GOA Trial Site Report

Investigation of the effect of P rate on late sown canola, Warren, 2021.

Trial code:	GAMA010211
Season/year:	Winter 2021
Location:	Jedburgh, Warren
Trial partners:	Peter Brigden and Gus O'Brien

Keywords

GAMA010, canola, late sowing, variety, population, TT, triazine tolerant, Clearfield, conventional, phosphorous rate

Key findings

- Choosing a high yielding variety, targeting higher plant populations and ensuring adequate phosphorus (P) levels improves the probability of achieving a profitable late sown canola crop.
- Sowing in the recommended window when possible is better than sowing late.
- Increasing target populations from 10 to 30 plants/m^2 increased yields, regardless of variety or time of sowing.
- There were considerable yield differences between varieties, hybrids outyielded conventional varieties.

Background

Ideal sowing windows for canola are well established and there has been a recent trend towards sowing early, as recent Grains Research and Development Corporation (GRDC) funded trials have shown yield improvements. However, delayed seasonal breaks (after the 10 May) are often quite common in Central West NSW, causing many growers to either reducing canola areas or removing the crop from the rotation with concerns over low profitability and possible crop failure.

The removal of canola from the rotation has many flow-on issues including disease and weed management as well as increased income risk through loss of commodity diversification. Clearly there are advantages to maintaining canola in the rotation with later autumn breaks but are there agronomic levers that can be manipulated to optimise the performance of late sown canola.

Trail work by Grain Orana Alliance (GOA) in the drought conditions of 2018 showed that hybrid Clearfield lines substantially out yielded similar maturity open pollinated TT lines when sown late. This may be due to the enhanced early growth rates and robustness of the hybrid lines, enabling biomass accumulation with minimal rainfall compared to the TT lines which could not. This work also demonstrated that hybrid canola was as good, as or in many cases, a better option for late sowing than pulses or cereals.

This work demonstrated that further investigation of varietal choice, both maturity and crop type (hybrid versus open pollinated) might give growers more confidence to keep canola in the rotations.

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Having robust plant populations is likely to become more important as sowing becomes later, as there is less time for compensatory growth and is worth further study.

This trial investigates changing variety, both maturity length and production systems, and the interaction with plant population to improve performance in late sown canola.

Aim

To compare crop performance of a range of canola varieties with differing maturities and or production systems, sown with various rates of P at low, medium and high plant populations within the optimal sowing window with the same treatments sown later, outside the optimal window.

Methods

Trial details							
Establishment date	Autumn 2021						
Sowing configuration	275 mm row spacing, knife point press wheel 150 kg/ha urea. P as treatment (see below), applied immediately before sowing (IBS).						
Paddock history	2020 wheat		Soil test	Nitrogen (N) (kg/ha)	Colwell P (ppm)	Sulfur (ppm)	
	2019 (drought)		0-10cm	36	33	3	
	2018 (drought)		10-90cm	120	-	7	
Sowing timings	Time of sowing (TOS)		Harvest	Targeting TOS 2 to be >3 weeks outside the latest timing, as recommended by the NSW DPI Winter crop variety sowing guide			
	TOS 1	27/4/2021	9/11/2021				
	TOS 2	25/5/2021	18/11/2021				
Treatments							
Phosphorous: P @ 0, 5, 10, 15, 20, 25 and 30 kg/ha applied to the medium population of Diamond							
Varieties and target plant population (plant/m^2): varieties common to the region, suiting later sowing	**Variety**	43Y92 CL	45Y93 CL	ATR Stingray®	Diamond	Hyola® 350 TT	HyTTec® Trophy
	Type	Imidazolinone tolerant hybrid		Triazine tolerant, open pollinated	Conventional hybrid	Triazine tolerant, hybrid	
	Phenology	Mid-fast	Mid-slow	Fast	Fast	Fast	Mid-fast
	Maturity	Early	Mid	Early	Early	Early	Early - early Mid
	Target population (plants/m2)	**Sowing rate (kg/ha)**					
	10	1.2	1.0	0.5	0.8	1.2	1.0
	30	3.5	3.0	1.6	2.5	3.5	2.9
	60	6.9	6.1	3.1	5.0	7.0	5.8
Trial design	Type: small plot (~12m x 2m) Design: split randomized block Replication: 4		Analysis ASREML – randomized split block with 3 factors. Tested to a 95% confidence interval				

Observations and measurements	• Soil testing • Plant establishment • Vegetation index (2) NDVI • Grain yield and quality

The planting date represented by the red bars on **Error! Reference source not found.** show that TOS 1 is towards the end of the ideal window for most varieties. While TOS2 is >3 weeks later than the ideal sowing window for most varieties and well outside district practice in the central west of NSW.

