Canola nutrition and disease management

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Key messages

- Split application of nitrogen at green bud and full flower produced the highest yields.
- The risk of a dry season can be reduced by using split fertiliser timings.
- Applying nitrogen consistently increases levels of protein in canola but reduces oil content.
- Using flutrifaol-treated starter fertiliser and in-crop fungicides increased yields of canola by an average of 0.42 t/ha.
- Fungicide use had no consistent impact on grain quality.

Background

Achieving above average canola yield and oil content requires effective management and strategic use of crop inputs like nitrogen and fungicides. This report investigates the effect of nutrition and disease management on canola yield and quality at Westmere in 2014.

Nitrogen fertiliser is usually the single greatest cost for canola growers. The challenge is to supply the right amount of nitrogen at the right time in order to meet crop demand and optimise yield and quality, without oversupplying nitrogen and reducing profit. Canola is grown primarily for oil, with crops attracting a bonus of 1.5 per cent on the base price for every percentage point above 42% oil. Increasing nitrogen supply increases grain yield and protein, concurrently decreasing oil content. The aim of the nutrition trial was to explore the effect of nitrogen rate and timing on canola yield and quality.

In terms of threats to yield, blackleg (*Leptosphaeria maculans*) is the most common and serious disease of canola. While fungicidal seed treatments and fertiliser dressings can provide protection against infection for up to six weeks post germination, studies have shown that the addition of foliar fungicide at around 4-leaf stage can further prevent infection. The aim of the disease management trial was to confirm that using seed dressings and in-crop fungicides would increase yields and preserve grain quality in a dry season compared to no fungicide

Method

Trials were conducted at both Hamilton and Westmere, however the Hamilton site suffered significant weed and bird damage. For this reason this report will focus on the two trials located at Westmere.

The trials were sown on 6 May 2014 using the SFS cone seeder on 200 mm row spacing. Mean crop emergence across all treatments was 32 pl/m_2. Both the disease management and nutrition trial were sown with 100 kg/ha MAP as starter fertiliser. The trials were managed according to best practice in regards to pests and weeds. Both trials were direct headed following desiccation; the nitrogen response trial was harvested on 28 November and the disease management trial harvested on 12 December 2014.

Deep soil tests were taken a week before sowing (Figure 1). There was 119 kg/ha of mineral N (ammonium NH^{4+} and nitrate NO_3^-) stored in the top metre of the soil profile, of which 74% was in the nitrate form and the remaining 26% in the ammonium form. The vast majority of soil nitrogen (83% or 99 kg/ha) was stored in the top 40 cm of the profile; NO_3^- and NH^{4+} levels tended to decline with depth. The treatments investigated and varieties sown in the two trials are detailed table 1.

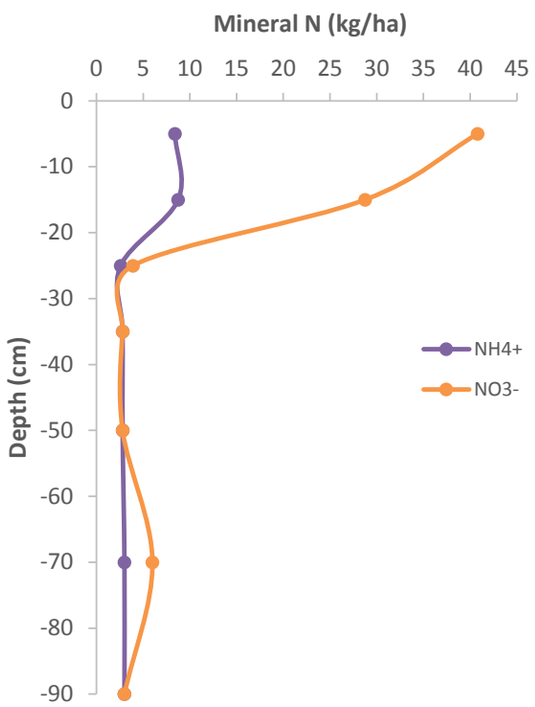


Figure 1. Distribution of mineral N through the soil profile at Westmere prior to sowing in 2014.

