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# The effect of nitrogen application on grain yield and grain protein concentration of six wheat varieties – Parkes 2015

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## Key findings

- » Suntop<sup>®</sup> was the highest yielding variety (4.48 t/ha).
- » Lancer<sup>®</sup> achieved high protein, high test weight and low screenings at all nitrogen application rates.
- » Grain yield increased as nitrogen application rates increased, but there was no significant increase in yield above 20 kg N/ha applied nitrogen.
- » Applying 160 kg N/ha resulted in a yield decrease.

## Introduction

This experiment evaluated the effect of variety and nitrogen rate on grain yield and protein concentration for six wheat varieties.

## Site details

Location	North Parkes Mines
Soil type	Red clay loam
Previous crop	Canola 2014
Sowing date	14 May
Fertiliser	70 kg/ha MAP + Sapphire
Available N	68 kg/ha (0–60 cm)
In-crop rainfall (April–October)	249.5 mm
Harvest date	24 November

## Treatments

Wheat varieties	Condo <sup>®</sup> EGA_Gregory <sup>®</sup> Lancer <sup>®</sup> Spitfire <sup>®</sup> Suntop <sup>®</sup> Viking <sup>®</sup>
Nitrogen rates	0, 20, 40, 80, 40 + 40 split * and 160 kg N/ha * split application 40 kg N/ha at sowing + 40 kg N/ha at growth stage 31 (GS31)

## Seasonal conditions

In 2015, the experiment site received above average growing season rainfall of 249.5 mm (April–October; 10-year average is 240 mm). Of this, 73 mm fell in April (Table 1). Below average rainfall was recorded in September (9.5 mm).

The site experienced 15 frost events in August and four in September (–3.9 °C was recorded on 19 August). Temperatures in the mid to high thirties were recorded during October, which coincided with the flowering window for many wheat varieties sown. The highest recorded temperature at the site was 41.7 °C on 17 October.

The experiments were sown into adequate moisture, had even establishment and were weed-free.

## Results

### Grain yield

Variety and nitrogen rate both had a significant effect on grain yield. Suntop (4.48 t/ha), Condo (4.44 t/ha) and EGA\_Gregory (4.31 t/ha) were the highest yielding varieties and Dart (4.22 t/ha) was the lowest yielding variety (Table 2). Grain yield increased when nitrogen (N) rate increased from 0 kg N/ha (4.25 t/ha) to 20 kg N/ha (4.35 t/ha), but did not increase with further increases in N rate. The highest rate of 160 kg N/ha resulted in a significant yield decrease (4.21 t/ha). The variety × N rate interaction did not affect grain yield (Table 3).

Table 1. Parkes rainfall 2015.

Parkes rainfall for 2015 (mm)														
Dec 2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	In-crop
89.6	52.0	36.0	1.0	73.0	34.5	14.0	61.0	33.0	9.5	24.5	52.0	9.0	399.5	249.5

Table 2. Grain yield and grain quality for six wheat varieties sown 14 May at Parkes 2015.

Variety	Grain yield (t/ha)	Grain protein (%)	Grain nitrogen yield (kg N/ha)	Screenings (%)	Test weight (kg/hL)
Condo	4.44	11.49	89.3	1.20	78.26
Dart	4.22	11.67	86.2	1.58	78.66
EGA_Gregory	4.31	11.40	86.0	1.30	78.87
Lancer	4.23	12.36	91.5	0.75	79.65
Spitfire	4.27	12.31	92.0	1.31	80.68
Suntop	4.48	11.55	90.6	1.76	79.45
I.s.d. (P = 0.05)	0.09	0.21		0.13	0.27

Table 3. Grain yield and grain quality for six nitrogen application rates across all varieties for 14 May sown wheat varieties at Parkes 2015.

Nitrogen rate (kg N/ha)	Grain yield (t/ha)	Grain protein (%)	Grain nitrogen yield (kg N/ha)	Screenings (%)	Test weight (kg/hL)
0	4.25	10.07	74.9	0.93	79.79
20	4.35	10.68	81.2	0.99	79.87
40	4.38	11.19	85.7	1.13	79.62
80	4.38	12.20	93.5	1.45	78.98
40 + 40 split	4.39	12.62	96.9	1.45	78.97
160	4.21	14.02	103.4	1.95	77.75
I.s.d. (P = 0.05)	0.09	0.21		0.13	0.28

