Nitrogen response of eight wheat varieties – Nyngan 2015

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Introduction

Nitrogen (N) is the nutrient most needed by wheat. It is essential for growth and development, and yield and grain protein levels. In recent seasons in Central West NSW there has been a significant trend towards very low grain protein levels with more than 30% of grain receivals meeting ASW or lower specifications. Protein levels of <10.5% in a prime hard variety usually indicate that insufficient N levels have not only limited grain protein concentrations, but also yield. Soil testing for N levels before sowing remains an important budgeting tool. It is the most useful indicator if additional applied N is needed to support crop growth and to maximise yield and grain protein potential within a given season. Consideration must also be given to starting soil water and target yield. This trial aimed to determine the effect of N rate on the yield and grain quality of eight popular bread wheat varieties at Gilgandra in central NSW in 2015.

Site details

Location:	**Nyngan**
Co-operator:	**Jack and Dione Carter**
Soil type:	**Red loam**
2014 crop:	**Canola**
2013 crop:	**Wheat**
Sowing date:	**5 May 2015**
Starting moisture:	**Full profile to 120 cm. (153 mm rain January–April). Wet sowing conditions**
In-crop rainfall:	**166 mm May–September. Good early season growth but a hard finish**
Fertiliser:	**70 kg/ha Trifos at sowing**
Fungicide:	**Prothioconazole (210 g/L) + tebuconazole (210 g/L) applied at 300 mL/ha on 21 August and 15 September**
Insecticides:	**300 g/ha pirimicarb (500 g/kg) (aphids)**
Starting N:	**230 kg N/ha (0–120 cm)**
Harvest date:	**29 October 2015**

Treatments

Variety	Dart$^{\Phi}$, EGA Gregory$^{\Phi}$, Kiora$^{\Phi}$, Lancer$^{\Phi}$, Spitfire$^{\Phi}$, Sunmate$^{\Phi}$, Suntop$^{\Phi}$ and Viking$^{\Phi}$
Nitrogen (N)	0, 20, 40, 80, 160 kg N/ha at sowing, and 40+40 (40 kg N/ha applied at both sowing and GS31).

Nitrogen was applied as urea pre-drilled immediately before sowing excepting the 40 + 40 treatment, which had 40 kg N/ha pre-drilled at sowing and 40 kg N/ha top-dressed at GS 31 to take advantage of suitable topdressing rain.

Key findings

This site was only moderately responsive to nitrogen (N) application. Yield and protein generally increased in all varieties with the 20 kg N/ha and 40 kg N/ha rates. However, yield decreased with higher application rates.

Protein and screening levels increased with N rates above 40 kg N/ha.

Kiora$^{\Phi}$ produced the highest screening levels. The sowing date of 5 May at Nyngan is probably a bit late for Kiora$^{\Phi}$, which would have exacerbated screenings.

Varieties with comparatively lower biomass such as Dart$^{\Phi}$, Lancer$^{\Phi}$, Spitfire$^{\Phi}$ and Sunmate$^{\Phi}$ maintained higher yield and lower screening levels even with the higher N application rates with a corresponding lower impact on harvest index also observed in these varieties.

Results

Table 1. *Effect of various nitrogen treatments on the yield, grain protein and screening levels of eight bread wheat varieties – Nyngan 2015*

Variety	N rate (kg/ha)	Yield (t/ha)	Protein (%)	Screenings (%)
Dart	0	3.21	10.3	9.5
	20	3.43	11.7	11.8
	40	3.08	13.2	18.7
	40+40	3.10	13.7	14.8
	80	2.93	14.4	18.7
	160	2.83	15.8	19.9
EGA Gregory	0	3.69	10.0	0.7
	20	3.46	11.3	4.6
	40	3.23	12.4	11.2
	40+40	3.21	13.9	14.8
	80	2.68	14.8	22.0
	160	2.42	15.2	24.3
Kiora	0	2.76	12.3	17.9
	20	2.75	13.0	22.2
	40	3.02	14.1	24.7
	40+40	2.61	15.9	36.1
	80	2.60	15.9	37.2
	160	2.33	17.8	48.3
Lancer	0	3.10	10.1	4.1
	20	3.69	11.2	6.4
	40	3.40	13.0	3.3
	40+40	2.80	14.6	15.9
	80	2.92	14.7	14.7
	160	2.67	16.2	16.6
Spitfire	0	3.55	11.6	7.1
	20	3.32	12.1	5.8
	40	3.11	13.1	10.2
	40+40	3.59	13.5	10.4
	80	3.40	14.0	11.2
	160	2.89	16.7	18.0
Sunmate	0	3.49	10.7	7.7
	20	3.70	11.2	4.8
	40	3.30	11.6	7.7
	40+40	3.09	13.2	9.4
	80	2.93	14.0	14.2
	160	2.67	15.3	16.4
Suntop	0	3.28	10.7	8.7
	20	3.54	10.8	8.4
	40	3.33	12.1	15.3
	40+40	3.47	12.8	17.7
	80	3.07	12.7	18.4
	160	2.68	15.3	32.6
Viking	0	3.52	10.9	10.3
	20	3.37	11.2	13.4
	40	3.22	12.3	17.6
	40+40	2.65	14.3	28.9
	80	2.78	14.1	28.9
	160	2.29	17.0	42.5
	LSD (P = 0.05)	0.56	1.4	9.0

Note: The LSD for screenings level is high; screenings data should be used with caution.

