Variety Specific AGRONOMY Packages

Wheat Seeding Rate and Nitrogen, Jerilderie

Increasing seeding rate from 150 to 250 seeds/m² increased grain yield of some varieties. Higher application rates of N at GS31 had small effects on grain yield or grain protein.

2007

The trial

Location: Jerilderie Research Station

Soil type: light clay
pH_{CaCl_2} (0-10 cm)–4.8;
Colwell P–44 mg/kg;
Deep N (nitrate 0-60cm)–19 mg/kg.

Rainfall: 354 mm annual total
194 mm in-crop (GSR)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5	67	31	32	53	13	52	3	0	10	23	65

Irrigation: 23 August–1 ML/ha
20 September–1 ML/ha
24 October–1 ML/ha

Previous crop: failed sub clover establishment

Management

Seeding rate: variable–determined from the germination percentage of the seed, 1000 seed weight, estimated plant establishment percentage and target plant population.

Sowing date: 19 June

Fertiliser: DAP (18 N, 20 P)–138 kg/ha

Herbicide: 1 June–2 L/ha glyphosate (450 g/L), 100 mL/ha oxyfluorfen (240 g/L) and 10% Hasten®

Harvest date: 10 December

Treatments

Seeding rate: target 150 or 250 plants/m²

Nitrogen: urea topdressed 16 August at either nil, 150 kg N/ha or 250 kg N/ha at growth stage 31 (1st node)

Varieties: bread wheat–Chara(Φ), EGA_Gregory(Φ), Ellison(Φ), Gladius(Φ), Ventura(Φ)
soft wheat–Barham(Φ) and Yenda(Φ)
durum wheat–EGA_Bellaroi(Φ) and Jandaroi(Φ).

Seasonal review

The trial was sown into good moisture and established well. Following the establishment rainfall events soil moisture was quickly depleted with just 3 mm of rain on 1 August and no further rainfall until mid-October.

Three irrigations were applied using high flow rates. The use of high flow rates aimed to reduce deep percolation losses therefore minimising the amount of water applied. The intervals between the irrigations were longer than ideal, but were the best compromise between plant water use, high cost of the water and the limited amount of irrigation water available.

Temperatures during the season were around average. There was a short period (3 days) of high temperature just prior to the third irrigation in October.

Results

Seeding rate, nitrogen and variety all had significant effect on grain yield, however interactions between the treatments were not significant.

Seeding rate

Increasing seeding rate from 150 seeds/m² to 250 seeds/m² increased grain yield by an average of 204 kg/ha. Only the varieties Barham, Chara and Yenda had significant increases in yield with the increased seeding rate, the other variety responses were not significant.

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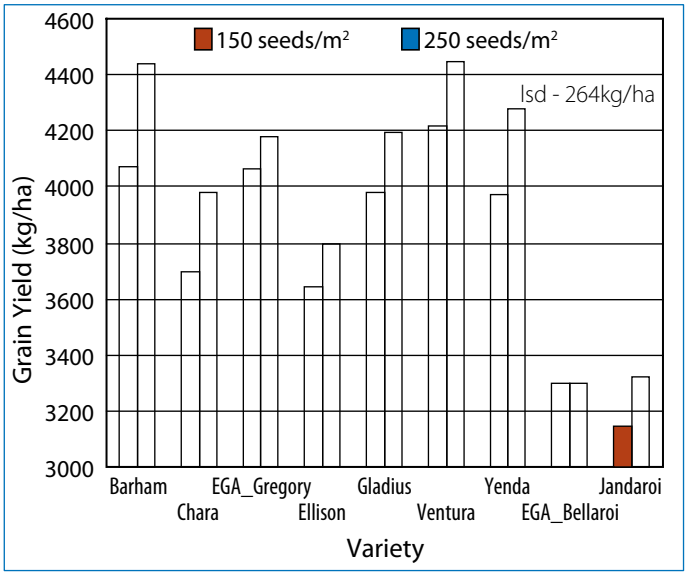

Figure 1 Yield response of bread and durum wheat varieties to seeding rates of 150 and 250 seeds/m² at Jerilderie.

