Timing of N application in canola

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TAKE HOME MESSAGES

- Delaying nitrogen application represents a risk management strategy for crop production that has previously been found to work successfully in cereal crops.
- The Longerenong trial site was not nitrogen responsive and hence it is not possible to draw conclusions regarding optimum management strategies from the trial conducted at this site.
- Dry matter production data at maturity collected from the Birchip site suggests that nitrogen application in canola can be delayed at least until the four leaf stage without loss of dry matter yield, but dry matter yield losses were incurred when all nitrogen application was delayed until late cabbage stage. However, the Birchip trial was not harvested for grain.
- Cautious adoption of delaying some nitrogen application is recommended.

Introduction

Delaying nitrogen application represents a financial risk management strategy for crop production that has previously been found to work successfully in cereal crops. It allows for growers to make fertiliser decisions later in the season when they have a better idea of the seasonal outlook than pre-drilling urea before sowing. Limited research on nitrogen timing in canola suggests that by splitting or, when reasonable soil N levels are present at sowing time, deferring nitrogen applications, yields are not reduced.

Methods

Trials were conducted at Birchip and Longerenong investigating the timing of nitrogen application on canola to determine if the risk of growing canola can be reduced, whilst maintaining yields, through the delayed application to nitrogen. The Birchip site was severely nitrogen deficient (28kg N/ha to a depth of 1m at sowing), whilst the Longerenong site was marginally nitrogen deficient (47kg N/ha to a depth of 1m at sowing).

Trials were sown with the variety Bravo at Longerenong on 22nd May 2007 and at Birchip on 24th May 2007. 60 kg/ha SupremeZ (N:P:K:S:Zn 11:22:0:4:1) was used as a basal fertiliser for all treatments at both sites. TriflurX® 1.2L/ha + 1L/ha Lorsban was applied immediately post sowing and incorporated by rolling harrows. Simazine (555gms/ha), atrazine (555gms/ha) and endosulfan (500mls/ha) were applied post sowing pre-emergent at both sites. Six nitrogen treatments were used at each site according to Tables 1 and 2. With the exception of the very high pre-drill rates of N, N application rates were based on N budgets to achieve average crop yields,

factoring in pre-sowing soil N and estimated N mineralisation. All post sowing nitrogen was broadcast by a hand spreader as urea.

Table 1:

Nitrogen treatments at Longerenong site.

Treatment No.	Treatment	Timing	N Rate	Date
1	Control	No N		
2	Pre drill very high	100% pre-drill	200kg	22/5/2007
5	Pre-drill	100% pre-drill	100kg	22/5/2007
3	Early top-dress	100% 4 leaf stage	100kg	27/7/2007
4	Split top dress	50% 4 leaf stage + 50% late cabbage (before bolting)	50kg +50kg	27/7/2007 + 15/8/2007
6	late top-dress	100% late cabbage (before bolting)	100kg	15/8/2007

Table 2:

Nitrogen treatments at Birchip site.

Treatment no.	Treatment	Timing	N Rate	Completed
1	Control	No N		
5	Pre-drill	100% Pre-drill	75kg	24/5/2007
2	Pre drill very high	100% Pre-drill	150kg	24/5/2007
3	Early top-dress	100% 4 leaf stage	75kg	27/7/2007
4	Split top-dress	50% 4 leaf stage + 50% Late Cabbage(before bolting)	35kg + 35kg	27/7/2007 16/8/2007
6	Late topdress	100% Late Cabbage (before bolting)	75kg	16/8/2007

Dimethoate (85mL/ha) was applied to the Birchip site on 29 June for insect control. For weed control, Select (250mL/ha), Verdict (25mL/ha), Hasten (1L/100L), SOA (0.8kg/100L) was applied at Birchip, and Select® (300mL/ha), Verdict (25mL/ha) and Lontrel (100mL/ha) with 0.5% Uptake was applied at Longerenong.

Results

At Longerenong, there were no significant differences in either plant establishment (mean 82.4 plants/m2) or grain yield (mean yield 1.05 t/ha) between nitrogen treatments.