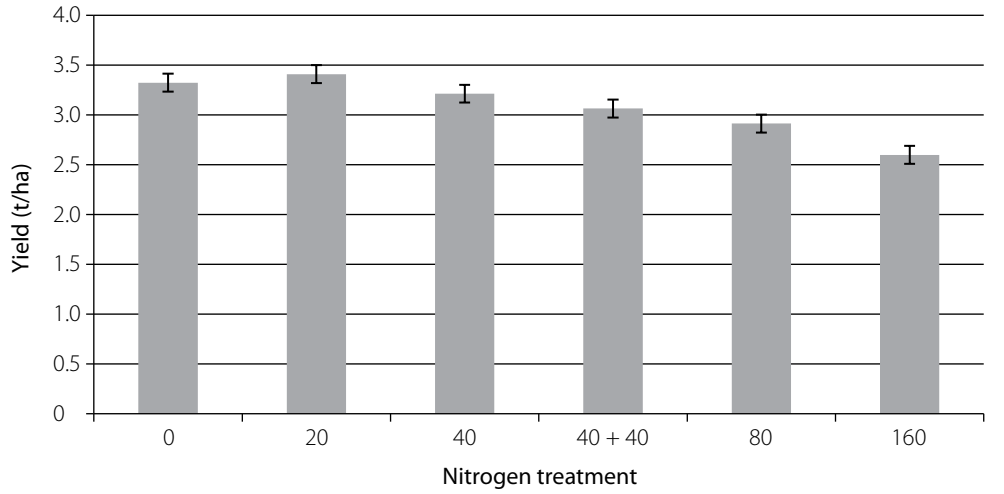

Figure 1. *Effect of nitrogen application on yield across varieties – Nyngan 2015*

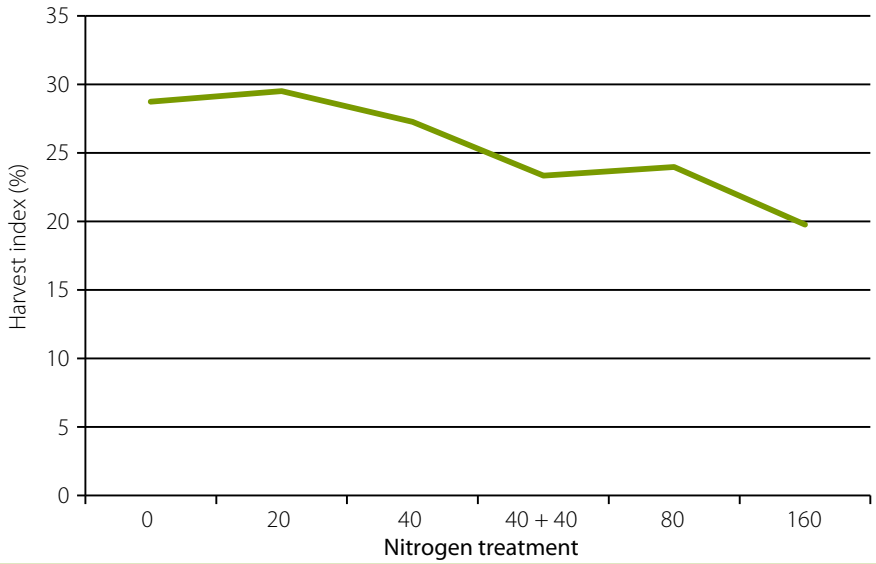

Figure 2. *Harvest Index averaged across wheat varieties and nitrogen application rates – Nyngan 2015*

Summary

Conditions at sowing were very wet. There was no effective in-crop rainfall after August and, combined with temperatures above 35 °C in September, resulted in a hard finish to the season.

This site had a high background starting N level (233 kg N/ha), which was surprising given the history of continuous cropping – 17 years of crop (wheat 40%, canola 20%, barley 20%, pulse 20%) with additional N (above starter fertiliser application) only applied in 1999. The lower rates of 20 kg N/ha and 40 kg N/ha gave modest yield increases in most varieties however, rates higher than this tended to reduce yield and also caused screenings levels to increase in this trial. Protein levels increased with N application rates of 40 kg N/ha and above as seed size decreased.

Biomass and harvest index (data not shown) demonstrated that increasing N rate in heavier biomass producing varieties such as EGA Gregory, Viking and Kiora produced more dry matter with comparatively less grain yield, i.e. a lower harvest index.

Acknowledgements

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