GOA Trial Site Report

Canola nutrition – Optimising canola phosphorus nutrition under high nitrogen strategies

Trial Code:	GONU00717-3
Year:	Autumn 2017
Location:	'Hillingrove' Jemalong
Collaborators:	David Pengilly

Keywords

GONU00717-4, canola nutrition, nitrogen, phosphorous, Jemalong

Editor's Note

This trial evolved from the GOA's nutrition research where canola has been found to be highly responsive to nitrogen (N). It was designed to test whether phosphorous (P) may become limiting when using higher rates of nitrogen to push yield potential. The 2017 season was a low rainfall/drought year and therefore, did not meet the objective of pushing canola yield potential.

Take home messages

Canola is highly responsive to P, and low P levels may be more limiting to yield than low N.

Soil testing is a useful tool to test for limiting nutrients like P and N.

Yield response tends to be higher for the nutrient with lower availability in the profile. In a season where yields are limiting, investment in the most limiting nutrient may give the better return on investment.

Soil constraints (such as an acid throttle) can complicate nutrient management.

Background

Average farm area planted to canola in Central NSW has roughly doubled over the past 10 years[1], as its profitability has improved (improved prices and bonuses for specific varieties) and also because of its good fit as a cereal break crop.

Because there is a greater tendency to move toward continuous cropping, reliance on inherent soil fertility to drive higher yields is potentially becoming limiting. Trails assessing canola P response have been variable. For example, 2014 canola VSAP trails canola at showed responses to added P, while no response occurred at Trangie[2] in the same year. GOA (and other) research has shown that canola is highly responsive to added nitrogen.

[1] AGSURF Data (apps.daff.gov.au/AGSURF/agsurf.asp

[2] grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2014/02/canola-agronomy-research-in-central-west-nsw

Therefore, it seems logical that increasing canola productivity through the addition of one nutrient, would also increase the demand for other likely deficient nutrients. This trial seeks to determine if there is such a relationship between N and P and the implications for canola management.

Aim

- To determine if increasing N rates in canola require corresponding increases in P rates.

Methods

A matrix of 4 rates for each nutrient was devised and paired with each other.

1. Nitrogen at four rates (0, 50, 100, and 200 kg N/ha) as urea
2. Phosphorous at four rates (0, 15, 30, 45 kg P/ha) as triphos

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 statistically different unless otherwise stated.

Table 1. Trial site details

Trial establishment date:	Autumn 2017	**Soil type:**	Sandy Clay Loam
Crop:	Canola	**Variety:**	Hyola 474CL
Sowing date:	29/05/2017	**Harvest date:**	21/12/2017
Planting method:	Knife point press wheels	**Row spacing (cm):**	23
Planting rate (kg/ha):	3.6	**Nitrogen**	0-10 cm: ~34 kg/ha 10-60 cm: ~55 kg/ha
Previous crop:	Wheat		
Pre-sowing stubble management:	Burnt	**Colwell P**	0-10 cm: 19 ppm 10-30 cm: <5 ppm

Results

Plant count

Plant establishment was assessed by plant counts. There was no significant impact as a result of any of the treatments.

Yields

Yield increased only with P (regardless of N rate) up to a rate of 30 kg/ha (**Figure 1**). The was no N response.

