

# Drivers of high-yielding irrigated canola production

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## Abstract

Canola has a sound fit in irrigated agricultural systems despite traditionally being a dryland crop and there is potential to increase the area sown by 25% if yield and profitability is improved. Varieties with superior performance in dryland systems may not be the highest yielding varieties in irrigated systems. The effect of variety and agronomic management on irrigated canola was investigated in six trials located throughout south-eastern Australia – Murrumbidgee, Murray Valley, Lachlan, north-west Victoria, south-east South Australia and Tasmania. Canola variety had a significant effect on grain yield at both Murrumbidgee trial sites (Leeton and Coleambally). At Leeton, 45Y88 (CL) was the highest yielding variety (4.18 t/ha) followed by Hyola 50 (4.17 t/ha) and AV Garnet (3.99 t/ha). At Coleambally, Hyola 50 again performed well yielding the highest, followed by Hyola 577CL and 45Y88 (CL). Variety by time of sowing interaction also had an effect on grain yield. At Leeton, Hyola 50 and 45Y88 (CL) had higher yields at the earlier time of sowing (9 April). In contrast, ATR Bonito and Hyola 577 (CL) achieved higher yields when sown later (24 April). AV Garnet yields were stable over the two sowing times.

## Key words

Irrigated, canola, variety, agronomy, high yielding, winter cropping

## Introduction

Recent industry research identified significant potential for increased production and profitability of irrigated canola (McCaffery 2006). The ‘Southern irrigated cereal and canola varieties achieving target yields’ project aims to increase irrigated canola and cereal production in the irrigated agricultural regions of south eastern Australia. This will be achieved by improving grower and adviser knowledge of high yielding canola varieties for irrigated systems and specific agronomy management to improve production, water use efficiency and profitability.

The first of three seasons of trials as part of the project was conducted in 2014. A further two years of trials will be conducted to validate these initial findings and develop recommendations in the form of best management practice guides and variety specific agronomy packages (VSAPs). Similar trials are being replicated throughout the irrigation areas of south eastern Australia.

## Methods

The two variety and agronomic management experiments were conducted at two locations in the Murrumbidgee Valley – Leeton and Coleambally (Table 1). The Leeton trial evaluated the effect of variety, time of sowing (TOS) and plant population on grain yield. The experimental design had variety and population nested in TOS with three replicates. A list of varieties is shown in Figure 1. Times of sowing were 9 and 24 April 2014, with low (30 plants/m<sup>2</sup>) and high (50 plants/m<sup>2</sup>) plant populations. A total of 250 kg/ha N was available at the Leeton trial site – 53 kg N/ha was present in the soil just prior to sowing, 102 kg N/ha was applied at the time of sowing, 50 kg N/ha was applied at visible bud and approximately 45 kg N/ha was mineralised during the season.

The Coleambally trial evaluated the effect of variety and nitrogen (N) management on grain yield. The trial was a randomised block design with three replicates. A total of 145 or 245 kg N/ha was available at the Coleambally site (depending on which nitrogen treatment was applied). The low (50 kgN/ha), medium (100 kg N/ha) and high (150 kg N/ha) N treatments had all nitrogen applied at sowing. The split N treatment had 50 kg N/ha applied at sowing and another 50 kg N/ha applied at visible bud. Data for both trials were analysed using Genstat 17th edition.

**Table 1. Leeton and Coleambally trial site details.**

	Leeton	Coleambally
Soil type	Self-mulching medium clay	LightHeavy red clay
Previous crop	Barley (2013)	Wheat (2013)
Irrigation	Autumn pre-watering – 2.2 ML/ha Three spring irrigations – 2.8 ML/ha Total – 5.0 ML/ha	Autumn watering-up – 1.0 ML/ha One spring irrigation – 1.2 ML/ha Total – 2.2 ML/ha
Sowing date	TOS 1 9 April 2014 TOS 2 24 April 2014	29 April 2014
Row spacing	300 mm	300 mm
Herbicides	Verdict™ at 100 mL/ha (by boom) Lontrel™ at 100 mL/ha (by boom)	Verdict™ at 100 mL/ha (by boom) Lontrel™ at 100 mL/ha (by boom)
Harvest date	TOS 1 12 November 2014 TOS 2 17 November 2014	6 November 2014

## Results

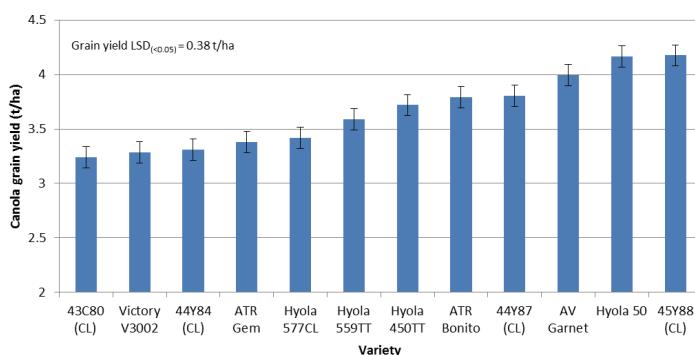
### Variety (both sites)

Variety had a significant effect on grain yield at both trial sites. At Leeton, 45Y88 (CL) was the highest yielding variety followed by Hyola 50 and AV Garnet, all yielding over 4 t/ha. The lowest yielding varieties were 43C80 (CL), Victory V3002 and 44Y84 (CL) which yielded 3.24 t/ha, 3.28 t/ha and 3.31 t/ha respectively (Figure 1).

