

Timing of Nitrogen for Canola Grown in the Lower Rainfall Areas of Western Australia

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Key Messages

- We observed no significant differences in grain yield (GY) between any treatments due to low yield potential and reasonable soil nitrogen (N) levels at seeding.
- Timing of N application had no effect on GY. This is consistent with last years' results at Wubin.
- Canola oil percentage decreased as N rate increased. High rates of N reduced oil significantly, consistent with last year at Wubin.
- The higher the rate of N the more rapidly oil percentage reduced, consistent with last year at Wubin.
- Gross margins (GM) decreased as N rates increased; all GM figures are negative due to poor GY, however, Sturt performed better than Pioneer 43Y23RR due to the higher seed costs associated with Roundup Ready (RR) seed.

Aim

To investigate the nitrogen rate and time of application response of canola varieties to yield and oil content of Triazine Tolerant (TT) and Roundup Ready (RR) hybrids in comparison with open-pollinated (OP) types to:

1. Provide growers in lower rainfall environments with guidelines on times of application to maximise grain and oil yields.
2. Determine if the management of hybrid canola nutrition is different to that of OP varieties due to different responses to N rates and timing.

Background

In 2011 DAFWA conducted N management of hybrid and OP canola in the low rainfall WA mallee. In that trial it appeared hybrids continued to respond to N in terms of GY and \$/ha compared to OP varieties in both TT and RR technologies. Hybrids at rates of N below 25kg N/ha produced equal or better yields than OP varieties at higher rates. This opened up the idea of using the improved genetics of hybrids with low rates of N near seeding, watching the season and applying more N as the season allows.

As part of this project, trials were conducted in 2013 across several locations. The following general conclusions were drawn:

- It is important to assess the N status and ensure canola is not over fertilised (in low rainfall areas), as the reduction in oil content with increasing N could lead to large discounts and
- There exists opportunities to delay making N decisions for canola in low rainfall conditions.

Trial Details

Property	Fitzsimons property, east Buntine				
Plot size & replication	22m x 1.54m x 3 replications				
Soil type	Sand over gravel				
Soil pH (CaCl₂)	0-10cm: 5.6	10-20cm: 5.5	20-30cm: 4.7	30-40cm: 5.7	40-50cm: 6.1
EC (dS/m)	0-10cm: 0.046				
Paddock rotation	2011: wheat, 2012: canola, 2013: wheat				
Variety	Sturt and Pioneer 43Y23RR				
Sowing date	01/05/2014				
Seeding rate	2.4 kg/ha Sturt and 1.5 kg/ha Pioneer 43Y23RR				
Fertiliser	01/05/2014: 80 kg/ha Macropro Plus banded, 22 kg/ha Urea top-dressed				
	27/06/2014: Urea (8wk treatments)				
	24/07/2014: Urea (12wk treatments)				
Herbicides & Insecticides	01/05/2014: 100 mL/ha Bifenthrin, 1.5 L/ha Trifluralin, 2 L/ha Spray.Seed 250				
	20/05/2014: 900 g/ha Roundup Ready on RR treatments				
	21/05/2014: 2.2 kg/ha Atrazine on TT treatments, 1% Spray Oil				
	06/06/2014: 0.85 mL/ha Dimethoate				
	11/06/2014: 500 mL/ha Clethodim, 1% Hasten				
	03/09/2014: 300 mL/ha Dominex (Insecticide)				
Harvest date	06/10/2014: 3 L/ha Reglone, 1% Wetter				
	13/10/2014				
Growing Season Rainfall	136mm				

Results

28 treatments: 2 cultivars (TT-OP = Sturt and RR – Hybrid = Pioneer 43Y23RR) (refer to table 4).

Table 1: Rainfall (mm) at the 2014 Main Trial Site, east Buntine in 2013 and 2014, compared to the Buntine historical long term average (1915-2013).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2013	18	0	34	6	37	7	30	38	28	12	0	0	210
2014	0	22	0	44.5	42.5	20	37	13.5	20	3	4	0	206.5
Mean	13.7	15.8	23.5	21.5	43.3	63.6	54.9	42.8	21.3	16.2	9.3	9.6	342

Table 2: Estimates of available water.

