4.3.5 What Sort Of Crop Canopy Did We Need In May Sown Mackellar Wheat In 2007? - Inverleigh, Vic

Location: Inverleigh

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GSR: (April – November): 393mm

Summary:
May 4th sown Mackellar wheat produced yields in the range of 4.74 – 5.99 t/ha following canola stubble. With high soil nitrogen reserves (176 kg/ha N, 0-90cm) recorded 2 days pre sowing, there was a small but significant response to applied nitrogen (0.43 t/ha at 50kg/ha N & 0.58 t/ha at 100kg/ha N). There was a significant advantage to nitrogen timed during stem elongation (GS30-39) over nitrogen applied in the seedbed. This advantage was evident in both single and split applications between which there was no difference.

The earlier sowing of this year's trial compared to previous seasons meant that the yield advantage of the higher plant population (160plants/m^2 versus 86 plants/m^2) was smaller than normal, 0.15 t/ha (not significant).

Overall, the better margins (after nitrogen and seed costs were deducted) came from the nitrogen applied at stem elongation (GS 31 to 39) (there was little difference between single and split applications) with a trend for the higher plant population and higher N rate to be superior at these timings. These margin advantages were based on a significant yield interaction ($p=<0.05$) between plant population, nitrogen rate and later N timing which suggested that greater productivity was derived from higher N rate when it was applied at stem elongation on a plant population of 160 plants/m^2 as opposed to less than 100 plants/m^2.

At the beginning of August, Yield Prophet® was run to test its accuracy for this long season HRZ scenario. It predicted that despite the high soil nitrogen content, there was a 60% chance of a response to applied nitrogen. It also reported that in-crop N would out yield seedbed N given a favourable finish. A fall of 76 mm of rain at the beginning of November did provide a more favourable finish and significantly improved the yield forecast from Yield Prophet at that stage. However, the yields forecast in November were not to the levels harvested (over 6t/ha for zero N control when the actual was just under 5 t/ha). In part this looked to be the result of inaccurate phenology, since Yield Prophet growth stage predictions were slightly behind the actual growth stages recorded in the field.

Background and Objectives:

- To determine the interaction of nitrogen timing and dose with plant population in terms of yield, crop structure, predisposition to lodging and quality in the high rainfall zone.
- To determine the influence of nitrogen applied at stem elongation versus up front nitrogen on soil moisture content and dry matter production *(data not presented in this report).*

Table 4.21: Trial inputs

Soil Nutrition:	Silty Loam, pH 5.8, Nitrate Nitrogen 176 kg/ha (0-90cm)
Sowing Date:	4th May 2007
Sowing Rate:	86 and 160 plants / m^2 (actual establishment)
Seed Treatment:	Hombre
Harvest Date:	14th December 2007
Design:	Replicated Split block design

Methodology:
The trial was sown with Mackellar feed wheat into 2006 canola stubble at two seeding rates, six nitrogen application timings, two nitrogen rates replicated four times. The trial was sown on May 4th.

Fertiliser Treatment:
All plots sown with 100kg/ha granular MAP Cu and Zn. Each nitrogen timing treatment (urea) was applied at two different nitrogen rates: 50 and 100 kg/ha N (Table 4.21).

Fungicide Treatment:
A standard GS 32 and 39 fungicide application to keep the trial disease free to extend the crop canopy duration. Opus 250 ml/ha was applied at both growth stages.

Table 4.22: Nitrogen timing and rate (kg/ha N applied)

Trt No.	Pre sowing	GS 30-31 (20/8/07) (pseudo stem erect)	GS 39 (26/9/07) (flag leaf emerging on main stem)
1	Untreated	---	---
2	100% Nitrogen	---	---
3	---	100% Nitrogen	---
4	---	---	100% Nitrogen
5	50% Nitrogen	50% Nitrogen	---
6	---	50% Nitrogen	50% Nitrogen

Each nitrogen timing was applied at 50 and 100 kg/ha N.

Weed Control:
Spray Seed @ 1.2L/ha and Trifluralin @ 1.2L/ha pre sowing incorporated by sowing, GS32 and GS39 – Opus 250ml/ha, GS32, Fastac 100ml/ha GS32.

Yield Prophet
The 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 the August 1st Report specially commissioned for this GRDC project (SFS 00015). Overall considering the earliness of this report it was reasonably accurate, although variety phenology was more advanced in the field than that predicted.

