Wheat row spacing

This trial was funded by the GRDC and conducted in collaboration with Nick Poole (Foundation of Arable Research, NZ)

Key findings

- Nitrogen applied during stem elongation significantly improved grain yield and protein.
- The higher density crop produced greater yields for both row spacings.
- There was little difference in grain yield between the row spacings.

Why do the trial?

To improve the nitrogen and water use efficiency of wheat by manipulating canopy size using different row spacing, nitrogen application timing and plant density.

How was it done?

Plot size	350mm (14") spacing 2.1m x 10m 225mm (9") spacing 1.4m x 10m	**Fertiliser**	DAP @ 60 kg/ha + 2% Zn Urea @ 65 kg/ha
Seeding date	13th May 2009	**Variety**	Gladius wheat @ 70 kg/ha
Available soil moisture 27th March (0-60cm)	0mm	**Soil nitrogen 27th March (0-60cm)**	117 kg N/ha

The trial was a randomised complete block design with 3 replicates, 2 row spacings, 2 crop densities and 2 nitrogen timings.

65 kg/ha urea was either broadcast by hand and incorporated by sowing on 13th May or broadcast by hand prior to a rain front at 2nd node (GS32) on 7th August. 1mm was received on the 7th August and 6.5mm on the 11th August.

Target plant densities were 100 and 200 plants per square metre.

Plot edge rows were removed prior to harvest.

All plots were assessed for grain yield, protein, test weight, grain weight and screenings with a 2.0 mm screen.

Results

There was no response in plant, tiller or head number from nitrogen timing or row spacing, but there was to sowing rate (Table 1). At the end of tillering the high density plots had 1.8 stems per plant and in the low density plots there was an average of 2.9 stems per plant. Although the lower crop density had fewer plants, it was able to compensate by producing more tillers per plant and grains per head. By the 19th October both the high and low density plots had lost an average of 29% of the stems to produce 216 heads per square metre in the high density plots and 186 heads per square metre in the low density plots (Table 1).

Although the high density plots produced 30 heads per square metre more, the number of grains per square metre in the high density plots was not significantly higher.

Table 1: Plant, tiller, head, aborted tillers and grain number per square metre, averaged across nitrogen timing and row spacing for high and low sowing rates at Hart in 2009.

Sowing rate	Plants	Tillers	Heads per square metre	Aborted tillers	Grains
High	171	309	216	92	4712
Low	89	255	186	69	4575
LSD (0.05)	10	30	21	10	ns

By delaying the application of urea (65 kg/ha) until 2nd node (7th August, GS32) both grain yield and protein were significantly improved (Table 2). Grain yield was increased by 0.14 t/ha (7%) and protein by 0.4% (3%).

Table 2: Grain yield (t/ha) and protein (%) for nitrogen timing, averaged across row spacing and plant density at Hart in 2009.

Nitrogen timing	Grain yield (t/ha)	Protein (%)
IBS	2.04	13.2
GS32	2.18	13.6
LSD (0.05)	0.11	0.2

Grain yield was also significantly affected by plant density and row spacing (Table 3). The highest yielding treatment of the trial, by 0.17 t/ha, came from the high sowing rate, at narrow row spacing, yielding 2.25 t/ha. At the low crop density narrow and wide rows both produced similar yield results, averaging 2.05 t/ha. These results are similar to previous years and show that there is no disadvantage to low density on wider rows, however, at high densities there is a trend for narrow row spacing to produce higher yields. Screenings were higher for the narrow row spacing at either the low or high sowing rates, averaging 1.8% compared to 1.4% for the wide row spacing.

Table 3: Grain yield (t/ha) and screenings (%) averaged across nitrogen timing for row spacing and crop density at Hart in 2009.

Row spacing	Plant density	Grain yield (t/ha)	Screenings (%)
Narrow	High	2.25	1.9
Wide		2.08	1.2
Narrow	Low	2.02	1.7
Wide		2.08	1.6
LSD (0.05)			
Spacing		ns	ns
Density		0.11	ns
Spacing*Density		0.21	0.2

Wayne Hawthorne surveys the scene.
Hart Field Day 2009