Nitrogen response trial

The nutrition trial had four nitrogen rates applied as single or split applications (Table 1). Nitrogen rates were calculated from pre-sowing soil tests to target canola yields of 2-2.5 t/ha.

Table 1. Nitrogen rates and timings in the canola nutrition trial

1	Nil
2	100 kg/ha urea @ green bud
3	200 kg/ha urea @ green bud
4	150 kg/ha urea @ green bud + 150 kg/ha urea @ full flower
5	200 kg/ha urea @ green bud + 200 kg/ha urea @ full flower

Fertiliser was applied by a hand spinner in the form of urea at the appropriate growth stage. The conventional varieties Hyola 50 and Garnet were sown in the trial.

Disease management trial

The disease management trial compared the impact on yield and quality of nine canola varieties sown with dressed fertiliser and treated with foliar fungicide ('Fungicide') to an untreated control ('No fungicide'). Therefore, half of the trial received disease management and the other half did not.

Table 2. Agronomic and management details for the disease management trial. Fertiliser dressing and foliar fungicide was applied to the 'Fungicide' half of the trial only.

Varieties	ATR Wahoo TT, ATR Bonito TT, Hyola 650 TT, Hyola 577 CL, 45Y86 CL, 45Y88 CL, 44Y24 RR, GT50 RR, Hyola 600 RR
Fertiliser dressing	MAP +/- Flutriafol (Impact® or Intake ®)
Fungicide	5/08/14 Prosaro 300 mL @ 6 leaf 16/09/14 Prosaro 300 mL @ early flower

For maturity and blackleg resistance ratings of the nine varieties refer to Table 3.

Results and discussion

Nitrogen response trial

Mean site yield was a modest 2.5 t/ha for Hyola 50 and 2.8 t/ha for Garnet. Historically, both varieties typically yield 300-400 kg/ha more. Below average growing season rainfall and a particularly dry spring combined with high nitrogen rates, causing abundant early growth and haying off, may account for these yield differences.

The application of nitrogen had a significant impact on the yield of canola at Westmere. Results from the trial showed that increasing the amount of nitrogen applied was positively correlated with improved yields. As Figure 2 shows, regardless of variety, applying nitrogen significantly increased yields compared to the untreated control. The highest application rate of 200 kg/ha urea at green bud plus 200 kg/ha urea at flowering yielded significantly higher than all other treatments except for the 150 kg/ha plus 150 kg/ha split.

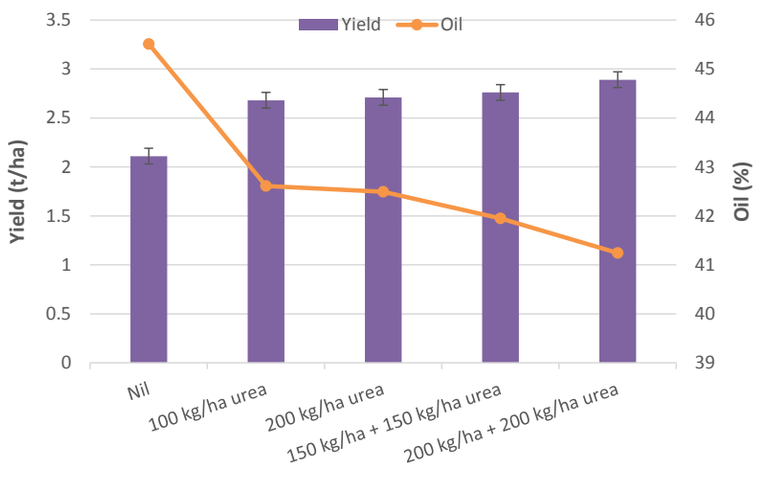


Figure 2. Canola yield and oil content in response to different urea rates and timings. Error bars represent LSD at p=0.05.

