4.1.2 Comparison Of Barley Variety, Row Spacing And Nitrogen Timing On Grain Yield, Weed Incidence And Disease - Inverleigh, Vic

Location:
SFS Inverleigh Research Site
(38 04'59.9" S, 143 56'16.9" E)

Funding:
Barley agronomy for Southern Australia and SFS.

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Rainfall:
Growing season (April – November): 393mm,
Season: 529mm

Summary of Findings:

In 2007, wider row spacings (400mm vs 200mm) significantly (P<0.01) reduced yield (4.36t/ha vs 4.69t/ha) when averaged across five barley varieties and two nitrogen timings, suggesting that the benefits of wider row sowing for crop residue management practices are coming at a significant financial cost ($100/ha+, using current prices). However, the barley variety WI with nitrogen applied at sowing (GS00) achieved the opposite result, as wider row spacings (400mm vs 200mm) significantly (P<0.05) increased yield (5.15t /ha vs 4.31t/ha).

Variety was also significantly (P<0.01) important and appears to have even a greater effect than row spacing in relation to yield, suggesting that row spacing decisions should be considered based on the variety and to a lesser extent, timing of nitrogen.

Delaying nitrogen application until stem elongation had no significant (P>0.05) impact on yield for any of the varieties at any of the row spacings, suggesting that growers can delay nitrogen application for risk management purposes and not suffer significant yield losses, thus reducing risk and costs at sowing.

Background:
Alternate stubble management practices to burning in the HRZ of Victoria are now being recognised as both beneficial to soil health and crop performance. Current research on row spacing widths has not been conclusive in the higher rainfall zones throughout SE Australia, so this trial aims to develop the knowledge in this area.

Key Trial Objectives:

1. Assess the potential yield loss/gains when increasing the seed row width for the benefits of subsequent inter-row (no-till) cropping;
2. To determine if nitrogen application efficiency can be increased in wider row spacing by applying the nitrogen either as an up front or in crop treatment;
3. To assess the varietal yield response to row spacing width, in response to nitrogen timing and row widths;
4. To assess weed incidence and disease pressure across each seed row width to determine crop competition factors.

Table 4.4: Trial Inputs

Sowing dates:	27th June 2007
Sown with:	80kg/ha of both barley and Granulock Supreme CuZn.
Harvest:	21st January 2008.

Urea was applied either at seeding or at first node (11th September) at 75kg/ha depending on treatment. Knockdowns applied prior to seeding, included Spray Seed at 1.5l/ha + Trifluralin at 1.5l/ha. Pre-emergences applied post seeding, included Dual Gold at 250ml/ha + Diuron at 500ml/ha. Post emergence herbicides were limited in this trial to help assess weed interactions, however Giant® was applied on 29th August at 650ml/ha to overcome wild radish seed set.

Trial Design:
This trial was a completely randomised block design. Three replicates were used, with 30 treatments in total; five varieties x three row spacings x two nitrogen timings.

The trial was also fully replicated at SFS Mininera research site. The outside rows were removed prior to harvest to minimize the edge affect.

- The row spacing widths were (200, 300 and 400 mm)
- The barley varieties were (Gairdner, Capstan, VB0432, WI and WARBAR)
- The nitrogen timings were (GS00 and GS31)

Results:

- Gairdner sown at 200mm row spacings widths, with nitrogen applied at GS31, yielding 4.34t/ha, but when compared to WI sown at 400mm with nitrogen applied at sowing (GS00), there was an average yield deficit of 0.81t/ha (Table 4.5).
- Wider row spacings (300mm vs 200mm) resulted in plant counts being significantly ($P<0.01$) reduced per square metre, when averaged across all varieties and nitrogen timings (101 plants/m^2 vs 77 plants/m^2).
- Similarly, when row spacing width was increased from 200mm to 400mm, tiller counts were significantly ($P<0.05$) reduced per square metre for all varieties when averaged across nitrogen timings.
- Grain quality proved to be a major issue as none of the barley varieties achieved malting quality specifications. However, it should be noted that Capstan is only a feed barley. Test weight and protein were the major limiting factors in relation to grain quality, as all treatments were below the minimum (65 kg/hl) required test weight and WI was the only malting barley below 12 percent protein maximum. Capstan had a significantly ($P<0.05$) lower test weight (58 kg/hl) than all other varieties when averaged across row spacing and nitrogen timing.
- Screening percentages were also significantly ($P<0.05$) higher in Capstan (2.1%) than in WABAR (0.96%) and WI (1.3%), showing that Capstan has the tendency to produce undesirable low test weight and high grain screenings.
- GreenSeeker™ (NDVI) was used fortnightly in the six weeks leading up to flowering (GS70) to determine if canopy greenness at flowering correlated to final yield. There was no interaction to suggest any association between canopy greenness and yield when comparing all of the treatments.

Table 4.5: System interactions across Barley Variety, Row Spacing Width and Timing of Nitrogen on Crop Output, when considering stubble retention and inter-row seeding practices in the HRZ of SW Victoria, SFS Research Site (Inverleigh) 2007.