At Birchip, no differences occurred in plant establishment (mean 99 plants/m2) or the percentage of ground cover at budding (mean 68%) between nitrogen treatments. Due to the drought season and imminent crop failure, dry matter cuts were taken on 4th November in lieu of grain yield. Significant differences in dry matter were observed (Table 3), with lowest yields occurring when either no nitrogen was applied

or when all nitrogen was applied at late cabbage (16 August 2007). The treatments with nitrogen applied either pre-sowing, applied at four leaf, or split between the four leaf and late cabbage stage, all produced similar yields which were 40-50% higher than the nil nitrogen control treatment.

Table 3:

Maturity dry matter (DM) production (kg/ha) in canola at Birchip with 6 nitrogen treatments (kg N/ha), represented "x_x_x", according to the percentage of total nitrogen applied pre-sowing, at 4 leaf or at late cabbage stage respectively.

	Nitrogen treatment (% split between predrill, 4 leaf and late cabbage)						LSD(5%)
	Nil	100_0_0	0_100_0	0_50_50	100_0_0	0_0_100	
Total N applied	0	150	75	70	75	75	
Maturity DM	1398	2312	2159	2280	2087	1548	***537***

Commercial practice

Results from these trials suggest that canola can be successfully grown when nitrogen application is delayed at least until the 4 leaf stage and possibly split between the 4 leaf stage and cabbage development. However, this is a preliminary interpretation only due to the lack of grain yield data from the Birchip site and the lack of any nitrogen response at the Longerenong site. Previous research at Wagga Wagga, Forbes, Bendigo and Condobolin have shown that delaying or splitting N fertiliser applications usually has no yield penalty associated with it as long as there is at least 40 kg/ha N in the top 50 cm at sowing time (Norton R., pers. comm.).

If planning to split or delay nitrogen, knowledge of soil N levels to a depth of at least 40 cm, preferably 60 cm is essential. A measurement of soil water reserves at this time will assist in estimating yield potential and planning N requirements. A new canola yield potential calculator, with greater accuracy than simple French–Schulz calculations, has been developed by CSIRO for southern NSW is now available (see description below).

Delaying nitrogen application may reduce the risk of growing canola by reducing up-front planting costs when seasonal prospects are less known. Growers should be aware that the application of nitrogen in-crop has its own risks, with potentially lower nitrogen use efficiency if volatilisation occurs prior to a rainfall event of sufficient magnitude to wash the nitrogen into the soil profile.

An improved potential yield calculator for canola

Refer to Kirkegaard et al. (2007). Maximising canola performance. In: *GRDC Research Updates Wagga Wagga*, NSW, 2007
http:/www.grdc.com.au/director/events/researchupdates?pageNumber=95

Estimates of potential yield can be calculated using rainfall data to determine the Seasonal Water Supply (SWS):

Potential Yield (kg/ha) = SWS (mm) x WUE (kg/ha/mm)

Assume WUE is 11 kg/ha/mm (reduce by 10% for each month sowing delay from early April). Note that WUE in good crops can vary from 8 to 14 depending on rainfall distribution.

SWS = [in-crop rain] + [Soil water at sowing] - [Soil water left at harvest] -120
[In-crop rain] = [rain from sowing to windrow]

In crop rain must be 450mm or less; if in crop rain is greater than 450mm, then water is not limiting yield.

[Soil water at sowing] = [fallow rainfall - 80] x 0.5*
(* varies from 0.4 to 0.6 depending on timing/amount of rainfall - weed-free fallow with stubble)

[Soil water left at harvest] = [post-flowering rainfall - 50] x 0.5*
(* varies from 0.5 to 1.0 at wetter sites 0.2 to 0.5 at drier sites)

Analysis of 15 years canola data in southern NSW showed that this approach significantly improved the accuracy of yield prediction (r 2 =0.68) over the French and Shultz approach (r2 =0.48).

Some caution in the use of this calculator may be required in Victoria as all validation has occurred in southern NSW. When determining target yields, these yields should only be 85% of potential, but this may be higher depending on soil type and grower experience.