# GOA Trial Site Report

## Canola nutrition – Optimising canola phosphorus nutrition under high nitrogen strategies

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|---|---|
| **Trial Code:** | GONU00717-3 |
| **Year:** | Autumn 2017 |
| **Location:** | Benolong, NSW |
| **Collaborators:** | Brett Robinson |


### Keywords

GONU00717-3, Canola nutrition, nitrogen, phosphorous, Benolong


### Editor's Note

This trial evolved from 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 be more limiting when using higher nitrogen rates to lift yield potential. The 2017 season was a low/drought rainfall year and therefore, did not meet the objective of pushing canola yield potential. Some plots did not have enough grain for testing, and while the analysis was completed data is not as robust as other trials with a full dataset.

### Take home messages

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

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

Prioritize investments in fertilizer to the most limiting soil nutrient, in this case phosphorus.

### 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.

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

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[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

Increasing productivity of canola through addition of one nutrient, would also likely increase demand for other 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 Nitrogen rates in canola require corresponding increases in phosphorous.

## Methods

A matrix of 4 rates for each nutrient (N and P) 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. Results were analysed by ANOVA and results compared using an 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

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|---|---|---|---|
| **Trial Establishment Date** | Autumn 2017 | **Seeding rate** | 2.5 kg/ha |
| **Crop and Variety** | Canola – 44Y89 | **Harvest Date** | 23/11/2017 |
| **Sowing date** | 02/05/2017 | **Row Spacing** | 27.5 cm |
| **Sowing equipment** | Double Boot Tyne | **Soil type** | Sandy Clay Loam |
| **Site nutrition: Nitrogen** | 0-10 cm: ~17 kg/ha<br>10-60 cm: ~110 kg/ha | **Pre-sowing stubble Management** | Burnt stubble |
| **Colwell P** | 0-10 cm: <5 ppm<br>10-30 cm: 9 ppm | **Previous Crop** | Wheat |

## Results

<u>Plant count</u>

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

<u>Yields</u>

Yield increased only with the addition of P (regardless of rate of nitrogen) up to a rate of 30 kg/ha (**Figure 2**). The was no N response.

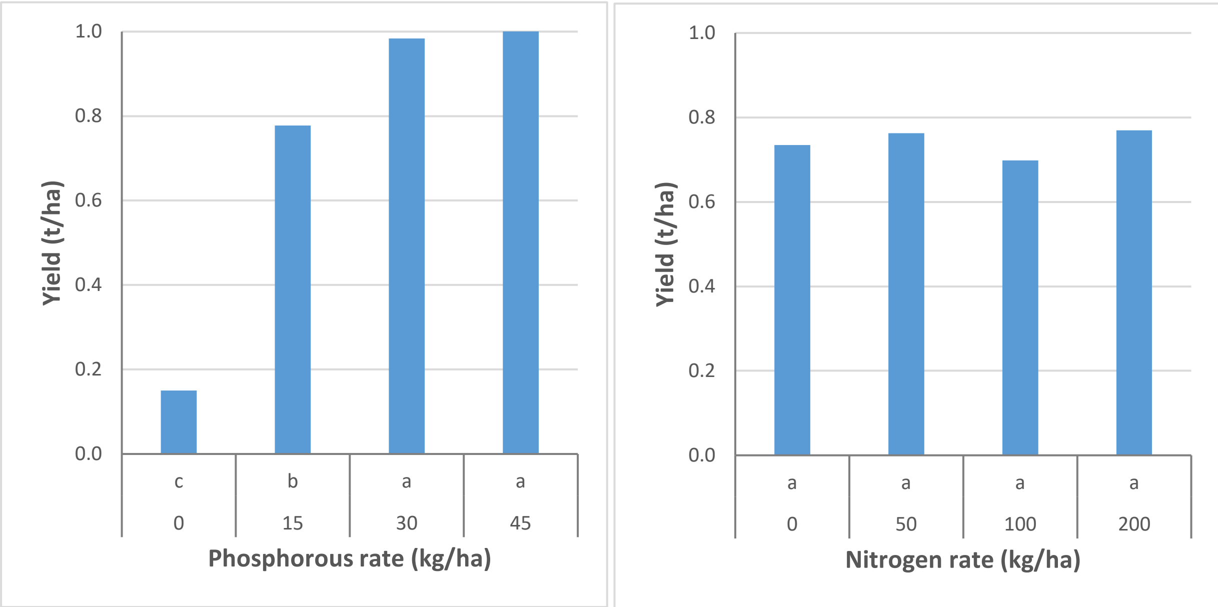


**Figure 1.** Canola yield (t/ha) response to increasing rates of nitrogen and phosphorous fertilisers (regardless of the rate of the other nutrient). Treatments with the same letter are not significantly different.

There was no significant yield interaction between N and P rates. P appeared to be more limiting than N. For example in **Figure 3** (below) all P treatments tended to have a similar yield response regardless of the N rate, and visa versa. The Yield response to added P was in the order of 800 kg/ha.