Sampling date:	2 May
Sampling depth (m):	0.9
Initial plant available water (mm):	-19
Initial nitrate (kg ha^{-1}):	176
Organic carbon 0-10 cm (%):	1.1
Rainfall since sampling (mm):	147
Sowing date:	4 May
Variety:	MacKellar
Yield Prophet forecast of GS30:	16-25 Sept
Yield Prophet forecast of GS37:	2-15 Oc

Extract from Yield Prophet Report
"This site had very high levels of initial nitrate; however the high yield potential of the region has resulted in there being a 60% chance that the nitrogen treatments will out yield the control. There is a 40% chance that the 100 kg ha^{-1} treatment will out yield the 50 kg ha^{-1} treatment. It is possible that the in-crop treatments will out yield the pre-drill treatment by a small amount if the finish to the season is particularly favourable. It is unlikely that there will be a difference in yield between the 200 and 100 plants m^{-2} treatments".

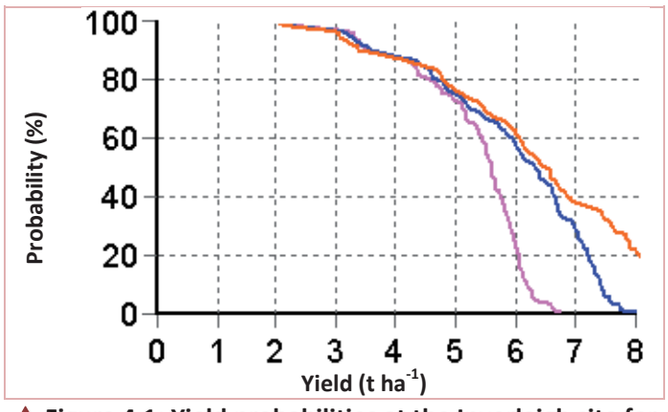

Figure 4.1: Yield probabilities at the Inverleigh site for the control (—) and 50 kg ha^{-1} N (—) and 100 kg ha^{-1} N (—) applied at seeding.

Results:

i) Crop Structure

Plant populations were targeted to produce approximately 100 and 200 plants/m^2, the actual figures established were 86 and 160 plants/m2. At GS30 higher plant population and seedbed nitrogen increased tiller number (Figure 4.2).

ii) Yield

Influence of nitrogen rate and timing on yield

There was a significant increase in yield associated with nitrogen application but the increase above 50 kg/ha N was not significant.

	No nitrogen	50 kg/ha N	100 kg/ha N
Yield (t/ha)	4.83	5.26	5.41
Difference to control	**0**	**+ 0.43**	**+0.58**

There was a significant advantage to nitrogen applied during stem elongation (p=0.01), this being evident in both the single applications and the two split approaches. There was no yield difference between single and split doses of nitrogen (Figure 4.3).

Influence of plant population on yield

There was a small yield increase associated with higher plant population but the difference between the two populations was not significant. The earlier sowing date is likely to have given the lower plant population greater chance to compensate compared to previous years.

	86 Plants/m2	160 Plants/m2	LSD
Yield (t/ha)	5.18	5.33	0.05
Significance of Difference			**NS**

iii) Margins after nitrogen and seed costs ($/ha)

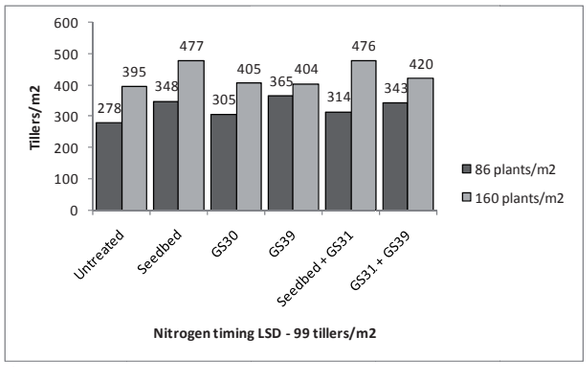

Figure 4.2: Figure 2: Influence of different nitrogen timings and plant populations on tillers/m2 (at 50kg/ha N rate) - Mackellar wheat sown 4th May.

There was no significant yield interaction between nitrogen timing and rate, however translating the yield effects into margins (after N and seed costs only) revealed that the best margins were produced by higher N rates applied at the stem elongation timings (Figure 4.4).

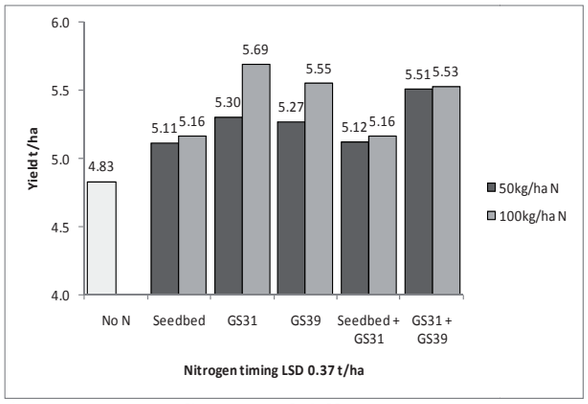

Figure 4.3: Influence of different nitrogen timings and rates on yield t/ha (mean of two plant populations) - Mackellar wheat sown 4th May.