Crop Interactions	Variety t/ha	Row Space t/ha	V x N t/ha	V x RS t/ha	RS x N t/ha	V x RS Tils/m^2	RS x N x V GS00N	RS x N x V GS31N
Variety								
Gairdner	4.21b							
Capstan	5.09a							
VBO432	4.30b							
WABAR	4.17b							
WI	4.83a							
Row Spacing								
200mm		4.69a						
300mm		4.51ab						
400mm		4.36b						
Variety x Nitrogen Timing								
Gairdner GS00N			4.15e					
Gairdner GS31N			4.28e					
Capstan GS000N			5.32a					
Capstan GS31N			4.87bc					
VBO432 GS00N			4.15e					
VBO432 GS31N			4.45de					
WABAR GS000N			4.10e					
WABAR GS31N			4.23e					
WI GS00N			4.77bcd					
WI GS31N			4.89b					
Variety x Row Spacing								
Gairdner 200mm				4.42c-f		583ef	4.50c-g	4.34d-i
Capstan 200mm				5.33a		723a-c	5.55a	5.11a-c
VBO432 200mm				4.32d-f		734ab	4.00g-i	4.64b-d
WABAR 200mm				4.72b-d		693a-d	4.84a-d	4.59c-f
WI 200mm				4.70b-e		752a	4.31d-i	5.08a-c
Gairdner 300mm				4.25ef		515fi	3.94h-j	4.56c-f
Capstan 300m				5.14ab		649fi	5.40ab	4.87a-d
VBO432 300mm				4.36d-f		657b-e	4.38d-h	4.34d-i
WABAR 300m				3.99fi		598e	3.89ij	4.08e-i
WI 300mm				4.81bc		639c-e	4.85a-d	4.77a-d
Gairdner 400mm				3.98fi		476i	4.01g-i	3.94h-j
Capstan 400m				4.82bc		578ef	5.01a-c	4.63c-f
VBO432 400mm				4.23fi		653ef	4.08f-i	4.38d-h
WABAR 400m				3.80i		573ef	3.58j	4.02g-i
WI 400mm				4.98ab		632de	5.15a-c	4.82a-d
Row Spacing x Nitrogen								
200mm GS00N					4.64			
200mm GS31N					4.75			
300mm GS00N					4.49			
300mm GS31N					4.52			
400mm GS00N					4.37			
400mm GS31N					4.36			
LSD (0.01)	**0.34**	**0.26**			**NS**		**TD**	**TD**
LSD (0.05)			**0.36**	**0.44**		**87**		

Wholly Protected Data. Means followed by the same letter do not significantly differ in relation to the LSD (either P=0.01 or P=0.05), NS = Not Significant, TD = Transformed Data.

This trial has not considered any costs savings associated with crop establishment, such as not having the need to manipulate crop residues; being able to sow at greater speeds using wider row spacings; or the reduction in horse power required for pulling fewer tines through the ground at seeding. Simple calculations for gross margin returns can be seen following in Table 4.6.

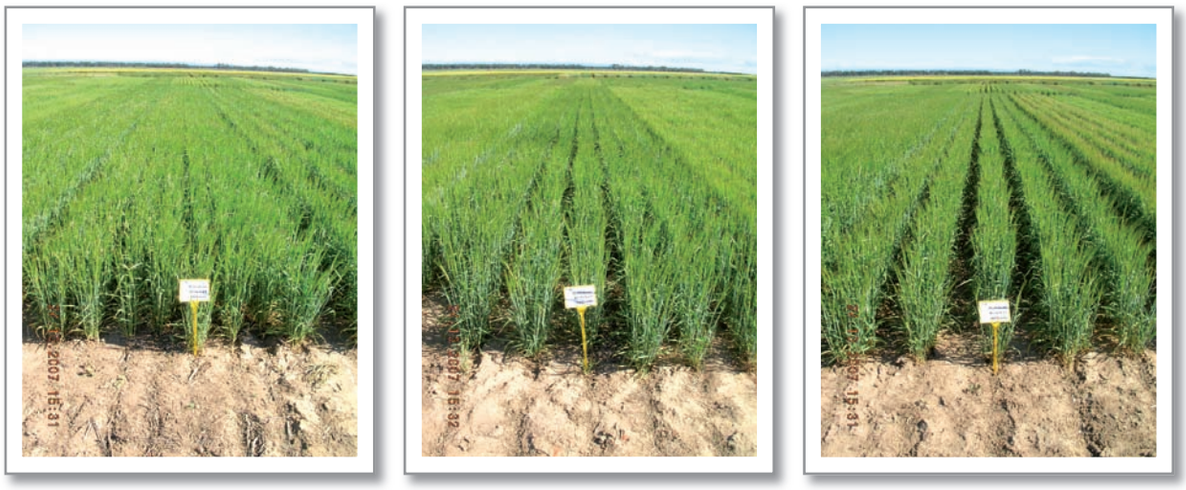
▼ Table 4.6: Barley variety outputs averaged across row spacing and N timing, based on feed barley at $330/t.

Treatment	Gairdner	Capstan	VBO432	WABAR	WI
Grain Quality	Feed	Feed	Feed	Feed	Feed
Gross Income/Ha	$1,389.00	$1,680.00	$1,419.00	$1,376.00	$1,594.00

The results of this year's trial showed Capstan as the most profitable variety, however it should be noted that all of the varieties were only of feed barley quality and that Capstan is only a feed barley, whereas the other varieties are potentially malting quality.

Trial Observations:

- Gairdner and Capstan generally appeared to perform poorly up until booting (GS40) when compared to the other varieties, however both Gairdner and Capstan recovered noticeably prior to flowering (GS60).
- Head drop in relation to the 30mm of rain in late December appeared to be influenced by variety and row spacing, with dwarf varieties (Capstan and WI) and narrower row spacings (200 mm), handling the weather better than the taller varieties (WABAR, Gairdner and VBO432) and wider row spacings (400mm), and hence, reduced yield losses.
- Weed incidence was not significant across this site and there was no difference in weed density between the different row spacing treatments.
- There was no significant disease pressure in the trial.
- GreenSeeker ™ was not able to accurately predict yields (r^2<0.04) using NDVI assessments.



▲ Photos 4.3: Gairdner barley at Inverleigh on October 24 with N applied at GS31. 200, 300 and 400 mm row spacings respectively left to right