

GOA trial site report

The impact of manipulating seeding rate across a range of canola maturities/varieties with delayed seasonal breaks.

Grain Orana Alliance

Trial code:	GAMA00723-1
Season/year:	Winter 2023
Location:	Ardmona, Gilgandra
Trial partners:	Rodger Pagen
Trial establishment date:	19.4.2023

Keywords

GAMA007, canola, late sowing, variety, population, triazine tolerant, Clearfield, conventional, Gilgandra

Take home messages

- Earlier sowing (mid-April) resulted in higher yields than later sowing (early-June).
- Increasing target plant populations from 10 to 30 plants/m² improved yields across all varieties and sowing times.
- Significant yield differences were observed between varieties, highlighting the importance of varietal selection.
- While late-sown canola typically yields less, trial results suggest it can remain a strong economic option, especially when compared with other late-sown crops and the agronomic costs of removing canola from the rotation.
- For late sowing, selecting a fast-maturing, high-yielding variety and targeting plant populations of 30 plants/m² or more is recommended.

Background

Early sowing of canola (before 25 April) has been shown through recent GRDC-funded trials to positively impact crop performance. However, sowing is often delayed due to late seasonal breaks (after 10 May) or excessively wet paddocks, as experienced in 2023. In response, growers may reduce canola plantings or remove the crop from their rotation altogether, driven by concerns over low profitability and potential crop failure.

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Removing canola from the rotation, however, has several flow-on effects—including the loss of disease and weed breaks, and increased income risk due to reduced commodity diversification. Given the agronomic and economic benefits of maintaining rotations despite later autumn breaks, it is worth exploring whether agronomic levers can be adjusted to optimise performance in late-sown canola.

Trial work by Grain Orana Alliance (GOA) during the 2018 drought showed that hybrid Clearfield lines substantially out-yielded open-pollinated TT lines of similar maturity when sown late. It was hypothesised that the enhanced early growth and vigour of the hybrid lines enabled sufficient biomass accumulation under minimal rainfall, whereas the TT lines could not. This work also demonstrated that hybrid canola was, in many cases, a more economically viable option for late sowing than pulses or cereals.

These findings suggest that further investigation into varietal choice—both in terms of maturity and crop type (hybrid versus open-pollinated), could give growers greater confidence to retain canola in their rotations. Robust plant populations are also likely to become increasingly important as sowing is delayed, given the reduced opportunity for compensatory growth. This aspect warrants further exploration.

Investigate the effect of changing variety (maturity and production systems) and plant population to improve performance in late sown canola.

Site characteristics

Sites were selected in the more western areas of the GOA region where the adoption of heavier sowing rates as a weed control tool are less used. Trials were placed in paddocks with a good rotational history to minimise disease risk.

Rainfall: 2023 was a below average season in Gilgandra (Table 1), and the in-crop rainfall was approximately 221.3mm.

Table 1: Monthly rainfall¹ (mm) and long term average (LTA) at trial site.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2023	52	42	90	30	1	33	32	14	9	25	126	67	521
LTA	62	52	48	39	41	45	42	38	40	47	52	54	560

Treatment descriptions

- The trial design was a small plot randomized complete block design with 4 replicates.
- All treatments were subject to 2 times of sowing, TOS (Table 2).
- The first time of sowing (TOS1) reflected an optimal/near optimal sowing time for all the varieties tested (Figure 1).
- The second time of sowing (TOS2) reflected a late sowing time for all the varieties tested (Figure 1).

¹ Gridded data for the trial site from: Access Gridded Data | LongPaddock | Queensland Government

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- All varieties were sown at 3 target plant populations; 10, 30, and 60 plants/m². Sowing rates and varietal characteristics are summarised in Table 3.

Table 2: Key trial dates.