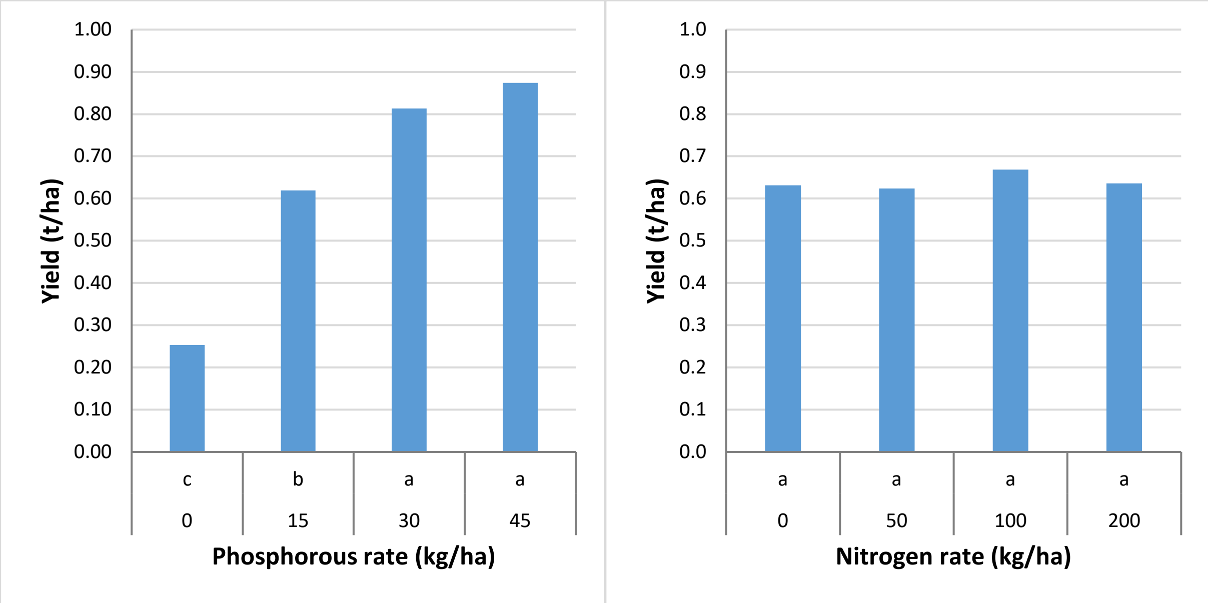

Figure 1. Canola yield (t/ha) response to increasing rates of N and P fertilisers (regardless of rate of the other nutrient).

There was no interaction between N and P rates on yields (**Figure 2**).

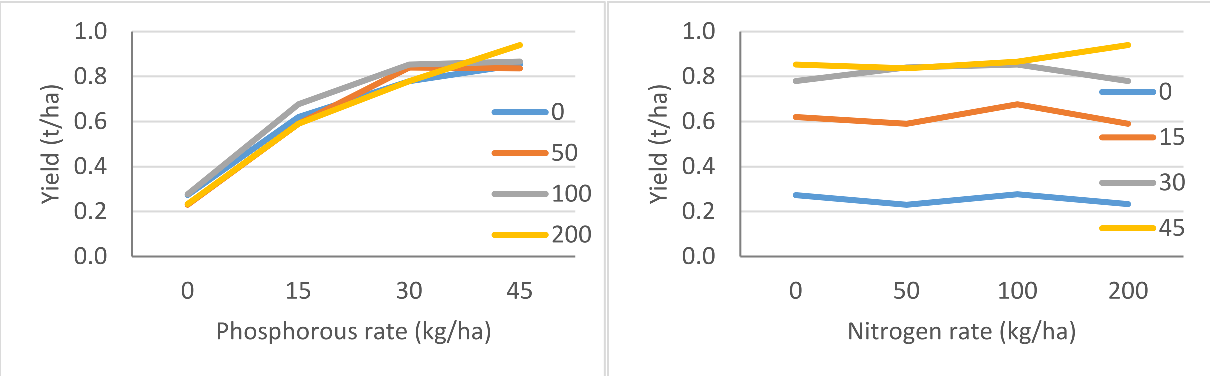

Figure 2. Canola yield (t/ha) response to increasing rates of N and P fertilisers.

<u>Oil</u>

Application of P fertiliser increased oil percentage (**Figure 3**) compared to no P, however there was no N response.

