GOA Trial Site Report

Can splitting phosphorous application reduce establishment losses and maintain yield in canola?

Trial code:	**GANU02521-1**
Season/year:	Winter 2021
Location:	'Gwandallan', Peak Hill
Collaborators:	Paul Bell

Keywords

GANU025, canola, phosphorous, split application, establishment

Key findings

- Placing fertiliser P away from the seed can reduce the negative effects it has on germination,
- The lowest plant population was where the highest rate of P was placed with the seed,
- Yield and oil responses to P application may not always be observed in paddocks with sufficient Colwell P.

Background

Grain Orana Alliance (GOA) has been researching options to reduce the negative effects of starter fertiliser on canola establishment over 22 trials starting in 2015.

Findings include

- Canola establishment can be affected by rates as low as 10 kg/ha phosphorus (P) equivalent to ~50 kg MAP (mono ammonium phosphate).
- Placement of fertiliser under the seed (deep banding) will improve establishment, except in some cases at very high P rates (>40 kg p/ha).
- Placement of P on the soil surface, either prior to planting or topdressed post planting eliminated damage to the crop and, in most trials, did not result in yield reduction.
- Yield differences were less in drier seasons, probably due to less root activity in the soil surface.

Further work needs to be undertaken into alternative application methods for P, including that of 'split applications', where a smaller portion of the starter fertiliser is placed with the seed with the remainder applied on the soil surface.

GOA is proposing to investigate various split P application options including timing, rates and placement options.

Aims

Investigate whether splitting the application of P can minimise establishment damage while maintain yields, particularly in dry years.

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Methods

Trial Details						
Trial established	Winter 2021					
Sowing configuration	250 mm row spacing, knife point press wheel					
Paddock history	2020 wheat	**Soil test**	Nitrogen (N) (kg/ha)	Colwell P (ppm)	Sulfur (ppm)	pH (1:5 KCl_2)
	2019 barley	0-10cm	32	43	2	4.7
		10-120cm	62			
Key dates	Sowing	Harvest	Comment: marginal establishment			
	21/4/2021	17/11/2021				

Treatments: All P applied as MAP

Placement	**Description**
With seed	Traditional P application method, banded with the seed at sowing
Immediately before sowing (IBS)	Broadcast onto the soil surface prior to sowing and incorporated by the seeder
Topdressed	Spread on the soil surface post planting with no incorporation
Split - high	Base rate of 10 kg/ha P with seed, the balance IBS
Split - low	Base rate of 5 kg/ha P with seed, balance IBS
Control	No P applied.

Rates

Rates P (kg/ha)	0	5	10	15	20	30	Treatments with P rates lower than 30 had the N component of the MAP balanced with urea to ensure all plots had the same N. Control plots – Balanced N applied by IBS. Split treatments – Balanced N also split (with and IBS). Remaining treatments – Balanced N applied with P
MAP (kg/ha)	0	23	46	68	91	137	

Trial design	Type: small plot (~12m x 2m) Design: split randomized block Replication: 4	Analysis ASREML – randomized complete block. Tested to a 95% confidence interval
Observations and measurements	• Plant establishment • Vegetation index (2) NDVI • Grain yield and quality	

Table 1: Site rainfall and long term average (LTA).

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	TOTAL
2021[1]	64	91	145	1	17	77	65	49	61	29	160	38	796
LTA	59	50	52	43	44	43	45	43	40	48	49	51	567

[1] BOM SILO Data Drill for Lat, Long: -32.65 147.90 (DECIMAL DEGREES), 32 39'S 147 54'E

Results

Plant Establishment:

The lowest plant population was <4 plants/m2 where the highest rate of P was placed with the seed. The highest population was greater than 12 plants/m2 and was where 5 kg P/ha was Topdressed. Placement of P with the seed tended to result in lower populations for all but the lowest rate of P (