Treatment	Sowing	Harvest
TOS1	19/4/2023	31/10/2023
TOS2	1/6/2023	27/11/2023

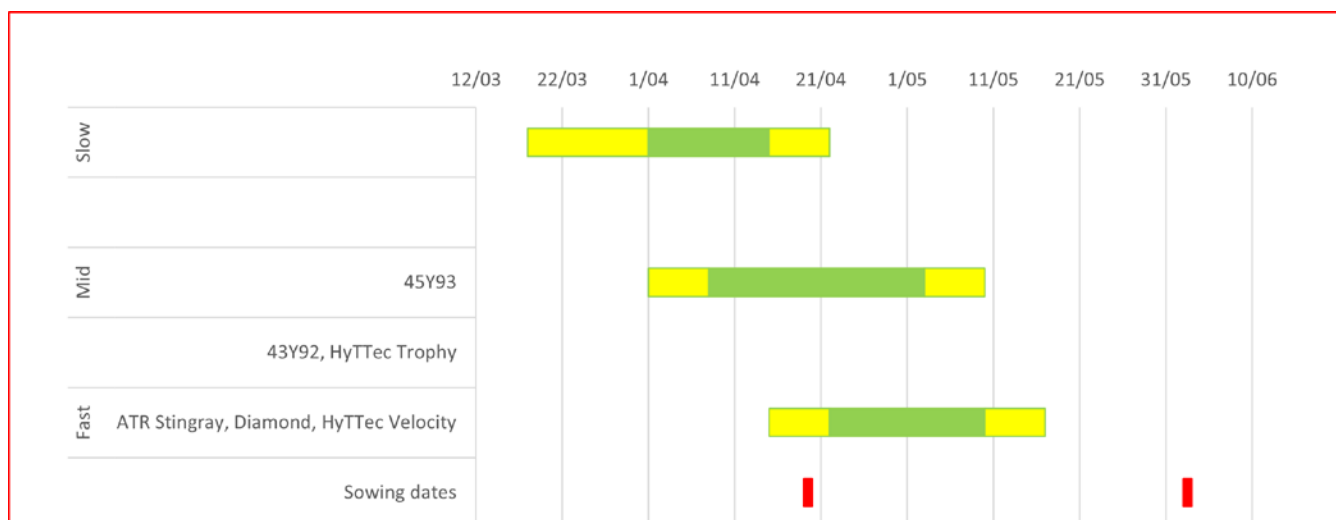


Figure 1: Phenology, optimal sowing windows, and actual sowing dates of the varieties tested. The first red bar denotes TOS1 and the second, TOS2.

Table 3: Key varietal characteristics and sowing rates for the varieties tested. Target plant populations were 10, 30, and 60 plants/m², and the values below these represent kg/ha sowing rates.

Breeder	Variety	Seeds/kg	Type	Phenology	Maturity	Plant height	10	30	60
Pioneer	43Y92	213,600	Hybrid CL	Mid-fast	Early	Medium	0.7	2.2	4.5
Pioneer	45Y93	173,000	Hybrid CL	Mid	Mid	Med-tall	0.9	2.8	5.5
Nuseed	ATR Stingray	320,000	OP	Fast	Early	Short	0.5	1.6	3.1
Nuseed	Diamond	205,000	Hybrid OP	Fast	Early	Medium	0.8	2.4	4.7
Nuseed	HyTTec Velocity	200,000	Hybrid TT	Fast	Early	Medium	0.8	2.4	4.7
Nuseed	HyTTec Trophy	250,000	Hybrid TT	Mid-fast	Early - Early Mid	Med-tall	0.6	1.9	3.9

Results

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. The full list of results is provided in the Appendix.

Plant populations:

- Establishment tended to be higher than the targeted population at TOS2, particularly at the higher sowing rates.
- Establishment tended to be lower than the target population at TOS1.
- In all varieties except for Diamond, treatments sown at target populations of 30 plants/m² or higher had a higher establishment in TOS2 than TOS1 (Figure 2).

