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Targeting 5 t/ha irrigated canola: effect of sowing date, variety choice and nitrogen management – Finley 2016

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Key findings

- Nuseed Diamond achieved 5 t/ha grain yield from early sowing (watered for germination on 12 April).
- The high yield of Nuseed Diamond was due to its high biomass accumulation and high harvest index. ATR Bonito$^{\phi}$ was the lowest yielding variety, largely because it accumulated less biomass than hybrid non-TT varieties.
- Split nitrogen application resulted in higher grain yield than all nitrogen applied at sowing or all nitrogen delayed to the 8-leaf stage.

Introduction

Irrigated canola growers strive for a grain yield of 5 t/ha, however there is little information on management strategies to achieve this goal. This experiment was designed to assist growers with variety, nitrogen management and sowing date decisions to maximise irrigated canola yield potential. Five canola varieties were sown on two sowing dates in April and were watered with a lateral irrigator (45 mm total over three applications) to aid crop establishment. Three nitrogen (N) treatments were applied to determine the optimum timing of N application – early, split and delayed.

Site details

Location	10 km north-east of Finley
Soil type	Grey–brown chromosol
Previous crop	Wheat (irrigated)
Fallow rainfall	244 mm (November 2015–March 2016)
In-crop rainfall	427 mm rainfall (April 2016–October 2016) plus 45 mm irrigation (April)
Soil nitrogen	98 kg/ha (0–150 cm, 29 April)
Starter fertiliser	100 kg/ha mono-ammonium phosphate (11% nitrogen, 22.7% phosphorus, 2% sulfur), treated with 2.8 L/t flutriafol (500 g/L)

Treatments

Due to the wet conditions in 2016, only a small amount of irrigation was required. Three separate applications of 15 mm were made through a lateral irrigator in April to ensure timely crop establishment, with no further irrigation for the rest of the season.

Varieties

ATR Bonito$^{\phi}$, Nuseed Diamond, Pioneer® 44Y89 (CL), Pioneer® 45Y25 (RR), Pioneer® 45Y88 (CL)

Sowing date (SD)

SD1: 8 April – watered for germination on 12 April
SD2: 30 April

Nitrogen timing

Early – 300 kg N/ha applied at sowing
Split – 150 kg N/ha applied at sowing and 150 kg N/ha applied at 8-leaf stage
Delayed – 300 kg N/ha applied at 8-leaf stage

Results

Phenology

Nuseed Diamond was the fastest variety to start flowering (defined as when 50% of plants have one open flower) from SD1, taking 91 days from sowing. Pioneer® 45Y25 (RR) was the slowest variety to start flowering from SD1, taking 125 days from sowing. The 30 April sowing (SD2) delayed the flowering of Nuseed Diamond by an extra 22 days, but only by eight days for Pioneer® 45Y25 (RR). Nuseed Diamond development is driven only by thermal time, therefore warmer temperatures hasten its development. Slower varieties such as Pioneer® 45Y25 (RR) have small but consequential responses to vernalisation that can delay flowering from early sowing when conditions are warm.

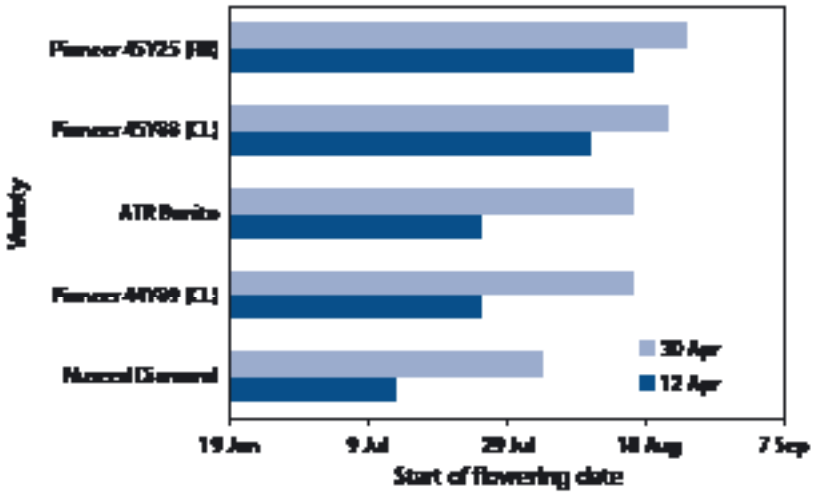

Figure 1. Start of flowering date (50% of plants with one open flower) of five canola varieties sown on two sowing dates at Finley, 2016.

Sowing date and variety choice

Variety choice was the most important factor affecting grain yield in this experiment, with an overall difference of 1.72 t/ha between the highest yielding variety (Nuseed Diamond) and the lowest yielding variety (ATR Bonito$^{\phi}$).

Nuseed Diamond was the highest yielding variety from both sowing dates and had approximately $400/ha higher gross income (based on canola at $500/tonne) than the next best variety, Pioneer® 44Y89 (CL).

The advantage of Nuseed Diamond for grain yield was likely due to its high conversion of biomass into grain yield (high harvest index). Nuseed Diamond averaged a harvest index of 0.30 compared with the next best varieties, Pioneer® 44Y89 (CL) and ATR Bonito$^{\phi}$ with a harvest index of 0.27. Pioneer® 45Y88 (CL) and Pioneer® 45Y25 (RR) both had a harvest index of 0.24. ATR Bonito$^{\phi}$ was lower yielding overall, because it grew less biomass than the hybrid non-TT varieties.

Differences in oil concentration were small relative to the differences in grain yield. ATR Bonito$^{\phi}$ from SD1 was the only variety to achieve 45% oil. The average oil concentration in this experiment was likely limited by the very high nitrogen application (300 kg N/ha).

There was evidence of varieties tabling in this experiment, but no lodging was observed.

Table 1. Grain yield (t/ha) and oil concentration (at 6% moisture) of five canola varieties sown on two sowing dates at Finley, 2016.

Variety	Grain yield (t/ha)		Oil concentration (%)	
	12 April	30 April	12 April	30 April
ATR Bonito	3.56	2.61	45.0	44.3
Nuseed Diamond	5.04	4.57	43.1	44.0
Pioneer 44Y89 (CL)	4.23	3.77	42.3	43.2
Pioneer 45Y25 (RR)	3.85	3.58	43.2	42.3
Pioneer 45Y88 (CL)	3.91	3.89	40.3	42.2
l.s.d. ($P<0.05$)	0.41		1.0	

Nitrogen management

For the early sowing date, the split N treatment was 0.28 t/ha higher yielding (averaged across all varieties) than the up-front N treatment, which was a further 0.33 t/ha higher yielding than the delayed N treatment. Grain yield was not affected by N management in the lower yielding SD2, which indicates that the differences between nitrogen timing is most likely to be observed when other factors such as sowing time are optimised.

Conclusion

For this experiment, management strategies that achieved 5 t/ha were:

1. variety choice (Nuseed Diamond)
2. sowing date (12 April)
3. nitrogen management (split application between pre- and post-sowing).

Nuseed Diamond appears an ideal plant type for irrigated canola, as it is able to grow large quantities of biomass and can effectively convert that biomass into grain yield.

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