Table 1: Warren rainfall for 2021 and long-term average (LTA)[1].

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	**TOTAL**
2021	32	81	254	0	30	58	42	28	53	20	92	52	**742**
LTA	49	46	42	35	36	35	30	30	30	35	36	44	448

Results

Plant establishment

Plant establishments were lower for TOS1 than for TOS2. Satisfactory establishment was achieved for all varieties, with differences between the populations within a variety and TOS, with the exceptions of 45Y93CL where the low and medium populations were similar and for the 43Y92CL where the medium and high populations were similar.

Yield

There was a yield response to all the factors included in this trial (**Figure 1**)

- Sowing later (TOS2) had a lower yield than TOS1.
- Increasing target populations from low to medium (10 to 30 plants/m^2) increased yields, regardless of variety or TOS
- Highest yields were achieved at the medium population
  The high population had better yields than the low population
- Diamond had the highest yield (over 3 t/ha) while Stingray® had the lowest (less than 2.5 t/ha).
- There was no P response.

[1] Queensland Government. (2021). SILO Gridded Climate Data. Retrieved 2025 from https://www.longpaddock.qld.gov.au/silo/

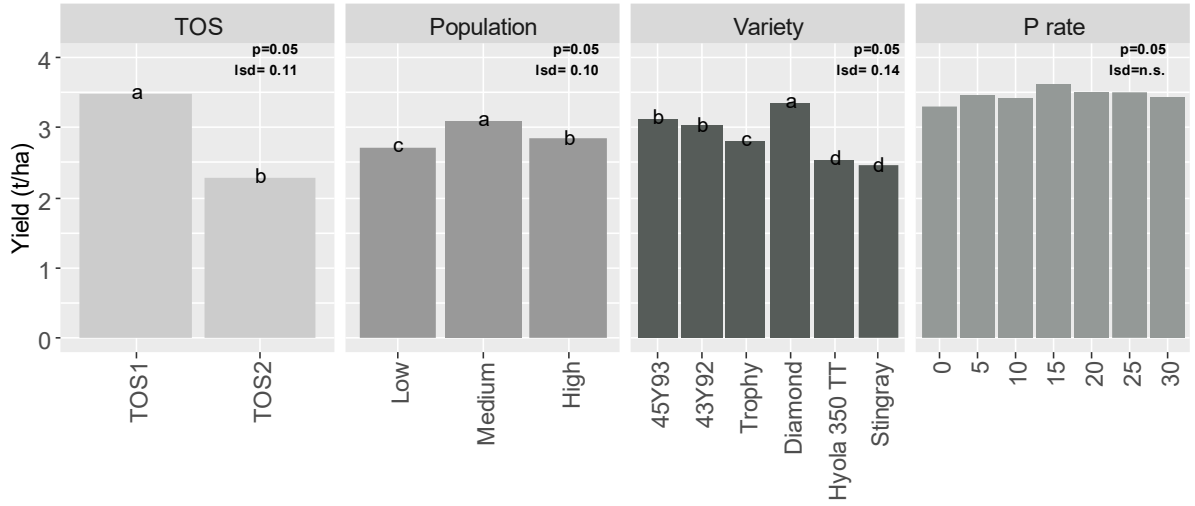

Figure 1. Canola yields as influenced by TOS, plant populations, variety and P rate. Results with the same letter within each factor are not significantly different.

YIELD AND INTERACTIONS BETWEEN POPULATION, VARIETY, TOS AND P RATE

Population and variety (Figure 2)

- For all varieties the lowest yield was at the low population, generally yields were highest at the medium population, though 45Y93CL, Diamond and ATR Stingray® yields were similar at the high population.