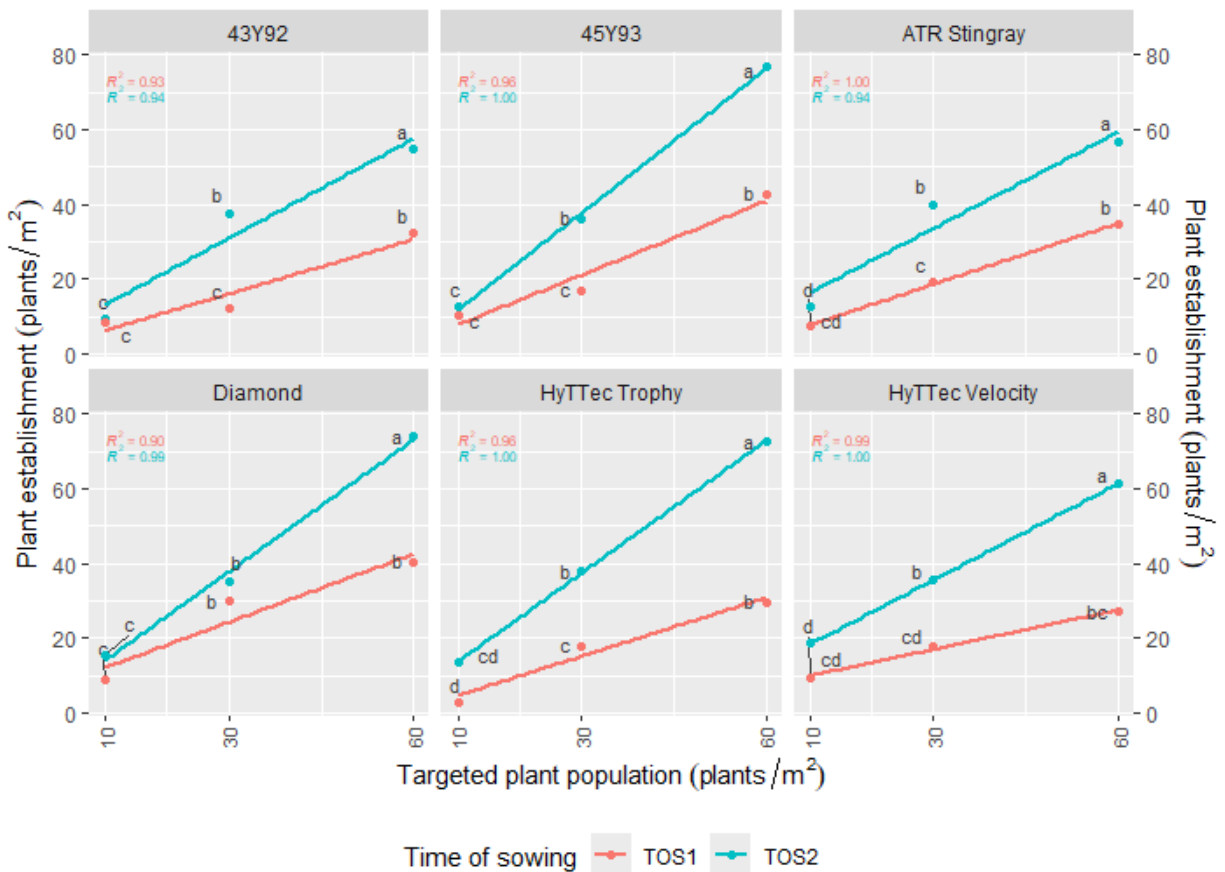


Figure 2: Plant establishment by variety, targeted plant population, and TOS. Treatments within the same variety with the same letter are not significantly different.

Yield:

- The average site yield was 0.71 t/ha.
- TOS2 resulted in significantly lower yields than TOS1 for all varieties and populations tested.

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- Increasing plant population from 10 to 30 plants/m² increased yield in every instance, and a further increase from 30 to 60 plants/m² increased or had no effect on yield in every instance.
- Diamond had the highest yields on average, regardless of timing.
- ATR Stingray® had the lowest yields on average, regardless of timing, though yield increased with sowing rate (Figure 3).