In a water-limited season such as that experienced in 2014, planning for split N applications is beneficial as it can help reduce the risk of excessive early growth and is a good strategy to hedge against the financial risk of a dry season (GRDC 2009).

As expected, oil content decreased with increasing nitrogen supply (and therefore canola yield) (Figure 2). The two split applications of urea both had oil percentages less than the base level of 42%. The untreated control with no in-crop nitrogen had the highest oil content at 45.5%.

There is also a negative relationship between protein and oil content, where increasing protein correlates with decreasing oil (Figure 3). Nitrogen is a major constituent of protein and when applied to a canola crop, the synthesis of protein increases but oil content is reduced due to fatty acid synthesis (Rathke et al 2005).

The same nitrogen, oil and protein relationship observed in this nutrition trial was also observed in the canola disease management trial.

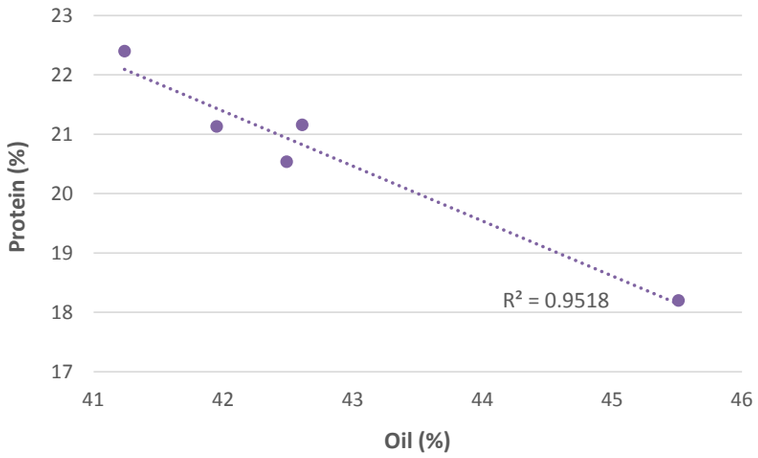


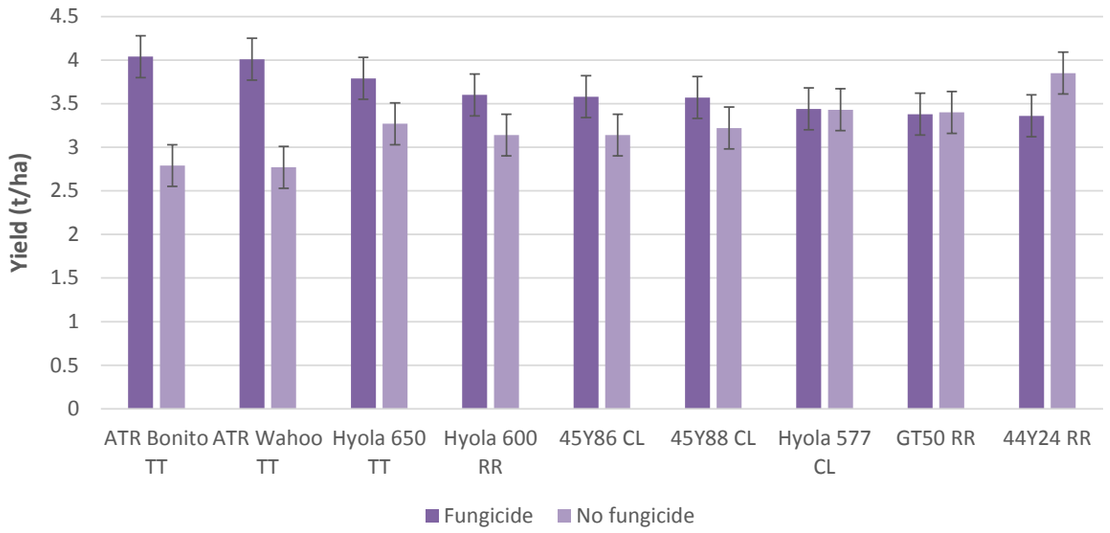
Figure 3. A strong negative correlation was observed between oil and protein content of canola grain.