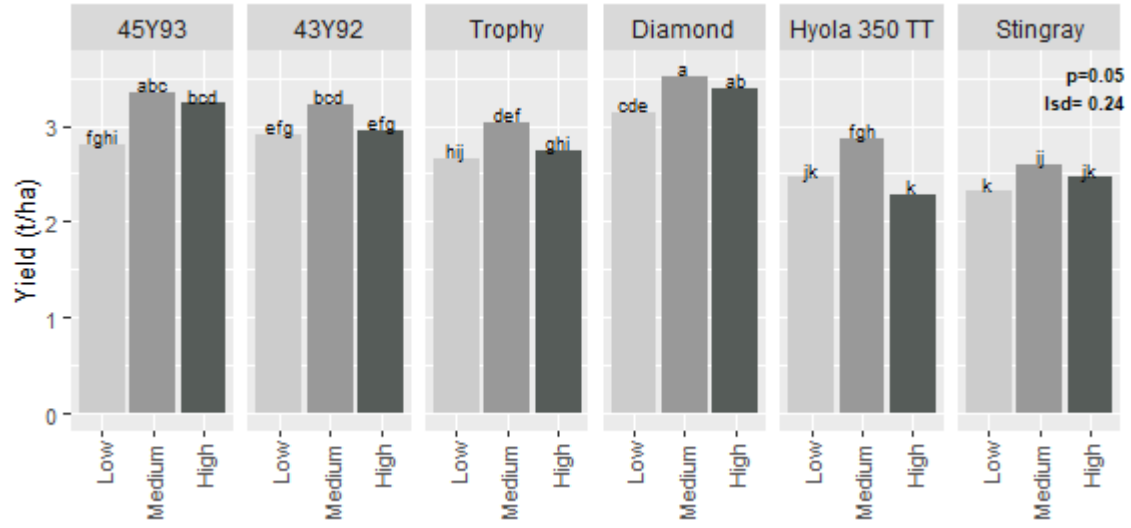

Figure 2. Canola yields as influenced by variety and population. Results with the same letter are not significantly different.

Timing and variety (Figure 3)

- At TOS 1: 45Y93CL, 43Y92CL and Diamond all had the highest yields and were not different to each other. Hyola® 350TT had the lowest yield.
- At TOS 2:

- Diamond had the highest yield, followed by 45Y93CL.
- 43Y92CL, HyTTec® Trophy and Hyola® 350TT were not different to each other
- ATR Stingray® had the lowest yield.