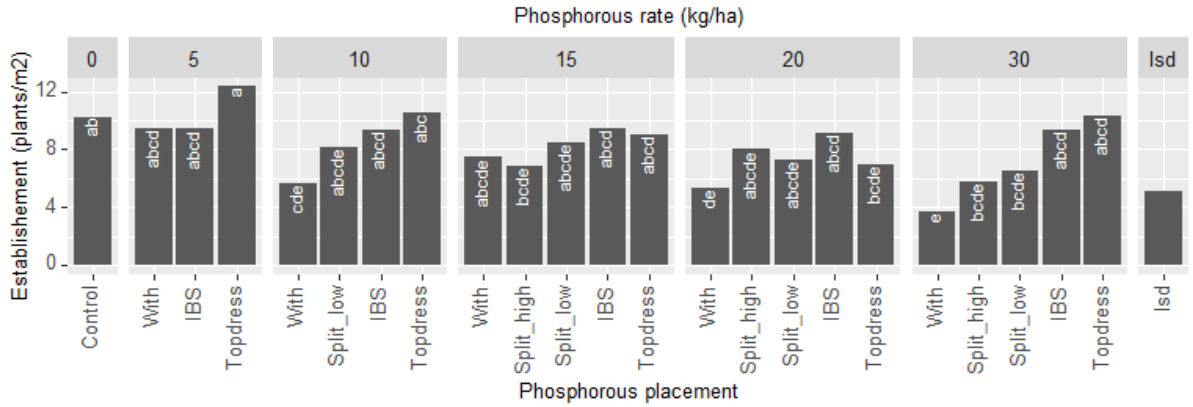

Figure 1).

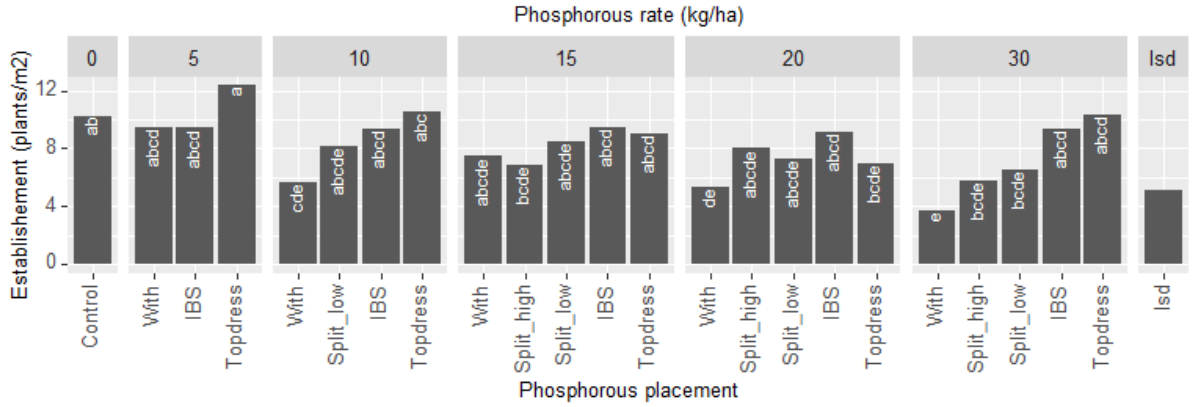

Figure 1. Canola establishment in response to varying rates and placement of P. Treatments with the same letter are not significantly different.

Yield

Little or no yield response to added P was observed in this trial.

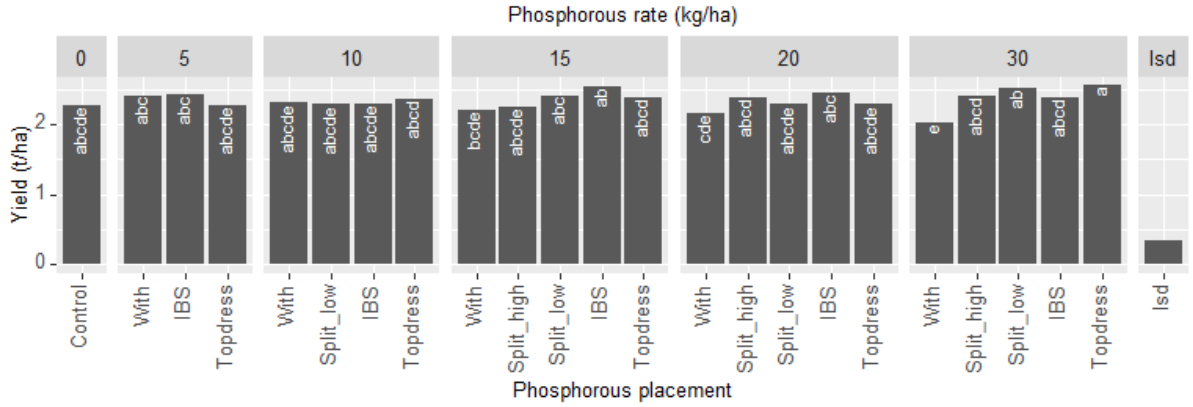

Figure 2. Canola yields in response to varying rates and placement of P. Treatments with the same letter are not significantly different.

