GOA Trial Site Report

Canola – Nitrogen timing and plant population

Trial Code: GONU00816-3

Year: Winter 2016

Location: 'Glenbrook', Alectown

Collaborators: Alan Westcott

Keywords

GONU008, Canola nutrition, plant population, nitrogen timing

Editor's Note

Soil testing revealed a severe 'acid throttle', at this site, which limited yield potential. The research team note the importance of taking this into account when assessing the significance of the data (see Box 1).

Take home messages

Canola can compensate for lower than desired plant establishment where adequate nutrition is available.

Where populations are more marginal it is recommended to apply budding stage or earlier.

Canola is highly N responsive. The important message is "get it on", particularly where chronic deficiency is apparent.

In a wet year with a soft finish, late N applications resulted in higher yields. If conditions are wet, later applications, or multiple lower rate applications may drive higher efficiencies.

In wet seasons where plant stands are adequate, delayed N application (flowering) can still result in good yield responses.

Background

GOA research in recent years has found that canola has a significant response to nitrogen (N) application. There has been views that this has been under 'ideal' conditions and that canola may behave differently in the field, particularly where low plant populations occur (as they commonly do). Research has primarily investigated two N application timings (sowing and budding), where no response was found, leaving open the question as to whether it can be applied even later without adverse impacts on yield.

Therefore two questions have arisen regarding further options for canola nitrogen management, how late can nitrogen be applied, and will this change in the plant population is sub-optimal.

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Aim

- Investigate the influence of plant population and N application timing on canola yield and oil content.

Methods

Treatments:

1. Population – 15 and 45 plants/m^2
2. 3 N application timings (200 kg/ha N as urea, hand broadcast)

Table 1: Trial application details

N Timing	Date	Comments
Sowing	04/05/2016	good soil moisture at planting, 18mm ~ 1 week post planting)
Bud visible	18/7/2016	~52 mm two days post application
Flowering	18/8/2016	~20 mm rain on 20/8/2016

Table 2: Trial site details

Trial Establishment Date	Autumn, 2016		
Crop and Variety	Canola – 44Y89	**Seeding rate**	0.8 & 2.5 kg/ha
Sowing date	04/05/2016	**Harvest Date**	18/11/2016
Seedling equipment	Double Boot Tyne	**Row Spacing**	27.5 cm
Crop Nutrition (kg/ha)	150 Triphos	**Soil type**	Clay Loam
Previous Crop	Wheat	**Pre-sowing stubble management**	
Soil test value 0-10 cm (at sowing) **15 cm**	Colwell P ~ 10 ppm, Sulphur ~ 4 ppm pH ~ 4.2 Aluminium sat ~ 38%	**Nitrogen**	0-60cm ~ 26 kg/ha,

A randomised complete block design with 3 replications across 6 ranges was used. Results were analysed by ANOVA and results compared by using a LSD method with a 95% confidence interval. Any references to differences between treatments should be assumed to be statistically different unless otherwise stated.

Results

Plant Population: Against targeted population of 45 and 15 plants/m^2, 44 and 19 plants/m^2 were established for the high and low treatments respectively.

Yield: This was a nitrogen responsive site. For example, application of 100 kg N/ha at sowing to high plant population treatment resulted in 1.1 t/ha higher yield than where no N was applied (Figure 1). A high degree of yield variability across the trial did allow clear differences between rates, timings or plant populations. Differences where, however, detected at the higher population between the untreated control (UTC) and the 100 kg/ha rate at all timings. At the lower population only the 100 kg N/ha applied at flowering was different to the untreated control. Where 100 kg N/ha was applied at sowing the high population outyielded the lower population.

