3.3 Cereal Row Spacing Trials

3.3.1 Barley Row Spacing and Agronomy Trial (Nitrogen Trial) - Inverleigh, Vic

Location:
Inverleigh Research Site.

Funding:
This was a GRDC funded trial through the National Barley Agronomy Project.

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Background/Aim:
The barley row spacing trial has the overall objective of defining the benefits of wide row spacing for residue flow and inter-row crop establishment versus the potential reduction in yield and quality for high rainfall cropping zones of southern Australia.

The individual objectives within the trial are as follows:

- To determine how nitrogen timings developed for canopy management (based on stem elongation timings) apply to wider row spacing (300mm compared to 200mm) for both dry matter production, yield and grain quality outcomes.
- To establish whether the interaction between row spacing and nitrogen timing differs between lower and higher rainfall scenarios.

Take home messages:

- Row Spacing: The 200mm row spacing was found to have a 0.47 t/ha yield advantage over the 300mm row spacing irrespective of nitrogen timing or variety choice. No significant difference in grain quality was observed between either row spacing. Row spacing was found to affect yield in Commander and VB0432 when nitrogen inputs were managed to suit each variety.
- Nitrogen Timing: The split application of nitrogen was found to increase dry matter production at flowering; however at crop maturity the nitrogen applied at sowing had the greatest biomass. No significant difference in yield was observed between nitrogen timing, however on average the nitrogen applied treatments yielded 0.23 t/ha above the no nitrogen treatment.
- Variety: No significant difference in yield was observed between barley varieties as each yielded 3.9 t/ha. Grain quality was poor across all parameters however Commander had the better retention and screening of all varieties. The trial found that to maximise the grain yield potential the management strategy of individual varieties must be varied.
- Variety Specific Agronomy: The interaction between row spacing, nitrogen timing and variety choice illustrates that each factor cannot influence the production system alone. Greater yields can be achieved when using variety specific agronomy. The trial found that where nitrogen was applied at sowing - VB0432 had a greater yield on 200mm row spacing, when nitrogen was applied at tillering no yield difference was observed between row spacing.

Treatments:

Row Spacing
200mm (8 inch)
300mm (12 inch)

Varieties
Gairdner
Commander
VBO432

Nitrogen Timing
Nil Nitrogen
50 kg N @ GS00
50 kg N @ GS30
25 kg N @ GS00 f.b. 25 kg N @ GS30

Results and discussion:
Dry matter production at early flowering (GS60) was maximised using the split application of nitrogen. At this growth stage the no nitrogen treatment yielded the lowest quantity of dry matter (9.08 t DM/ha), this response to nitrogen was an expected outcome as the crop was becoming nitrogen deficient. The split application of nitrogen yielded 11.12 t DM/ha, this treatment demonstrated good early biomass from the GS00 nitrogen application and then boosted by the later nitrogen application. The early applied nitrogen produced the largest biomass at harvest with a yield of 9.8 t DM/ha, however the grain component of the crop will have contributed to this mass.

Variety specific agronomy is becoming an important management tool for grain growers to maximize grain yield and quality potential. Table 1 shows that there is no significant difference in yield between 200mm (4.20 t/ha) and 300mm (3.73 t/ha) row spacing irrespective of variety choice and nitrogen timing.

Figure 2 illustrates that the barley variety VBO432 has a greater yield response in a 200mm row spacing compared to 300mm when nitrogen is applied at sowing. When nitrogen is applied at tillering, this response is not evident (Figure 3). The opposite can be said of Commander barley, where a greater yield differential between row spacing's is observed when nitrogen is applied at tillering. However, no significant difference in yield is observed between 200mm and 300mm row spacing when nitrogen is applied at sowing.

As previously mentioned, no significant difference in yield was observed between 200mm and 300mm row spacing's irrespective of nitrogen timing and variety choice, although the narrow row spacing yielded 0.47 t/ha higher. No significant quality difference was observed between row spacing treatments. Although there were no grain yield or quality gains between row spacing's within the trial, in a commercial environment other benefits may be observed which included greater capacity to inter-row sow, retain stubble and improved soil health.

Of the three barley varieties trialled no significant difference in yield was observed as each yielded 3.9 t/ha irrespective of row spacing and nitrogen timing. In a poor finish to the season grain quality was severely reduced, however of the three varieties Commander had the better grain quality, this was due to larger seed size which reduced screenings and increased grain retention.

Nitrogen timing did not significantly affect yields although the nil nitrogen treatment yielded less than the applied treatments. This trend was also evident across grain quality, where the no nitrogen treatment had a lower protein content and improved retention and screening parameters.

Each of these agronomic factors influence grain yield and quality individually, however when applied tactically together greater gains and variation can be observed.

Figure 1. Effect of Nitrogen Timing on Dry Matter Production - means of 2 row widths and 3 varieties.

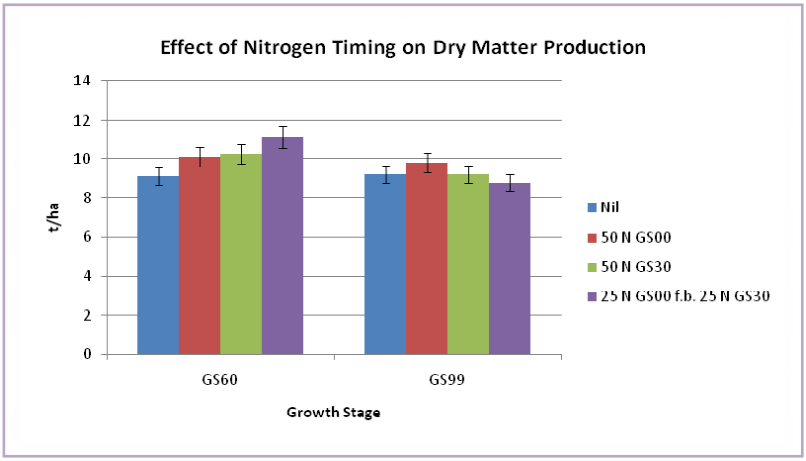

Figure 2: Effect of Row Spacing on Variety Yield (Nitrogen applied at GS00).