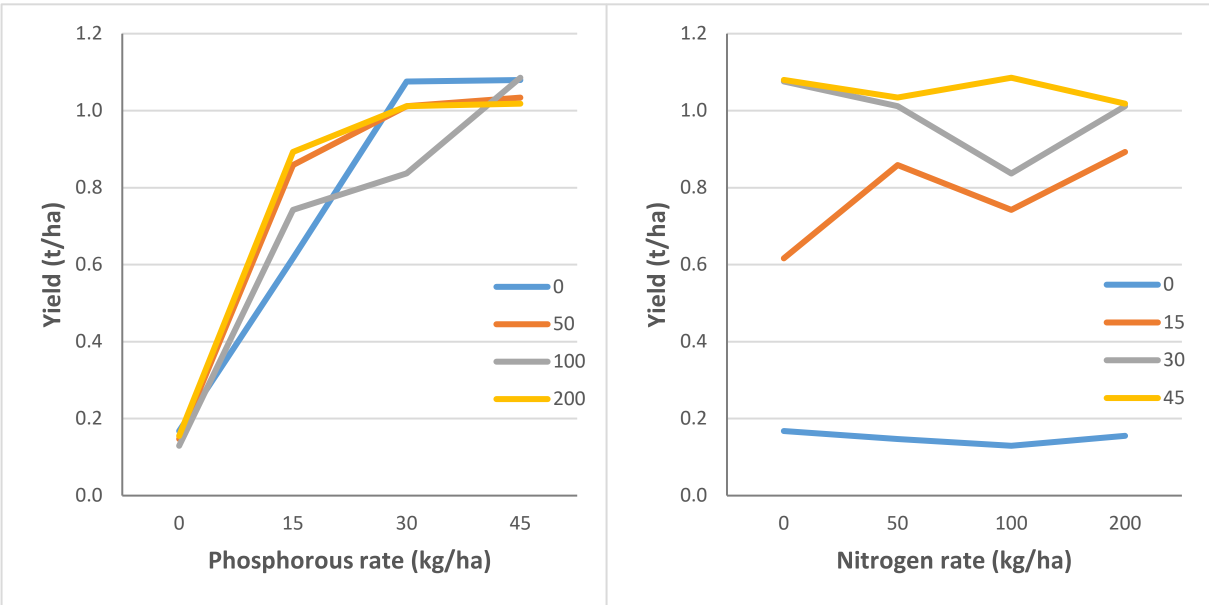


**Figure 2.** Canola yield (t/ha) response interaction to increasing rates of nitrogen and phosphorous fertilisers.

Oil

Six plots had insufficient harvested grain to analyse for quality, five of these were from the 0 P treatments. With this reduction in the data set, there is not enough confidence in the analysis to draw conclusions regarding the treatment influence on oil content.

## Discussion

Because of dry/drought 2017 seasonal conditions the trial did not meet the objective of determining if phosphorous may become limiting where yield potential is being pushed.

Yields: The site has a history of low P, confirmed by soil testing. There was a large yield penalty where no P was applied. There was no response to N. Soil testing revealed moderate levels of residual N, particularly in the 10-30 cm layer (approx. 75 kg/ha) where arguably there was enough to supply moderate crop requirements in a dry season such as 2017.

Yield results highlight the need for P fertiliser. Although soil N levels were adequate, the crop was not able to capitalise on it without P. This trial highlights the need to address the most limiting nutrient as a priority.

## Conclusion

Confirmed that canola is responsive to 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 N and P.

## Acknowledgements

Research undertaken as part of this project is made possible by the significant contributions of growers through both trial cooperation and GRDC. The authors would like to thank them for their continued support. Special thanks to Brett Robinson from Geurie who hosted this trial.

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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 | 0.17 | d | 41.3 | * |
| **0** | 50 | 0.15 | d | 41.5 | |
| **0** | 100 | 0.13 | d | 41.1 | |
| **0** | 200 | 0.16 | d | 41.6 | |
| **15** | 0 | 0.62 | c | 43.2 | |
| **15** | 50 | 0.86 | abc | 42.3 | |
| **15** | 100 | 0.74 | c | 42.7 | |
| **15** | 200 | 0.89 | abc | 42.5 | |
| **30** | 0 | 1.08 | ab | 42.1 | |
| **30** | 50 | 1.01 | ab | 41.9 | |
| **30** | 100 | 0.84 | bc | 41.5 | |
| **30** | 200 | 1.01 | ab | 42.0 | |
| **45** | 0 | 1.08 | ab | 41.5 | |
| **45** | 50 | 1.03 | ab | 41.8 | |
| **45** | 100 | 1.09 | a | 41.6 | |
| **45** | 200 | 1.02 | ab | 40.7 | |
| | lsd | 0.12 | | | |

# incomplete grain quality data set, these are the average values, however it is not recommended that conclusions be drawn from this data set.