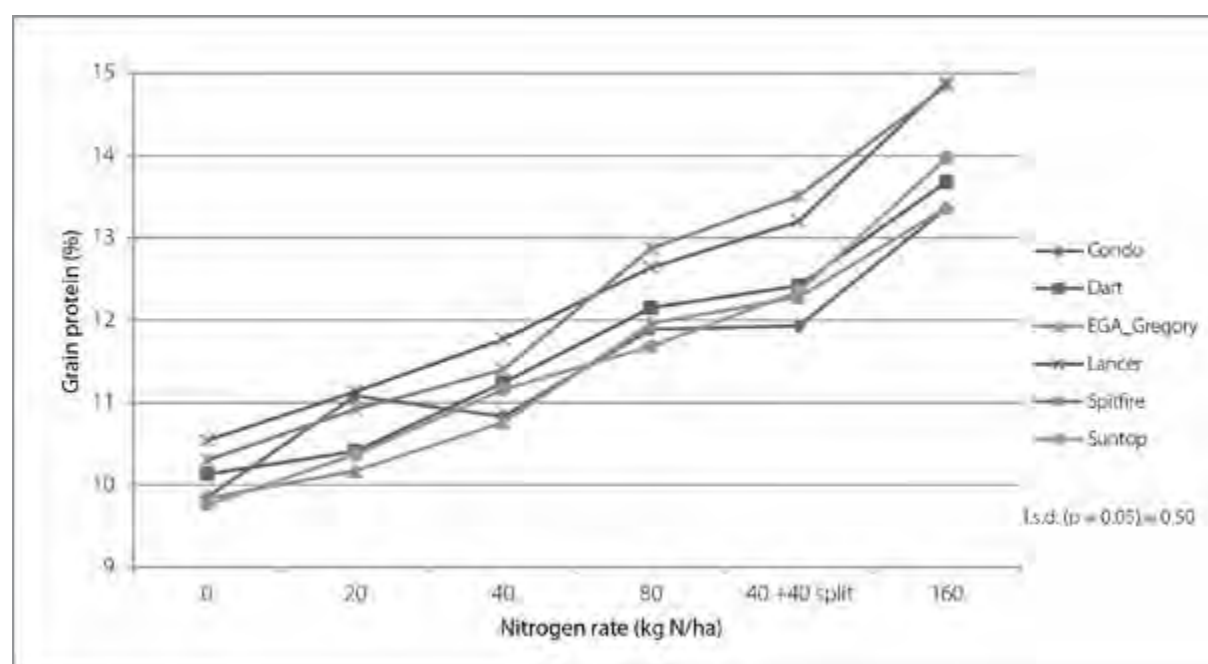


Figure 1. Grain protein of six wheat varieties by six N rates at Parkes 2015.

### Grain quality

Variety and N rate both significantly affected grain protein, screenings and test weight. Lancer had the highest grain protein content (12.36%) followed by Spitfire (12.31%) and Dart (11.67%) (Figure 1). Lancer had significantly lower screenings than all other varieties (0.75%). Spitfire had the highest test weight (80.68 kg/hL) followed by Lancer (79.65 kg/hL).

All varieties except Suntop maintained screening percentages below 5% when 40 kg N/ha was applied. The increased application rates of nitrogen resulted in EGA\_Gregory, Dart and Suntop having screenings higher than the acceptable level of 5%.

Spitfire, Lancer and Condo achieved standard grade levels of screenings up to 80 kg N/ha (both upfront and split application). Suntop and Dart had screenings above the 5% level.

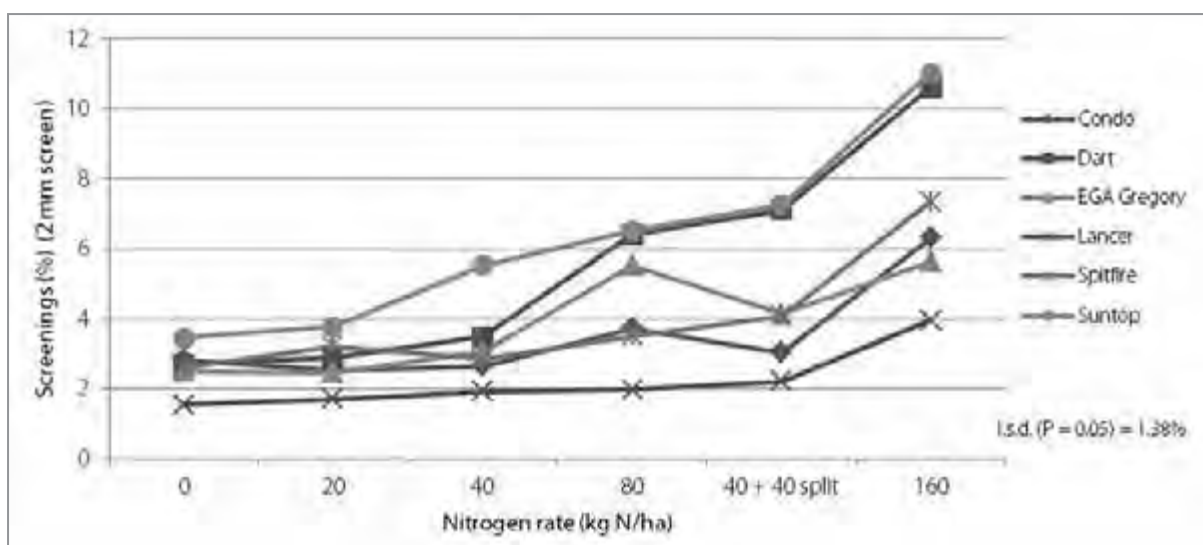


Figure 2. Screenings of six wheat varieties by six N rates (kg N/ha) at Parkes 2015.

All varieties had the highest screenings when 160 kg N/ha was applied. All varieties except Lancer had screenings over 5% at this nitrogen rate (Figure 2).

## Summary

The Parkes site is in the medium rainfall zone of central NSW. Suntop performed well in this environment being the highest yielding of the six varieties (4.48 t/ha) followed by Condo (4.44 t/ha). There was little difference between Condo and Suntop in yield, but they were significantly different from the third highest yielding variety, EGA\_Gregory (4.31 t/ha). All three varieties are quick maturing which allowed them to finish before the high temperatures in October 2015.

There was no significant yield increase after 20 kg N/ha (4.35 t/ha) of N was applied. There was no indication that the split application benefitted the crop, as the 40 + 40 kg N/ha split (4.39 t/ha) did not yield significantly higher than the 80 kg N/ha upfront (4.38 t/ha). Applying 160 kg N/ha resulted in the lowest yield of all nitrogen treatments when averaged across all varieties (4.21 t/ha).

Lancer was able to maintain high grain protein, high test weight and low screenings across all the nitrogen application rates.

## Acknowledgements

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