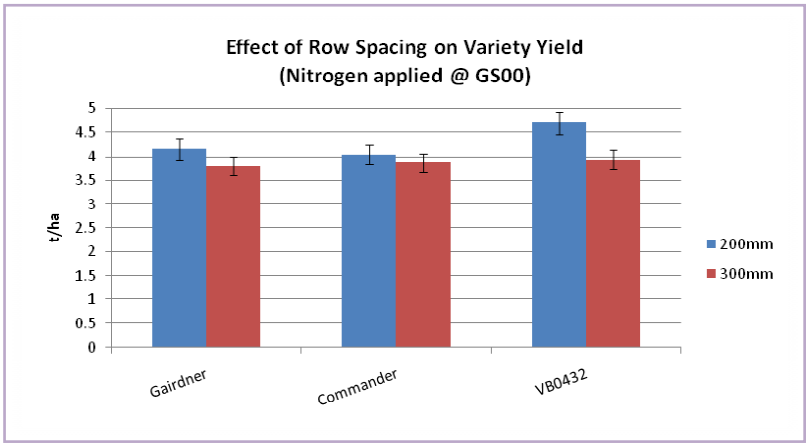

Figure 3: Effect of Row Spacing on Variety Yield (Nitrogen applied at GS30).

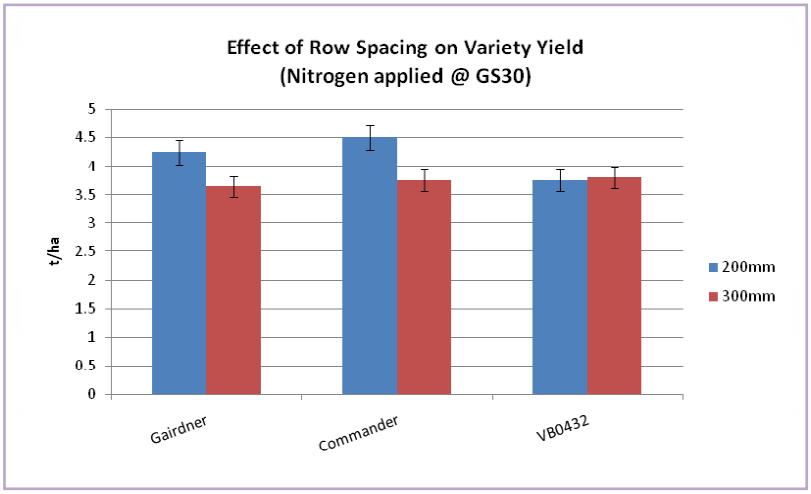

Table 1: Grain yield and quality analysis, including protein, test weight, retention & screenings, corrected to 12.5% moisture.

	Yield (t/ha)	Sig. Diff.	Protein (%)	Test Weight (kg/hl)	Retention (%)	Screenings (%)
Row Spacing						
200mm (8 inch)	4.20	a	11.5	61.7	57.4	11.0
300mm (12 inch)	3.73	a	11.9	61.4	52.7	12.7
Prob (F)	**0.100**		**0.225***	**0.542***	**0.066**	**0.124***
LSD (0.05)	**0.64**		**0.68**	**1.47**	**5.20**	**2.50**
Variety						
Gairdner	3.93	a	11.9	62.4	44.9	14.6
Commander	3.99	a	11.3	61.0	64.4	9.7
VB0432	3.97	a	11.9	61.3	55.8	11.3
Prob (F)	**0.911***		**0.010**	**0.035**	**0.001**	**0.022**
LSD (0.05)	**0.35**		**0.37**	**1.04**	**5.50**	**3.20**
Nitrogen Timing						
Nil	3.79	a	10.8	61.8	65.2	7.9
50 N GS00	4.09	a	11.9	61.8	55.5	11.9
50 N GS30	3.95	a	12.3	60.8	46.2	15.6
25 N GS00 f.b. 25 N GS30	4.03	a	11.8	61.8	53.3	12.0
Prob (F)	**0.296***		**0.001**	**0.055**	**0.001**	**0.001**
LSD (0.05)	**0.35**		**0.32**	**0.08**	**3.60**	**1.70**

[1] Consideration needs to be taken for yields, as plots represent 72.5% of arable area and thus should be calculated using this percentage for comparison to local and commercial results.
[2]Means followed by the same letter do not significantly differ (P=0.10, LSD).
[3]Quality parameterisation is based on 2009-2010 NACMA Barley Standards and should be used as a guide only. Testing was undertaken at Riordan Grains, Inverleigh Office.
*These parameters are not statistically significant at the p=0.05 level.

Conclusion:
No significant difference in grain yield was observed between row spacing, nitrogen timing or variety choice when compared irrespectively of each of the other two parameters. Trends were evident that on average the nitrogen applied treatments yielded 0.23 t/ha above the no nitrogen treatment, and that the 200mm row spacing was found to have a 0.47 t/ha yield advantage over the 300mm row spacing.

The key message from the trial is that each factor cannot influence the production system alone, however in combination greater yield potential can be achieved when using variety specific agronomy. Where nitrogen was applied at sowing - VB0432 had a greater yield on 200mm row spacing, when nitrogen was applied at tillering no yield difference was observed between row spacing. Tailoring the production system to a specific variety will optimise grain yield and profitability.

Figure 1. Plots at Inverleigh