Fungicide

Mean site yield was 3.6 t/ha for the fungicide treated varieties and 3.2 t/ha for the untreated varieties. Compared to historical canola yield results the canola treated with fungicide yielded 0.2-0.5 t/ha more than average; untreated canola tended to yield 0.2-0.8 t/ha less.

Even though the prevalence of disease was low this season due to dry conditions, on average yields of canola increased by 0.42 t/ha with the use of dressed fertiliser and foliar fungicide (Figure 4). Although leaf lesions were observed early on, across the trial the incidence of blackleg disease was minor with no evidence of stem canker at maturity.

Figure 4. Comparison of the yields of nine different canola varieties at treated with no fungicide or with dressed fertiliser and in-crop foliar fungicide.



Triazine Tolerant varieties (ATR Bonito, ATR Wahoo and Hyola 650) were the highest yielding with the addition of flutriafol treated fertiliser and fungicide but with no fertiliser or foliar protection, these varieties were amongst the lowest yielding. The Clearfield varieties were middle of the range in terms of yield; only Hyola 577 CL didn't experience a yield increase in response to fungicide application. Two of the three Roundup Ready® varieties, GT50 and 44Y25, actually had decreased yield in response to treatment with fungicide.

Fungicide application did not have any consistent effects on test weight, oil or protein content of the grain (Table 3). Grain quality was highly variable both within and between varieties.

Table 3. Canola variety performance in response to fungicide at Westmere.

Variety	Blackleg rating	No fungicide			Fungicide		
		Test weight (kg/hl)	Oil (%)	Protein (%)	Test weight (kg/hl)	Oil (%)	Protein (%)
ATR Wahoo TT	MR (P)	65.5	43.6	22.6	68.3	41.3	23.1
ATR Bonito TT	MR(P)	65.1	42.0	23.6	68.7	42.1	24.1
Hyola 650 TT	R (est)	64.7	43.2	21.8	65.5	41.8	23.5
45Y86 CL	MS (P)	65.7	42.9	23.1	65.8	42.2	23.6
45Y88 CL	MR (P)	64.9	43.0	23.5	66.6	41.2	22.8
Hyola 577 CL	R-MR (P)	67.1	42.6	22.5	65.1	43.6	23.1
44Y24 RR	MR (P)	67.2	42.2	23.5	66.3	43.2	21.9
Hyola 600 RR	R-MR (est)	65.8	41.0	23.6	65.6	45.0	22.5
GT50 RR	R	64.5	42.2	23.5	66.0	42.2	22.6
	LSD (*p*=0.05)	**2.4**	**1.7**	**1.1**	**2.4**	**1.7**	**1.1**

MR = Moderately Resistant. R = Resistant. MS = moderately susceptible. P = Provisional blackleg ratings (insufficient data to meet rating protocols). est = Estimate by marketing company (yet to be rated by the Australian Oilseeds Federation).

Conclusion

After 2014 some questions still remain. Does foliar fungicide offer the same protection as fertiliser or seed dressing alone? Could farmers opt for one fungicide protection option and still receive the same yield? This year in a dry season it appeared that way, however this may not be wise if the season was to play out differently, and readers should treat the information presented with caution. Using a variety more susceptible to blackleg may help tease out the response to fungicides. Would there be a greater yield difference in response to maturity if it was a high disease year? SFS will continue with its canola agronomy research in the coming years to obtain a broader data set.

References

Grains Research and Development Corporation ('GRDC') (2009) Canola best practice management guide for south-eastern Australia. GRDC, Kingston ACT.

Rathke G, Christen O, Diepenbrock W (2005). Effects of nitrogen source and rate on productivity and quality of winter oilseed rape (Brassica napus L.) grown in different crop rotations. Field Crop Research. 94: 103-113.