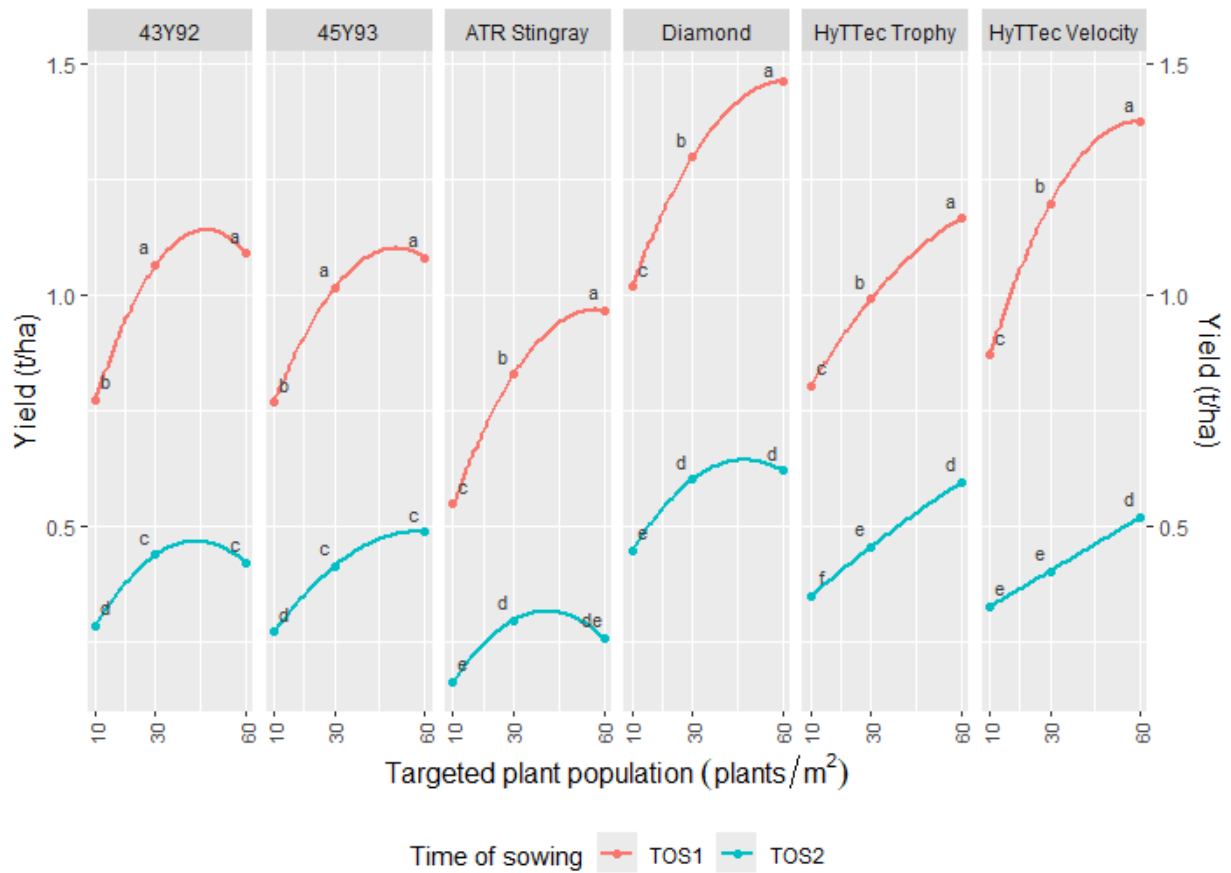


Figure 3: yield by variety, targeted plant population, and TOS. Treatments within the same variety with the same letter are not significantly different.

Oil:

- Oil content was not practically affected by varietal choice or population within each TOS.
- Diamond and HyTTec® Velocity achieved the highest levels (~46%) at TOS1.

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- Oil content in TOS2 was significantly lower than oil content in TOS1 due to a yield limited N dilution effect (Figure 4).