Year	Pre-sowing (mm)	Stored pre-sowing (mm) estimate	Growing Season Rainfall (GSR, mm)	GSR + (mm)
2013	58	27.5	152	179.5
2014	66.5	50	136	186
Mean	74.5	40.6	242.1	282.7

Table 3: Water limited yield calculations.

GSR + stored water minus 1/3 loss	124mm
Potential yield (10 kg/ha/mm)	1,240 kg/ha
Target yield = 75% of Potential Yield	930 kg/ha

There were no significant differences in grain yield between any treatments due to low yield potential and reasonable soil N levels at seeding. There may have been an N response if grain yields were greater. Select your nitrogen (SYN) calculations made earlier in the year suggested that the total organic N at the trial site was 59kg N/ha.

Sturt and Pioneer 43Y23RR responded in the same way to applied N at this trial at east Buntine in 2014. The grain yield of both varieties increased with total applied N up to 70kg N/ha (Table 4), though not significantly. For all rates of applied N, the timing of application had no effect on grain

yield. Therefore 30kg N/ha could be applied either 30N in 8 weeks (10N at seeding and 20N at 8 weeks after sowing (WAS)) or 18N at seeding and 12N 12WAS with similar responses in grain yield.

Table 4: Grain yield (t/ha) of Sturt TT and Pioneer 43Y23RR canola varieties, also shown with average yield across varieties, for various N application rates and timings at east Buntine in 2014.

Nitrogen rate (kg/ha) & timing	Sturt (t/ha)	Pioneer 43Y23RR (t/ha)	Mean (t/ha)
Nil	361	491	426
8N seeding	440	537	489
18N seeding	440	551	496
30N in 8 weeks	454	644	549
50N in 8 weeks	435	514	475
70N in 8 weeks	444	569	507
18N seeding and 12N 12WAS	398	574	486
18N seeding and 32N 12WAS	394	588	491
18N seeding and 52N 12WAS	421	574	498
30N in 8 weeks and 10N 12WAS	454	560	507
30N in 8 weeks and 20N 12WAS	417	583	500
30N in 8 weeks and 40N 12WAS	458	523	491
Mean	465	610	537

LSD = 76.4.

While N rate increased grain yield up to 70kg N/ha, N had a negative effect on canola oil percentage. Oil percentage decreased, as N rate increased (Figure 1). Oil percentage dropped approximately 0.04% for every additional unit of N applied up to 70kg N/ha. Timing did not have an effect on oil percentage.

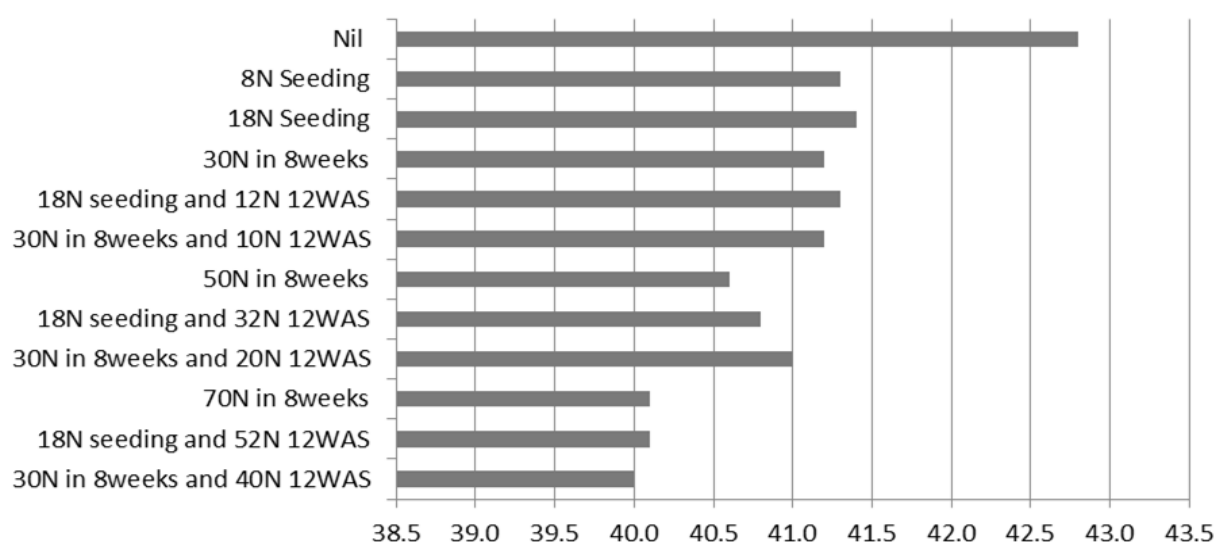


Figure 1: Effect of rate and timing of N on percentage of oil in canola at east Buntine in 2014 (mean of two varieties). LSD (P=0.96).