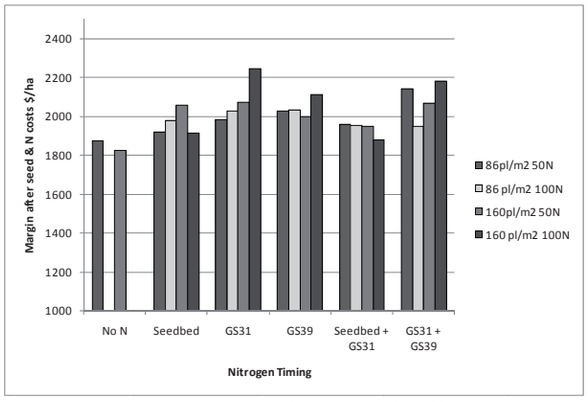

Figure 4.4: Figure 4: Influence of different nitrogen timings, nitrogen rates and plant population on margin after nitrogen and seed costs ($/ha) - Mackellar wheat sown 4th May.

iv) Yield (t/ha), Quality and Margins ($/ha)

Table 4.23: Influence of different nitrogen timings, nitrogen rates and plant population on Yield t/ha, % Protein, Thousand seed weight (g), % Screenings 2.2mm, Test weight kg/hl and margin $/ha (after deduction of nitrogen and seed costs)

Plant pop	N rate	N timing	Yield t/ha	Protein %	TSW g	Screenings %	Test wt kg/ha	Margin $/ha
100	50	Zero N (Control)	4.74	9.7	32.8	9.3	77.0	1876
		Seedbed	4.99	10.6	33.5	7.4	78.7	1916
		GS30-31	5.16	10.4	32.8	9.4	77.2	1981
		GS37-39	5.28	11.3	33.9	8.0	78.4	2029
		Seedbed + GS30-31	5.11	10.4	33.8	7.0	78.6	1956
		GS30-31 + GS37-39	5.58	10.9	35.3	7.7	78.1	2142
	100	Zero N (Control)						
		Seedbed	5.27	11.8	33.6	6.5	78.5	1978
		GS30-31	5.40	10.4	33.9	7.0	77.2	2025
		GS37-39	5.42	12.2	35.1	7.1	78.3	2030
		Seedbed + GS30-31	5.22	11.6	34.3	7.8	78.0	1950
		GS30-31 + GS37-39	5.23	12.2	34.3	7.1	78.2	1949
200	50	Zero N (Control)	4.92	9.4	33.7	8.2	78.1	1823
		Seedbed	5.24	10.5	32.7	6.8	77.6	2056
		GS30-31	5.43	10.5	35.2	6.9	77.8	2072
		GS37-39	5.25	11.0	33.2	8.5	78.7	1997
		Seedbed + GS30-31	5.13	9.4	32.7	8.0	78.5	1949
		GS30-31 + GS37-39	5.44	10.6	34.5	6.7	79.1	2068
	100							
		Seedbed	5.06	12.0	33.2	6.3	77.8	1914
		GS30-31	5.99	10.9	34.5	6.7	78.1	**2246**
		GS37-39	5.67	12.4	35.5	7.0	79.0	2113
		Seedbed + GS30-31	5.09	11.5	33.1	7.4	77.3	1878
		GS30-31 + GS37-39	5.84	11.9	34.7	6.5	78.6	2178
LSD								
[Within Seed rates, Control v Trt]			**0.45**	**0.5**	**1.7**	**1.5**	**1.1**	
[Within Seed rates, Trt v Trt]			**0.52**	**0.5**	**1.9**	**1.8**	**1.3**	
[Other Comparisons, Control v Trt C v T]			**0.55**	**0.5**	**1.9**	**1.5**	**1.3**	
[Other Comparisons, Trt v Trt]			**0.60**	**0.5**	**2.1**	**1.7**	**1.4**	
Significant Interaction Contrasts			**Srate x Nrate x Nlateness 5% sig.**	**Srate x Nrate 5% sig. Srate x Nsplitting 1% sig.**	**Nil**	**Nil**	**Srate x Nlateness 1% 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 Raxil $450/tonne.
Note: Application costs have been included in the above calculations based on,
Top dressing - $7.5/ha, at sowing $5/ha