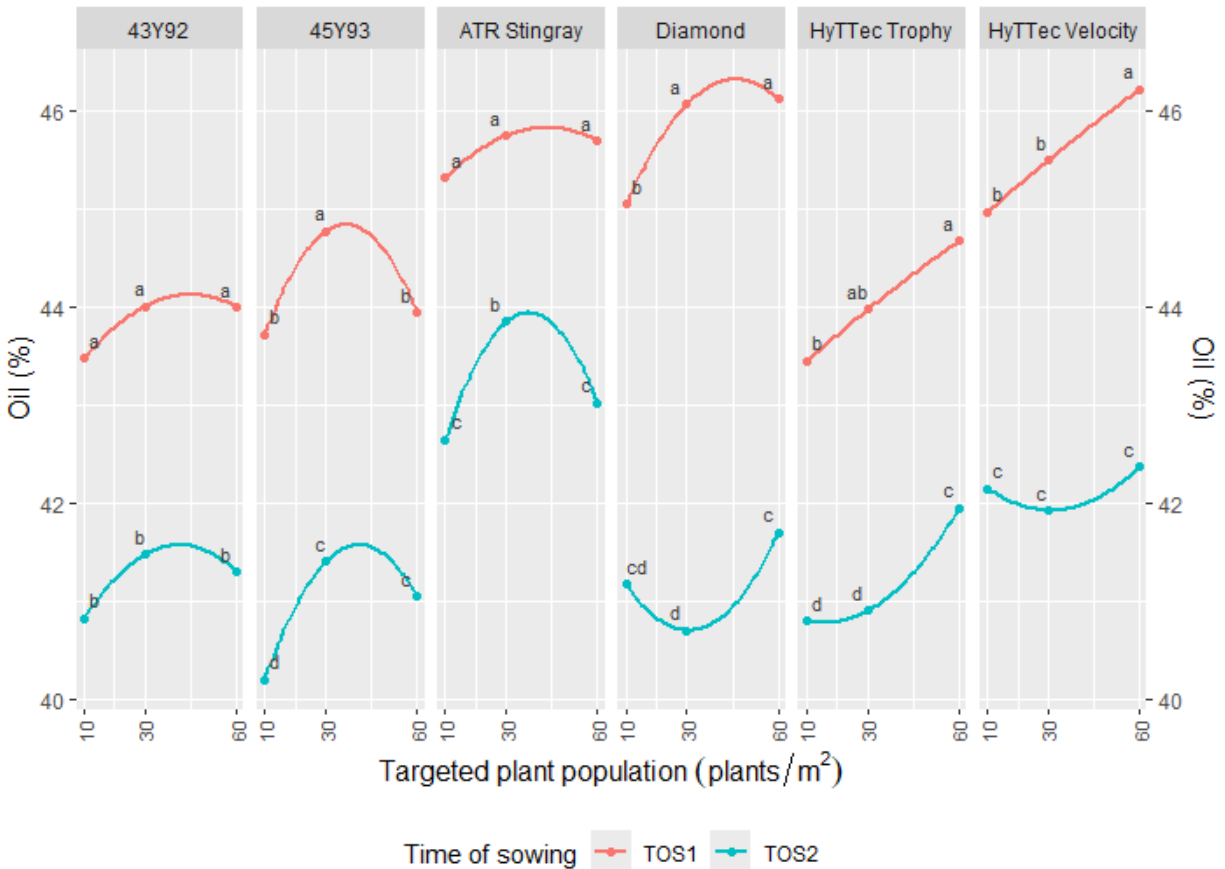


Figure 4: Oil content by variety, targeted plant population, and TOS. Treatments within the same variety with the same letter are not significantly different.

Discussion

The 2023 season was drier than average, with moisture stress at sowing and during pod filling, and the in-crop rainfall at this site was approximately 221.3 mm. As a result, the average site yield was 0.71 t/ha, and the average site oil content was 43%.

TOS1, sown in mid-April, was optimal for varieties classified as mid and mid-fast, and aligned closely with the start of the sowing window for fast-maturing types such as Stingray®. In contrast, TOS2 was well outside the

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optimal window—by more than a month—regardless of variety. Despite a 6-week difference in sowing dates, harvest occurred only four weeks apart, suggesting that crops at TOS2 accelerated their development and likely experienced a shortened flowering window.