Economic Analysis

Gross margin analysis indicates that there was no economic benefit in applying N at east Buntine in 2014, due to very low grain yields and the price of input costs particular seed costs for 43Y23RR seed. Gross margins decreased as N rates increased (Figure 2).

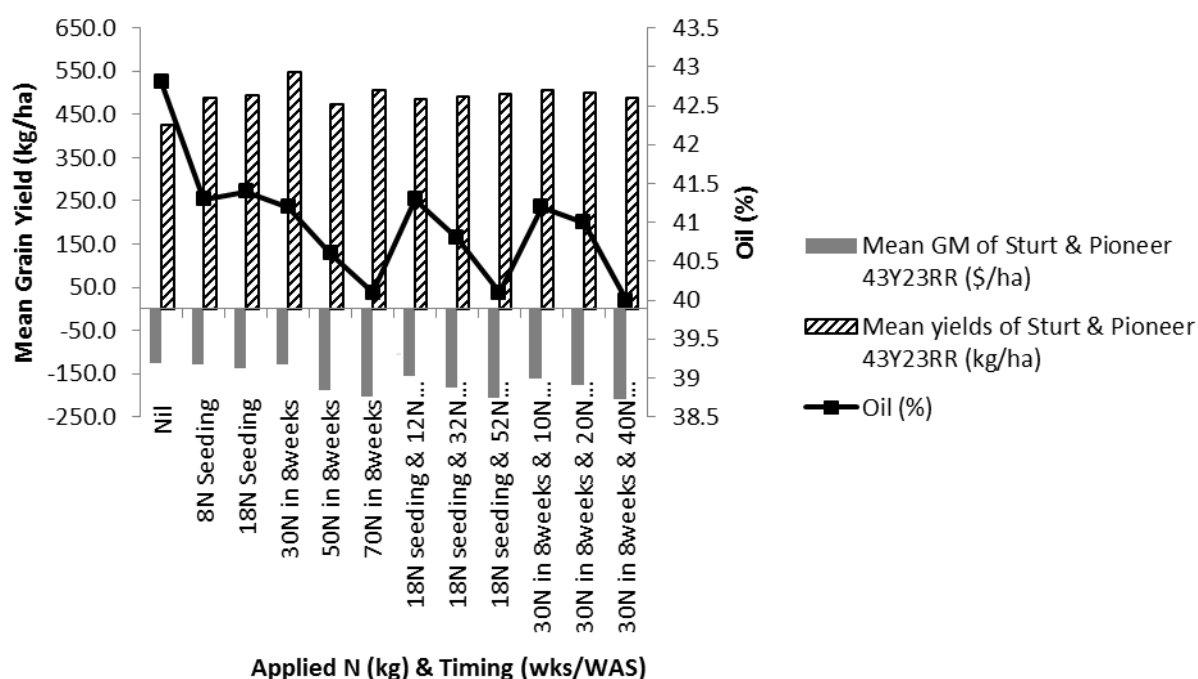


Figure 2: Effect of N on grain yield, oil and gross margin of canola at east Buntine in 2014.

Comments

Findings in response to N on grain yield and oil in 2014 are similar to those findings seen at Wubin in 2013. At this trial in 2014 in the majority of treatments, canola has responded to N up to 12 WAS, at rates up to 70kg N/ha, though not significantly.

At this trial at east Buntine in 2014 oil decreased quicker than grain yield increased in response to N. Now that markets do not have an oil limit, it is important for canola growers to have good working knowledge of soil N, target yield and the expected response of oil and yield, in order for them to maximise economic returns. We recommend people use tools to such as the application: *N broad acre* to assist with N management decisions.

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