

N Fertiliser strategies to maximise the grain yield of hybrid canola in the West Midlands region: Part 1 – Grain yield

Nathan Craig (WMG), Brianna Hindle (WMG) Erinn McCartney (Gentech Seeds)

Key Messages

- The highest grain yield was 4.35 t/ha and lowest was 2.81 t/ha
- Water Use Efficiency ranged from 16 to 25 kg/ha/mm growing season rainfall

Background

Canola is an important crop grown in rotation through the West Midlands Region due to its rotational benefits when grown in rotation with cereals, and the generally profitable nature of the crop. While canola is known to have a high nutritional requirement to achieve grain yield relative to cereal crops, it is suggested that the genetic potential of hybrid canola varieties is being limited by the availability of N to the crop. The yield potential of canola has been shown to be related to biomass production, and the objective of this trial is to evaluate the amount and timing of N application on hybrid canola to maximise biomass production and grain yield in our region.

A randomised complete block design experiment was conducted at 'Kayanaba', Dandaragan in 2019 to assess various rates and timing of application of nitrogen on Hybrid canola. The soil type was a strong sandy loam soil with 23 mg/kg of N in the top 90 cm prior to seeding, and a pH of 6.7 in the 0-10 cm and 4.6 in the 30-50 cm soil depth. The site was previously sown to barley in 2018.

The site was sown dry on the 5th of May 2019 using knifepoints and press wheels to achieve a sowing depth of 2 cm. The nitrogen treatments evaluated are presented in Table 1. Growing season rainfall was 267mm and was 66% of the long-term average, while annual rainfall was 272mm for 2019 (BOM, Chelsea site 9006).

Table 1. Amount of N and timing of N application in the Pioneer Yieldmax canola trial. N fertiliser was applied as a mix of MaxAm and Urea to give 15 units of S with each application of N

Treatment	Strategy	Total N applied (kg N/ha)	Applied N (kg N/ha)			
			Seeding	2 leaf	6 leaf	First flower
1	Control	10	10			
2	N early	80	10	35	35	
3	N early	150	10	70	70	
4	N early	200	10	95	95	
5	N early	240	10	100	100	30
6	N late	150	10		70	70
7	N late	200	10	30	80	80
8	N unlimited	300	10	92	138	60
9	NKS21	150	10	40	60	40
10	NKS21	300	10	80	120	90

Results

Table 2. Canola grain yield, oil, protein content, and water use efficiency (WUE) for each treatment in 2019. Lower case letters denote significant differences between treatments. ns = no significant difference ($P > 0.05$).

N Applied	Timing	Grain Yield kg/ha	Oil %	Protein %	WUE kg/ha/mm GSR*
10	Early	2.81a	47.7cd	21.6	16a
80	Early	3.31b	48.2d	23.7	19b
150	Early	3.79c	47.0bc	20.8	22c
150	Late	3.80c	46.8bc	22.0	22c
200	Early	3.99cf	46.4ab	22.2	23cd
200	Late	3.95ce	46.7b	22.2	23cd
240	Early	4.31ef	46.4ab	22.9	24de
300	Unlimited	4.36f	45.6a	20.9	25e
150	NKS21	3.83cd	47.0bc	22.0	22c
300	NKS21	4.21def	46.1ab	22.7	24de
	P-value	<0.0001	<0.0001	ns	<0.0001

Grain yield showed an increasing trend across the N application treatments, with the greatest yield measured where 300 units of N was applied compared to the lowest which was 10 units of N applied (Table 2). The largest change in yield occurred between 10 and 150 units of N and was a similar trend observed for biomass at early stem elongation. The application of 240 and 300 units of N was significantly higher than 150 units of N applied. There was no difference in grain yield between the early versus late scheduling of fertiliser application.

Grain oil content varied between 45.6% and 48.2% across all treatments and there was a trend that oil percentage decreased as the rate of N applied increased (Table 2). Grain protein varied between 20.0 and 22.9 and showed no influence by the application of N fertiliser treatments. The water use efficiency (WUE) varied between 16 and 25 kg/ha/mm growing season rainfall, with WUE increasing as the rate of N increased.

Discussion

Increasing the rate of nitrogen applied to hybrid canola was successful in achieving grain yields of up to 4.36 t/ha at the Dandaragan site in 2019. This was achieved on a strong, fertile soil type for the region, and in an atypical season where growing season rainfall received was 66% of the long-term average and with little summer rainfall to contribute to grain yield. The increase in grain yield was offset by a reduction in oil content of the grain and considering the current bonus system for grain oil content >42%, this slightly reduced the overall profitability of the higher yielding treatments. This reduction in grain oil content supports earlier findings, although oil content was still well above the threshold of 42% in this study. Further studies are required to determine the yield response to increased nitrogen fertiliser rates in seasons that are average or above average for growing season rainfall.

The full report can be found on the WMG website www.wmggroup.org.au

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