Late sowing, particularly at target populations above 30 plants/m², resulted in plant establishments that exceeded expectations. This suggests a possible physiological or environmental mechanism enhancing establishment under later sowing conditions. The trend was more pronounced at higher sowing rates, indicating that increased rates may be beneficial for achieving rapid canopy closure within a compressed growing window. Across all varieties and sowing times, increased plant populations consistently improved or stabilised yield. Additional benefits are likely to include enhanced weed competition and reduced reliance on herbicides.

Varietal performance differed markedly, with greater variation observed at TOS1 than TOS2. Hybrid varieties outperformed the sole open-pollinated line, Stingray[®], particularly at higher plant populations. At TOS1, Diamond achieved the highest yield at 1.5 t/ha (High population), outperforming Stingray[®] by up to 1.0 t/ha at equivalent sowing rates. Even at TOS2, Diamond maintained a yield advantage of 0.3–0.4 t/ha over Stingray[®] across all population levels, highlighting the importance of varietal selection under delayed sowing conditions.

Conclusions

Although late-sown canola may not yield as well as timely-sown crops, the results from this trial suggest it can still be a strong economic option—particularly when compared with other crops suited to late sowing. This is especially relevant when considering the agronomic costs associated with reducing or removing canola from the rotation.

For growers considering late sowing, selecting a variety with fast phenology and strong yield potential is recommended. Targeting plant populations of 30 plants/m² or more is also advised, to maximise establishment and support yield under a shortened growing window.

Acknowledgements

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Appendix

Time of sowing	Variety	Target population	Plant establishment (plants/m ²)	Yield (t/ha)	Oil (%)
TOS1	45Y93	Low	10.3 jkl	0.8 i	43.7 hi
		Medium	17.0 ijk	1.0 fg	44.8 ef
		High	42.7 d	1.1 ef	44.0 h
	43Y92	Low	8.7 jkl	0.8 i	43.5 hi
		Medium	12.2 jkl	1.1 efg	44.0 fgh
		High	32.2 def	1.1 ef	44.0 gh
	HyTTec Trophy	Low	2.9 l	0.8 i	43.5 hi
		Medium	18.0 ijk	1.0 fg	44.0 gh
		High	29.7 efg	1.2 de	44.7 efg
	Diamond	Low	8.7 jkl	1.0 fg	45.1 cde
		Medium	30.0 efg	1.3 bc	46.1 ab
		High	40.3 de	1.5 a	46.1 ab
	HyTTec Velocity	Low	9.3 jkl	0.9 hi	45.0 de
		Medium	17.8 ijk	1.2 cd	45.5 bcd
		High	27.2 fghi	1.4 ab	46.2 a
ATR Stingray	Low	7.5 kl	0.5 jk	45.3 cde	
	Medium	19.2 ghij	0.8 i	45.8 abc	
	High	34.8 def	1.0 gh	45.7 abc	
TOS2	45Y93	Low	12.8 jkl	0.3 p	40.2 r
		Medium	36.3 def	0.4 mno	41.4 nopq
		High	77.0 a	0.5 klm	41.1 opq
	43Y92	Low	9.2 jkl	0.3 p	40.8 pqr
		Medium	37.7 def	0.4 klmn	41.5 mnop
		High	55.0 c	0.4 lmno	41.3 nopq
	HyTTec Trophy	Low	13.5 jkl	0.3 nop	40.8 pqr
		Medium	37.8 def	0.5 klm	40.9 pqr
		High	72.7 ab	0.6 j	42.0 klmn
	Diamond	Low	15.7 ijkl	0.4 klmn	41.2 opq
		Medium	35.3 def	0.6 j	40.7 qr
		High	74.2 a	0.6 j	41.7 lmno
	HyTTec Velocity	Low	18.5 hijk	0.3 op	42.2 klm
		Medium	35.5 def	0.4 mno	41.9 lmn
		High	61.5 bc	0.5 jkl	42.4 jkl
ATR Stingray	Low	12.8 jkl	0.2 q	42.7 jk	
	Medium	40.0 de	0.3 p	43.9 h	
	High	57.0 c	0.3 pq	43.0 ij	
lsd	lsd	lsd	11.7 na	0.1 na	0.7 na