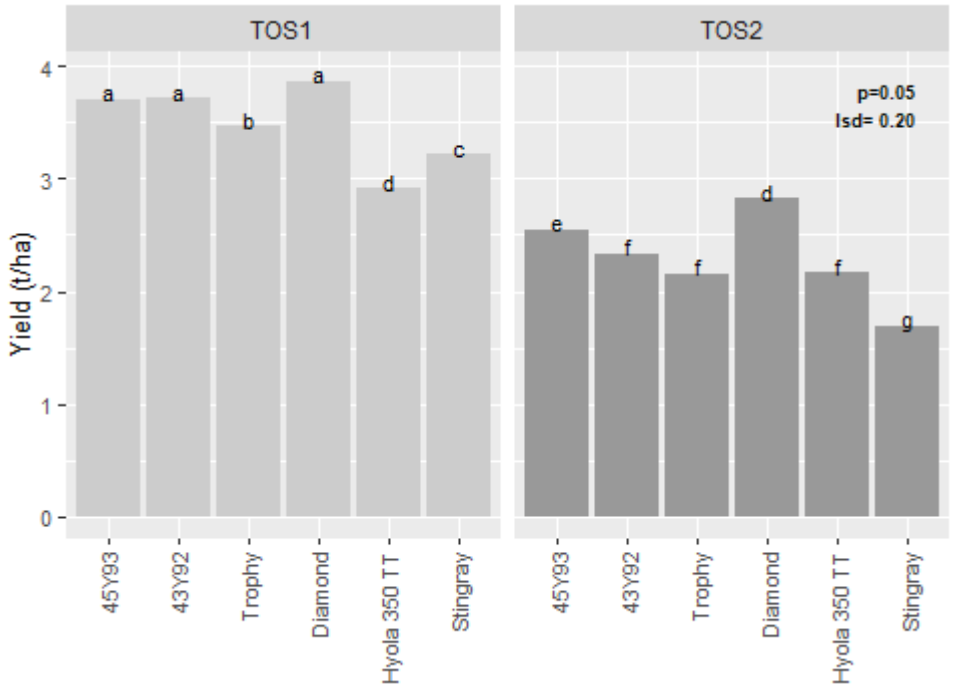

Figure 3. Canola yields as influenced by timing and variety. Results with the same letter are not significantly different.

Timing and population

- At both TOS's the medium population had the highest yield.
- The high population was not different to the low population at TOS2

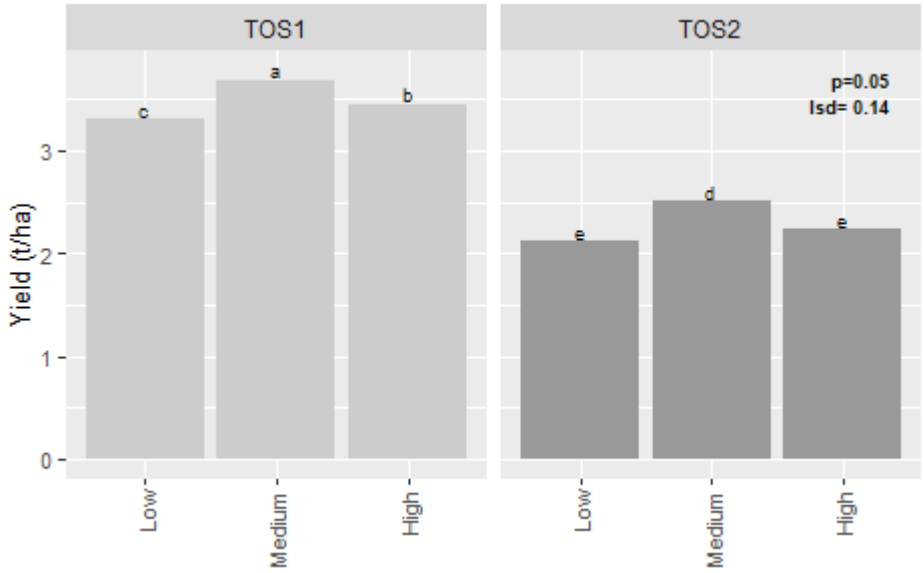

Figure 4. Canola yields as influenced by timing and population. Results with the same letter within each facet are not significantly different.

P rate and timing (Figure 5)

- There was little response to applied P.

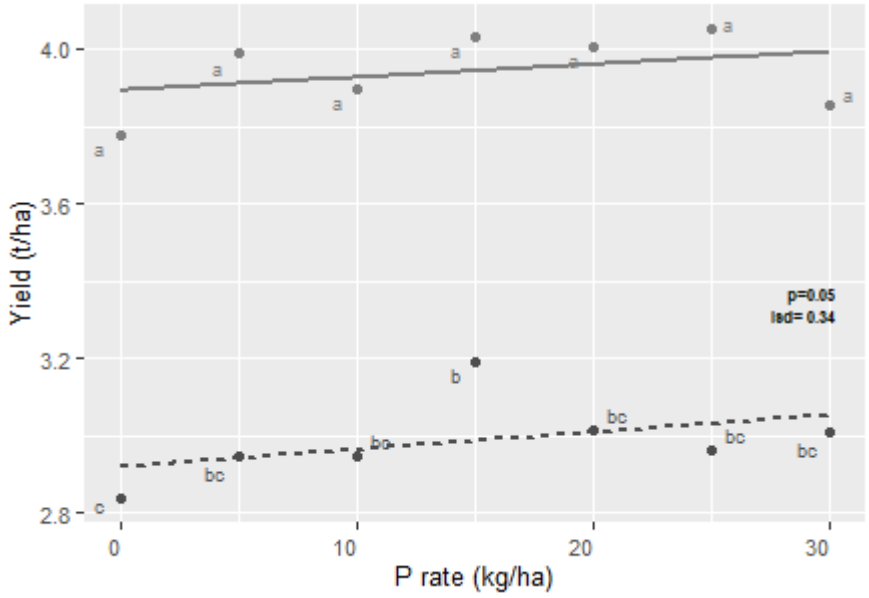

Figure 5. Canola yields as influenced by TOS and P rate. Results with the same letter within each facet are not significantly different.