At Coleambally, the highest yielding variety was Hyola 50 (2.76 t/ha) followed by Hyola 577CL (2.56 t/ha) and 45Y88 (CL) (2.54 t/ha). The lowest yielding varieties were ATR Gem, Hyola 450TT and ATR Bonito which yielded 1.77 t/ha, 1.93 t/ha and 2.00 t/ha respectively. Hyola 50, 45Y88 (CL) and AV Garnet were in the top four grain yielding varieties at Leeton and Coleambally.

Variety affected grain oil content at both sites. At Leeton, the highest oil yielding varieties were AV Garnet, 44Y84 (CL), 45Y88 (CL) and Hyola 50. The same four varieties were in the top five oil yielding varieties at Coleambally.

Variety significantly affected plant establishment and normalised difference vegetation index (NDVI) at both trial sites (data not shown) but these measurements did not have a correlation with grain yield. Variety also affected lodging and harvest index at the Leeton site (not measured at Coleambally). At Leeton, Hyola 450TT had the highest varietal lodging of 4.4 when measured on 23 October followed by Hyola 559TT with 1.6 (0 – no lodging; 9 – complete lodging). In addition, ATR Bonito had the highest harvest index (0.43) followed by Hyola 559TT (0.42) and AV Garnet (0.40).



**Figure 1. Canola grain yield of varieties averaged across all time of sowing and plant population treatments at Leeton 2014.**

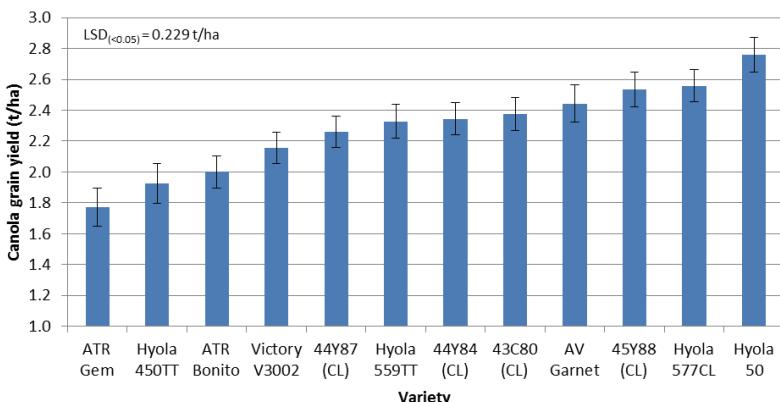


Figure 2. Canola grain yield of varieties averaged across all nitrogen treatments at Coleambally 2014.

#### Time of sowing (Leeton)

Time of sowing (TOS) showed no effect on grain yield when averaged across all varieties. This is likely due to TOS1 having obvious signs of frost damage and therefore reduced grain yield potential, while TOS2 had no frost damage.

However, there was a significant variety by sowing time interaction at Leeton. Four of the top six yielding varieties 45Y88 (CL) (1), Hyola 50 (2), 44Y87 (CL) (4) and Hyola 450TT (6) had higher yields at TOS1. In contrast, ATR Bonito had higher yields at TOS2, and AV Garnet had stable yields across the two sowing times. All varieties in the lower yielding bracket (7–12) yielded higher in TOS2 (Figure 3).

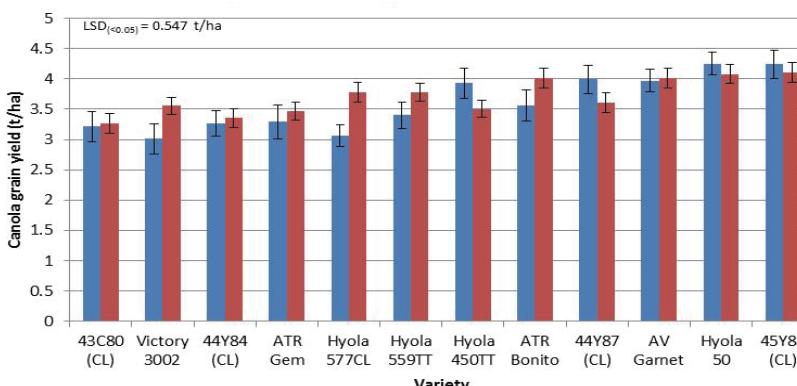


Figure 3. Canola grain yield for varieties at each time of sowing at Leeton 2014.

#### Plant population (Leeton)

Plant population did not have a significant effect on grain yield.

#### Nitrogen management (Coleambally)

Nitrogen management demonstrated no significant effect on grain yield.

#### Conclusion

These canola trials demonstrated that varietal selection is a major driver of achieving high yields. At Leeton, 45Y88 (CL), Hyola 50 and AV Garnet had the highest grain yields. Varieties 43C80 (CL), 44Y84 (CL), Victory V3002 and ATR Gem had low yields irrespective of time of sowing or plant population. Time of sowing did not affect grain yield, potentially due to severe frost events at flowering time of the early sown treatments. Higher plant population reduced oil content whilst having no yield response. These results need to be considered carefully as individual varietal results show variable responses to plant population.

At Coleambally, Hyola 50 and Hyola 577CL had significantly higher grain yields than all other varieties. 44Y84 (CL), Hyola 50, AV Garnet and Victory V3002 had the highest oil contents.

These results represent the first of three years' data. A further two years of trials will be conducted in 2015 and 2016 to validate these results and develop varietal and agronomic recommendations.

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### **References**

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