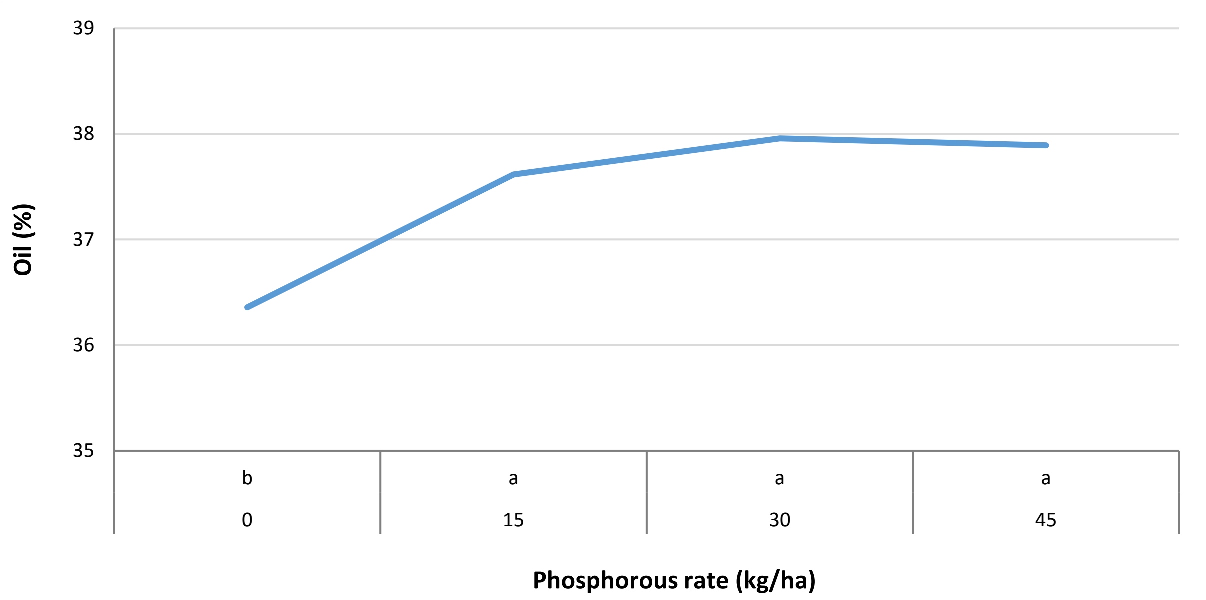

Figure 3. Canola oil (%) response interaction to increasing rates of Phosphorous.

Discussion

The trial was planted very late (end of May), 2 weeks outside of an optimal sowing window for the Jemalong area. It is likely that late sowing limited yield potential.

The site had low starting levels of P, particularly in the 0-10 cm layer resulting in a large yield response to P. The addition of 30 kg/ha P increased yields by close to 0.5 t/ha, a highly economic response. Soil testing indicated that the starting soil available N levels were adequate to support yields achieved in this trial in a dry season and may explain the lack of N response.

Yield results highlight the importance of P fertiliser for canola production.

Conclusion

Canola is responsive to applied P.

P deficiency can severely limit canola yields and is possibly more limiting than nitrogen.

Soil testing is a useful tool to test for limiting nutrients like P and N.

Acknowledgements

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Appendix

Table 2. Impact of plant populations, P rates and P placement on yield and % oil of canola. Results followed by the same letter are not significantly different.

P-rate (kg/ha)	N rate	Yield (t/ha)		Oil (%)	
0	0	0.19	ns	39.4	ns
0	50	0.12	ns	39.2	ns
0	100	0.16	ns	38.8	ns
0	200	0.18	ns	39.0	ns
15	0	0.19	ns	39.5	ns
15	50	0.15	ns	38.6	ns
15	100	0.28	ns	39.1	ns
15	200	0.27	ns	38.2	ns
30	0	0.22	ns	40.1	ns
30	50	0.33	ns	39.1	ns
30	100	0.23	ns	38.6	ns
30	200	0.30	ns	38.3	ns
45	0	0.25	ns	39.4	ns
45	50	0.37	ns	38.5	ns
45	100	0.27	ns	39.5	ns
45	200	0.21	ns	38.3	ns
	lsd	ns			