Discussion

2021 was an above average rainfall year, which proved to be good for canola production at Warren (Table 1), although sowing conditions at the TOS 1 were drying off and some varieties we struggled to achieve the desired plant populations.

As expected, TOS had the greatest impact on yields, with the early timing (TOS1) outyielding the later sown crop (TOS2) by more than 1 t/ha. What was not very well known was the influence population might have on TOS2. It was considered that a high population may be more important as the time for compensatory growth is reduced. In this case having a medium population was the optimal sowing rate at both TOS's. The earlier, TOS1 had a much lower establishment due the dry sowing conditions than TOS2, despite this, yields were still optimised at the medium population, and exceeded the TOS2 yields, showing the ability of canola to compensate if time allows. At both timings a target population of 10 plants/m^2 was too low for optimal yield. There was not much benefit from increasing the population above 30 plants/m^2.

There were big varietal responses in yield. Diamond performed very well and when it was planted outside its recommended window, yielding close to 3 t/ha at the medium sowing rate (target of 30 plants/m^2). One reason that growers lack confidence to back late sowing of canola is that experiences have been variable, possibly due to the use of open pollenated TT varieties, that have a known low vigour (10-15% lower yields than conventional varieties[2]).

There was a relatively mild and wet spring finish to the season. This may have suited some of the longer varieties and in a tighter finish, the quicker varieties such as Stingray may have performed better. At least one study concluded that yield is very closely correlated to biomass at nearly all stages of crop growth[3]. Field observations showed that the higher yielding varieties such as Diamond had much higher early vegetation compared to Stingray at the target population of 30 plants/m^2, this trend was also reflected in yield. This might suggest that varieties that accumulate the early biomass have the higher yield potential even under tough finishes.

The use of better genetics and ensuring adequate plant populations could remove a much of the risk associated with late sown canola while.

Conclusion

Canola can be maintained in the rotation in late sowing scenarios. Growers' confidence can be increased by sowing varieties with higher yield potential and ensuring that populations are greater than 10 plants/m^2.

Acknowledgements

The research undertaken as part of this project is made possible by the significant contributions of growers through both trial cooperation and the support of the GRDC, the authors would like to thank them for their continued support. Special thanks go out to Gus O'Brien and family from Warren who hosted this trial.

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[2] GrowNote-Canola-North-4-Physiology.pdf
https://grdc.com.au/__data/assets/pdf_file/0031/369274/GrowNote-Canola-North-4-Physiology.pdf