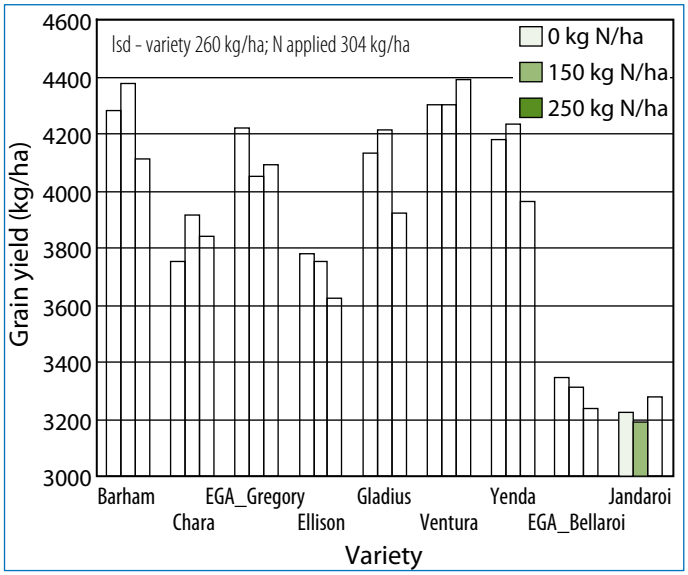

Figure 2 Grain yield of bread and durum wheat varieties topdressed with nitrogen at GS 31 at Jerilderie.

Nitrogen application

There was no effect on grain yield between the nil N treatment and 150 kg N/ha topdressed at growth stage 31. However there was a significant reduction in yield when 250 kgN/ha was applied at the same growth stage (Figure 2).

Variety

The variety Ventura had a grain yield of 4331 kg/ha which was significantly higher than all other varieties except for the new soft wheat variety Barham (4258 kg/ha) (Figure 2). The two durum varieties, Bellaroi and Janderoi were the lowest yielding varieties in the trial with yields of 3297 kg/ha and 3231 kg/ha respectively (Figure 2).

Plots were scored for lodging prior to harvest using a 0 to 9 scale (0=no lodging; 9=whole plot completely lodged). There was little lodging in the bread wheat varieties with the highest average score 0.1. The durum variety Janderoi lodged in all treatments, with an average lodging score of 7.4. Bellaroi durum also lodged with an average score 1.7.

Grain Protein

Grain protein was significantly increased when the seeding rate was increased from 150 seeds/m² to

