significant interaction between plant population and nitrogen rate (Table 4.25)

Influence of plant population on yield

There was a slight trend for the higher plant population (193 plants/m²) to be higher yielding than the below 100 plants/m², but the difference of 0.21 t/ha was not statistically significant.

▼ Table 4.27: Plant population and yield

	100 Plants/m ²	193 Plants/m ²	LSD
Yield (t/ha)	3.32	3.54	0.58
Significance of Difference			ns



▲ Figure 4.6: Influence of different nitrogen timings and rates (mean of both plant populations) on yield (t/ha) – Gairdner barley sown 13th June.

iii) Quality data

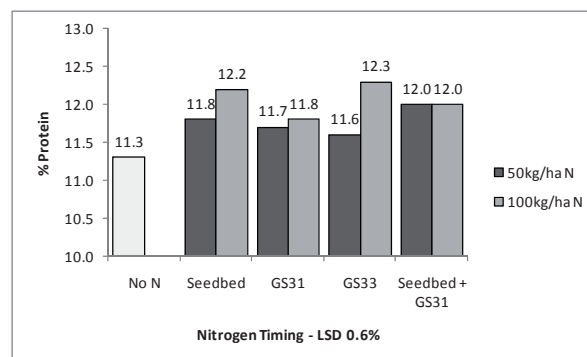
There were a number of significant effects of treatments on grain quality. Grain protein was significantly greater with applied nitrogen treatments with a non significant trend for 100kg/ha N to produce higher protein than 50kg/ha N. There were no significant differences due to timing (Figure 4.7 and Table 4.27). Grain retention was significantly reduced by nitrogen application from 96% down to 92%, higher N rates giving the greatest reduction. All screenings were below 2% but again nitrogen caused small but significant increases <1% to more than 1%.

At the 50kg/ha N all quality parameters were within the top malting grade for Gairdner GA1 except test weight which was below the minimum of 65 kg/hl in all treatments.

iv) Yield Prophet

Like the wheat, this trial was also set up with the objective of ground truthing Yield Prophet forecasts in order test the accuracy of the APSIM model in this long season HRZ scenario. The following data displays the initial starting points for the predictions and an extract from August 1st Report specially commissioned for this GRDC project (SFS 00015).

Sampling date:	13 June
Sampling depth (m):	0.9
Initial plant available water (mm):	-5
Initial nitrate (kg ha ⁻¹):	203
Organic carbon 0-10 cm (%):	1.1
Rainfall since sampling (mm):	87.75
Sowing date:	13 June
Variety:	Gairdner
Yield Prophet forecast of GS30:	9-19 Sept
Yield Prophet forecast of GS37:	21 Sept-2 Oct



▲ **Figure 4.7: Influence of different nitrogen timings and nitrogen rate and plant population on % protein – cv Gairdner sown 13th June**

Extract from Yield Prophet Report – August 1st:

“This site had very high levels of initial nitrate and there is only a low chance that there will be any difference between any treatments, but it is a bit hard to tell as yield potential exceeds the range of Yield Prophet X-axes!”

On November 8th Yield Prophet forecast that yields would be between 5-6t/ha with 50% probability of attaining approximately 5.7t/ha. This prediction and the small response to treatments was reasonably accurately predicted, however as with the wheat trial, the predicted growth stages were later than actual and the actual results showed a significant benefit to later applied nitrogen, whilst Yield Prophet forecast no difference between the seedbed and in-crop timings.

▼ Table 4.28: Influence of different nitrogen timings, nitrogen rates and plant population on Yield t/ha, % Retentions (>2.5mm), % Screenings 2.2mm, % Protein, Test weight kg/hl and Margin after Nitrogen and seed cost (\$/ha)

	N		Yield	Retent	Screening	Protein	Test wt.	Margin
	kg/ha		t/ha	%	%	%	kg/hl	\$/ha
100 plants /m2	0	Untreated	4.99	96.0	0.9	11.6	63.1	1976
	50	Seedbed	4.86	94.8	0.9	11.9	62.1	1864
	50	GS31	5.18	94.6	1.0	11.7	63.4	1989
	50	GS33	5.30	95.1	1.1	11.7	62.6	2037
	25+25	Seedbed+GS31	5.03	94.8	1.0	12.4	62.6	1924
	100	Seedbed	5.23	91.7	1.4	12.1	63.0	1962
	100	GS31	5.28	94.2	1.1	11.8	63.7	1977
	100	GS33	5.40	93.3	1.5	12.0	63.6	2022
	50+50	Seedbed+GS31	5.13	93.4	1.3	12.1	63.3	1914
193 plants /m2	0	Untreated	5.14	96.0	0.8	11.1	62.7	1911
	50	Seedbed	5.25	94.2	1.0	11.8	62.9	2060
	50	GS31	5.55	94.2	1.0	11.7	63.0	2120
	50	GS33	5.69	94.7	1.1	11.5	63.6	2173
	25+25	Seedbed+GS31	5.36	94.1	1.1	11.7	63.2	2041
	100	Seedbed	5.03	91.7	1.2	12.2	62.8	1902
	100	GS31	5.60	91.8	1.2	11.9	63.5	2090
	100	GS33	5.68	93.3	1.6	12.5	63.2	2117
	50+50	Seedbed+GS31	5.06	92.3	1.3	11.9	63.0	1866
LSD(5%) Within plant pop.[Ctrl vs Trtd]			0.33	0.9	0.3	0.8	0.9	
LSD(5%) Within plant pop.[Trtd vs Trtd]			0.38	1.0	0.3	0.9	1.0	
LSD(5%) Other comparisons[Ctrl vs Trtd]			0.54	1.9	0.3	1.2	1.2	
LSD(5%) Other comparisons[Ctrl vs Trtd]			0.56	1.9	0.3	1.3	1.3	
			Srate	Nil	Nil	Nil	Nil	
			x Nrate					
			5% sig.					

Notes: Grain price based on feed category flat price of \$400/t not adjusted for protein and screenings. Cost of nitrogen as urea - \$1.10/kg N. Seed including Hombre \$450/tonne.

Note: Application costs have been included in the above calculations based on,
Top dressing - \$7.5/ha, at sowing \$5/ha