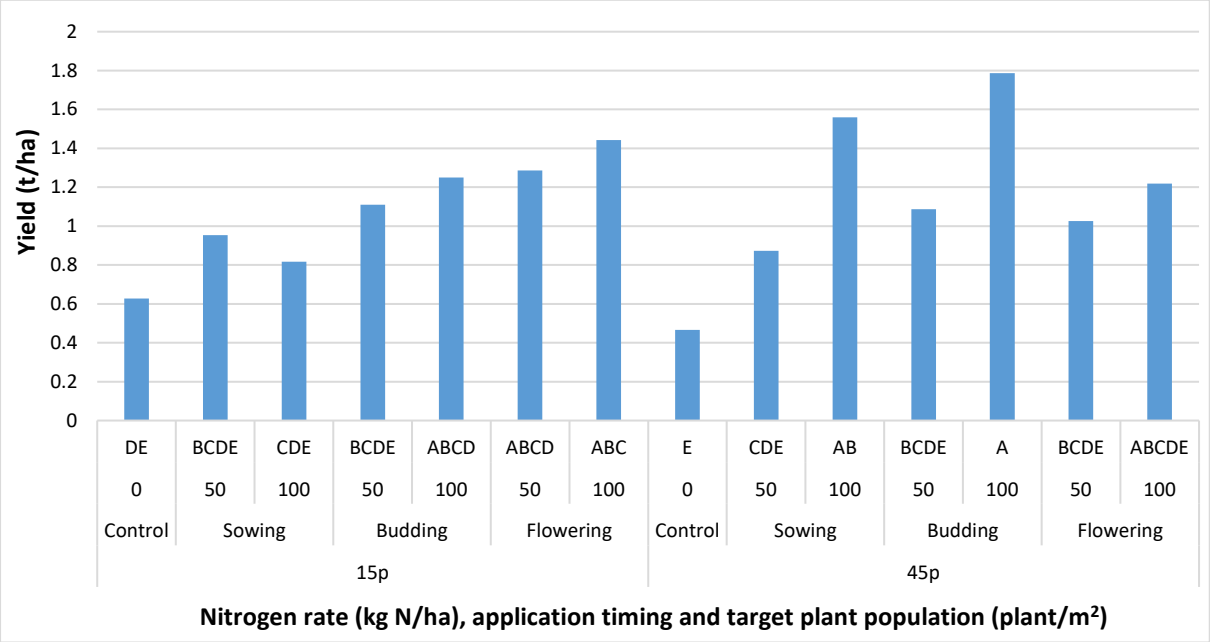

Figure 1. Yield (t/ha) response by N rate and plant population where nitrogen was applied at sowing, budding and flowering. Treatments with the same letter are not significantly different.

Discussion

This site was confounded by an acidic band detected in to soil at ~ 15 cm depth. Soil testing at and after planting revealed pH_{Ca} levels of 4.9 and 4.2 at depths of 5 and 15 cm respectively. At the same depths aluminium saturation was 4.8% and 38.0% respectively. Current recommendations for canola production[1] include that canola should not be grown in soils with pH_{Ca} less than 5.2, and aluminium concentration above 5%. This site is borderline at 5 cm depth and is much worse at 15 cm. In paddocks where lime has been applied with little or no incorporation, soil testing to ensure adequate remediation of soil acidity is highly recommended. If 'acid throttles' are detected tolerant crops should be considered and/or investing in liming and its through incorporation.

Despite the limitation of the acidity, there was still a significant response to N. There is also strong evidence to suggest that lower populations can compensate where adequate nutrition is supplied to perform as well as higher populations. The results would also tend to suggest that in this environment, timing of application was not as important as getting the fertilizer on.

[1] Canola Growth and Development, PROCROP, NSW DPI, 2011

BOX 1 - CASE STUDY:

Soil testing and looking for acid bands.

At this site, soil samples were collected manually (with a hand auger). The sampler tested pH using a field test kit and detected a possible acid band. Subsequently samples were sent for analysis from the standard 0-10 cm and 10-60 cm soil depths. Results did not reflect the 'acid throttle' detected with the field test kit (see the Table below).

As the season progressed (2016 was a very wet winter with favourable growth conditions for canola), it became obvious that the crop was not performing to expectations. It was decided to retest the site to see if "acid throttle" may have been the cause. Targeted testing at 5 cm increments down the soil profile confirmed the field test and indicated that the site had the potential to severely restrict growth and subsequent yield of canola.

Depth (cm from surface)	Bulked testing		Segmented testing	
	pH_{Ca}	Aluminium saturation %	pH_{Ca}	Aluminium saturation %
0	5.6	<1		
5			4.9	4.8
10				
15		Tested only for nitrates and sulfur	4.2	38
25			4.7	<1
35			5.6	<1
50			6.2	<1
60				

Conclusion

Results of the trial suggest further testing is required.

- Canola can compensate for lower than desired plant establishment where adequate nutrition is available.
- Where populations are more marginal it is recommended to apply budding stage or earlier.
- Canola is highly N responsive. The important message is "get it on", particularly where chronic deficiency is apparent.
- In a wet year with a soft finish, late N applications resulted in higher yields. If conditions are wet, later applications, or multiple lower rate applications may drive higher efficiencies.

Acknowledgements

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