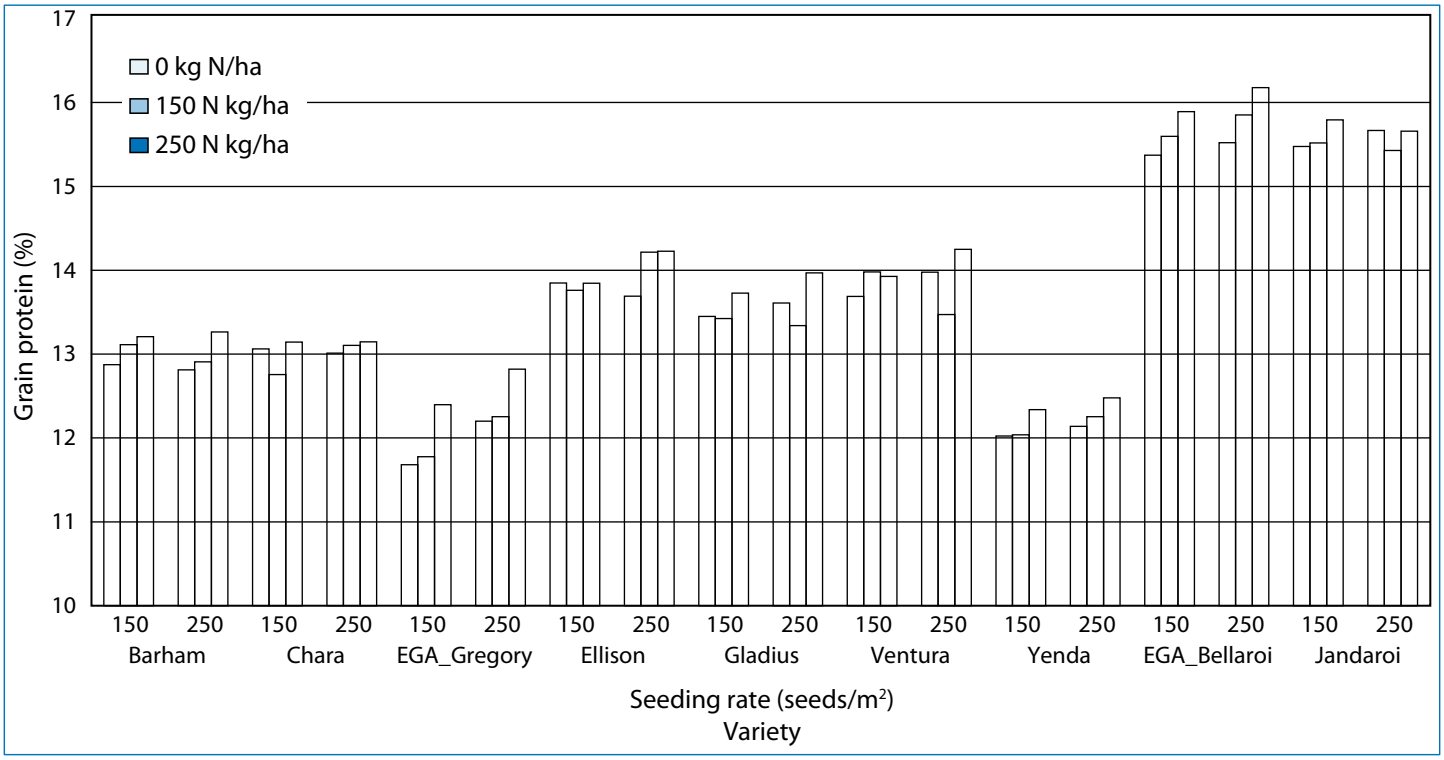

Figure 3 The ef ect of variety, nitrogen applied at GS 31 and seeding rate on grain protein at Jerilderie in 2007.

250 seeds/m^2 and when the level of N applied at GS 31 was increased from 150 kg N/ha to 250 kg N/ha. Grain protein also depended on variety (Figure 3). The interactions between seeding rate, N application and variety were not significant for grain protein.

Discussion

The yields achieved were lower than expected for an irrigated trial. This is likely due to the delay in the first irrigation past the optimal time. Yield of the high input treatments (250 kg N/ha sown at 250 seeds/m^2) was likely to be more affected by the limited water supply during the critical head emergence to early grain fill period.

Nitrogen: The yield reduction observed in the highest N treatments may have been exacerbated by applying all the N at GS 31, promoting greater vegetative growth than the other N rates. Application of N in future trials will be changed to match the *10 tonne principles* for irrigated wheat, developed by NSW DPI.

Seeding rate: Increasing the seeding rate from 150 to 250 seeds/m^2 resulted in higher yield. A simple economic analysis calculating the increased cost of seed compared with the increased income suggests that it is economic to plant at the higher seeding rate:

Additional cost: 40 kg/ha of seed (40 g/1000 seeds, ??% germination, ??% establishment) (2008 price $970/t for seed)=$37.60/ha.

Additional income: 204 kg/ha increased yield ($300/t grain price)=$61.20/ha

Additional return: $23.60/ha gained by sowing at the higher seeding rate.

The break-even yield increase at prices stated is 125 kg/ha. The cost of increasing seeding rate will vary depending on variety and seed-lot due to differences in 1000 grain weight and germination percentage, and hence the weight of seed required to achieve the target plant population.

Sowing time: The June sowing of the trial meant that the sowing time was closest to the optimum sowing window for the quicker maturing, short season variety Ventura. This may explain why Ventura was the highest yielding variety of the trial.

The soft wheat varieties Barham and Yenda performed well despite being 2 and 4 weeks respectively, outside their optimum sowing window.

Calculating seeding rate

The following formula can be used to calculate sowing rates, taking into account:

- target plant population
- germination percentage (93% = 0.93 in the formula)
- seed size or 1000 seed weight
- establishment–usually 80%, unless sowing into adverse conditions (80% = 0.8 in the formula).

Tip–1000 seed weight:

- *count out 200 seeds*
- *weigh to at least one decimal point of a gram*
- *multiply weight in grams by five to give 1000 seed weight.*

Example:

target plant population (plants/m^2)		1000 seed weight (grams)		germination x establishment		
130	x	32	÷	0.93 x 0.8	÷	100

= your seeding rate 56 kg/ha

Your calculation:

target plant population (plants/m^2)		1000 seed weight (grams)		germination x establishment		
	x		÷	x	÷	100

= your seeding rate 56 kg/ha

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Further information: available from the project team agronomists at NSW DPI Wagga Wagga, Condobolin, Parkes, Hillston, Temora, Cowra and Moulamein.

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