[3] Zang et al 2016 CSIRO PUBLISHING | Crop and Pasture Science

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Appendix: Results table

TOS	Variety	Population	P rate (kg/ha)	Plant establishment (plants/m²)		Yield (t/ha)		Oil (%)	
TOS1	43Y92	High	20	30.7	klm	3.67	bcdefgh	43.5	klmnopq
TOS1	43Y92	Low	20	9.5	rst	3.53	efghij	44.3	cdefghijk
TOS1	43Y92	Medium	20	24.0	mnopq	3.93	abc	43.9	ghijklmn
TOS1	45Y93	High	20	34.3	jkl	3.79	abcdef	43.7	ijklmno
TOS1	45Y93	Low	20	12.3	rst	3.44	ghijk	44.1	efghijklm
TOS1	45Y93	Medium	20	19.0	nopqr	3.89	abcd	44.0	fghijklmn
TOS1	Diamond	High	20	44.3	ghi	4.02	a	44.5	cdefgh
TOS1	Diamond	Low	20	10.5	rst	3.57	defghi	45.0	abcd
TOS1	Diamond	Medium	20	26.3	lmno	4.00	ab	45.5	a
TOS1	Hyola 350 TT	High	20	56.5	ef	2.55	qrst	44.3	cdefghij
TOS1	Hyola 350 TT	Low	20	11.5	rst	2.84	nopq	44.7	abcdefg
TOS1	Hyola 350 TT	Medium	20	24.3	mnop	3.35	hijkl	44.4	cdefghi
TOS1	Stingray	High	20	32.3	klm	3.22	jklm	44.5	cdefghi
TOS1	Stingray	Low	20	5.8	t	3.15	klmn	44.2	defghijk
TOS1	Stingray	Medium	20	15.8	pqrs	3.28	ijklm	44.6	bcdefg
TOS1	Trophy	High	20	39.3	ijk	3.46	fghijk	44.5	cdefghi
TOS1	Trophy	Low	20	8.5	st	3.29	ijklm	44.1	efghijklm
TOS1	Trophy	Medium	20	25.8	lmno	3.66	cdefgh	44.0	ghijklmn
TOS2	43Y92	High	20	71.7	cd	2.23	tuvwx	43.3	mnopqr
TOS2	43Y92	Low	20	14.0	qrst	2.27	tuvw	42.3	tu
TOS2	43Y92	Medium	20	39.8	hijk	2.50	qrstu	42.6	qrstu
TOS2	45Y93	High	20	83.5	bc	2.67	pqrs	42.8	pqrstu
TOS2	45Y93	Low	20	12.5	rst	2.17	uvwx	41.5	v
TOS2	45Y93	Medium	20	48.0	fghi	2.81	nopq	42.4	stu
TOS2	Diamond	High	20	93.0	ab	2.75	opqr	43.6	jklmnop
TOS2	Diamond	Low	20	17.3	opqrs	2.70	opqrs	43.2	nopqrs
TOS2	Diamond	Medium	20	45.5	ghi	3.02	lmno	43.3	lmnopqr
TOS2	Hyola 350 TT	High	20	101.4	a	2.02	wxy	42.6	rstu
TOS2	Hyola 350 TT	Low	20	15.5	pqrst	2.09	vwx	42.4	stu
TOS2	Hyola 350 TT	Medium	20	49.5	fgh	2.38	stuv	42.6	qrstu
TOS2	Stingray	High	20	69.8	d	1.70	yz	42.7	qrstu
TOS2	Stingray	Low	20	11.4	rst	1.48	z	42.1	uv
TOS2	Stingray	Medium	20	30.5	klm	1.90	xy	42.2	tuv
TOS2	Trophy	High	20	62.7	de	2.03	wxy	42.1	uv
TOS2	Trophy	Low	20	13.5	rst	2.03	wxy	42.7	qrstu
TOS2	Trophy	Medium	20	44.8	ghi	2.42	rstuv	42.6	rstu
TOS1	Diamond	Medium	20	26.3	lmno	4.00	ab	45.5	a
TOS1	Diamond	Medium	0	31.5	klm	3.78	abcdefg	44.9	abcdef
TOS1	Diamond	Medium	5	26.5	lmno	3.99	abc	45.0	abcd
TOS1	Diamond	Medium	10	28.8	lmn	3.89	abcd	45.5	ab
TOS1	Diamond	Medium	15	24.5	lmnop	4.03	a	44.5	cdefgh
TOS1	Diamond	Medium	25	29.3	lm	4.05	a	44.9	abcde
TOS1	Diamond	Medium	30	31.0	klm	3.85	abcde	45.1	abc
TOS2	Diamond	Medium	20	45.5	ghi	3.02	lmno	43.3	lmnopqr
TOS2	Diamond	Medium	0	47.3	fghi	2.84	nopq	44.2	efghijkl
TOS2	Diamond	Medium	5	47.3	fghi	2.94	mnop	44.1	defghijklm
TOS2	Diamond	Medium	10	49.5	fgh	2.95	mnop	44.0	fghijklmn
TOS2	Diamond	Medium	15	53.8	efg	3.19	klm	43.6	jklmnop
TOS2	Diamond	Medium	25	44.0	ghij	2.96	mnop	43.7	hijklmno
TOS2	Diamond	Medium	30	45.0	ghi	3.01	lmnop	43.0	opqrst

lsd	lsd	lsd	lsd	10.2	0.34	0.8