Oil

Little or no oil response to P was observed in this trial.

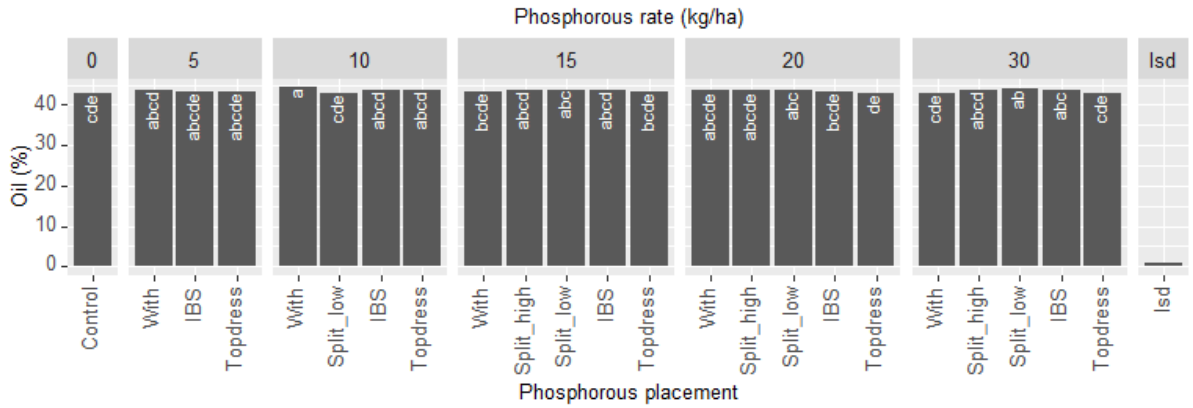

Figure 3. Canola oil response to varying rates and placement of P. Treatments with the same letter are not significantly different.

Discussion

This trial was sown slightly deeper seeking moisture. This plus a significant rainfall event soon after sowing limited germination to an average of 8.7 plants/m^2. Germination where P was placed with the seed tended to be supressed, particularly at the higher rates, supporting placement of starter fertiliser away from the seed.

The suppression of germination in the 'with' treatment at the highest rate of P was also reflected in the final yields. For the remaining treatments there was very little difference, suggesting that this was a non-responsive P site.

The results from this site support the placement of starter fertiliser away from the seed to optimise plant establishment.

- A lower amount of P with the seed should maximise emergence and allow for more efficient use of sowing equipment (less refill time).
- The surface applied fertiliser could possibly be delayed until plants have established, or seasonal conditions become more favourable.
- This tool may be of use to growers who don't have the option to deep band.

Conclusion

Placement of P away from the seed at higher starter fertiliser rates can reduce negative impacts on germination. Splitting the application to apply a smaller portion of the fertiliser may also reduce the impact.

Acknowledgements

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DISCLAIMER — TECHNICAL

Appendix

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Phosphorous Rate (kg/ha)	Placement	Plant establishment (plants/m2)	Yield (t/ha)	Oil (%)
0	Control	10.3ab	2.3abcde	43.0cde
5	IBS	9.4abcd	2.4abc	43.4abcde
	Topdress	12.3a	2.3abcde	43.4abcde
	With	9.5abcd	2.4abc	43.6abcd
10	IBS	9.3abcd	2.3abcde	43.7abcd
	Split_low	8.2abcde	2.3abcde	43.0cde
	Topdress	10.5abc	2.4abcd	43.7abcd
	With	5.7cde	2.3abcde	44.3a
15	IBS	9.5abcd	2.5ab	43.6abcd
	Split_high	6.8bcde	2.3abcde	43.6abcd
	Split_low	8.5abcde	2.4abc	43.8abc
	Topdress	9.0abcd	2.4abcd	43.3bcde
	With	7.5abcde	2.2bcde	43.3bcde
20	IBS	9.2abcd	2.4abc	43.3bcde
	Split_high	8.0abcde	2.4abcd	43.5abcde
	Split_low	7.3abcde	2.3abcde	43.8abc
	Topdress	7.0bcde	2.3abcde	42.8de
	With	5.3de	2.2cde	43.5abcde
30	IBS	9.3abcd	2.4abcd	43.8abc
	Split_high	5.8bcde	2.4abcd	43.6abcd
	Split_low	6.5bcde	2.5ab	44.0ab
	Topdress	10.3abcd	2.6a	43.0cde
	With	3.7e	2.0e	43.0cde
lsd	lsd	5.1	0.3	0.9