GOA Trial Site Report

Manipulating seeding rate across a range of canola maturities/varieties with delayed seasonal breaks.

Trial code:	GAMA00720-1
Season/year:	Winter 2020
Location:	'The Plains', Nyngan
Trial partners:	Haydon Wass

Keywords

GOMA007, canola, late sowing, variety, population, triazine tolerant, Clearfield, conventional

Key findings

Late sown canola (~month later than recommended), can be economically competitive with other crops that might be sown such as barley and will allow rotations to be maintained. Consider the following findings:

- use varieties with higher yield potential
- ensuring that populations are well above 10 plants/m^2
- increasing target populations from 10 to 30 plants/m^2, regardless of variety or time of sowing (TOS), increased yields
- TOS2 had a much lower yield than TOS1, with considerable yield differences between varieties
- varieties that accumulate the earliest biomass have the highest yield potential, even under tough finishes
- plant populations proved to be equally as important at both TOSs, with the target population of 10 plants/m^2 being too low to optimise yield.

Background

Early sowing of canola (before the 25 April) has recently been shown through Grains Research and Development Corporation (GRDC) funded trials to have a positive effect on the crop performance. However, delayed seasonal breaks (after the 10 May) are quite common in Central West NSW, leading to many growers to either reducing canola areas or removing the crop from the rotation due to concerns over low profitability and possible crop failures.

The removal of canola from the rotation has a number flow-on effects, including disease and weed management and potential effects on income due to loss of commodity diversification. There are many advantages to maintaining canola in the rotation with late autumn breaks, but can agronomic levers be manipulated to optimise late sown canola performance?

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. It was hypothesised that the enhanced early growth rates and robustness of the hybrid lines enabled sufficient biomass accumulation on the minimal rainfall where the TT lines could not. Having good plant populations is likely to become more important as sowing becomes later and there is less time for compensatory growth.

GOA's work demonstrated that hybrid canola was as good, or in many cases a better option, for late sowing than pulses or cereals. Further investigation into varietal choice, maturity and crop type (hybrid verses open pollinated) may increase growers' confidence to keep late sown canola in the rotations.

This trial investigates the ability to change variety (maturity and production systems) and the interaction with plant population to improve performance in late sown canola.

Aim

Compare crop performance of a range of canola varieties with differing maturities and or production systems sown at low, medium and high populations within the optimal window and at a later sowing timing outside the traditional sowing window.

Methods

Trial Details	
Trial Establishment Date	Autumn 2020
Sowing configuration	275 mm row spacing, DBS, 150 kg/ha Urea, 100 kg/ha MAP

Paddock history	2019 wheat	**Soil test**	Nitrogen (kg/ha)	Colwell P (ppm)	Sulfur (ppm)
		0-10cm	34	58	5
		10-90cm	125		

Sowing timings	Time of sowing (TOS)		Harvest	Target the later sowing to be more than 3 weeks outside the latest timing as recommended by the NSW DPI Winter crop variety sowing guide
	Ideal (TOS1)	28/4/2020	30/10/2020	
	Late (TOS2)	29/5/2020	9/11/2020	

Varieties and Target plant pop (plant/m²): a selection of quicker varieties to suit later sowing common to the region	**Variety**	45Y91	43Y92	Trophy	Diamond	Hyola 350 TT	Stingray
	Type	Hybrid	Hybrid	Hybrid	OP	Hybrid	OP
	Phenology	Mid-slow	Mid-fast	Mid-fast	Fast	Fast	Fast
	Maturity	Mid	Early	Early - early mid	Early	Early	Early
		Sowing rate (kg/ha)					
	10	0.9	1.0	0.7	0.9	1.2	0.5
	30	2.7	2.9	2.2	2.7	3.6	1.6
	60	5.4	5.9	4.4	5.4	7.3	3.2

Trial design	<u>Type:</u> small plot (~12m x 2m) <u>Design:</u> split randomized block <u>Replication:</u> 4	Analysis ASREML – randomized split block with 3 factors. Tested to a 95% confidence interval
Treatment related observations and measurements	• Soil testing • Plant establishment • Vegetation index (2) NDVI • Grain yield and quality	

The rainfall at the site for 2020 is shown in **Table 1.**

Table 1: Rainfall for 2020 and the long-term average (LTA)

Nyngan (The Plains) rainfall													
Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	**TOTAL**
2020	9	83	103	121	5	21	23	47	27	65	10	50	**564**
LTA	63	52	44	37	39	33	32	27	29	37	39	39	**471**

Results

The actual planting date is represented by the red bars on **Figure 1**, show in the first timing of sowing is towards the end of the ideal window for most varieties. The second timing is well over a month later than the recommendations, and well outside of what growers would consider in this environment.

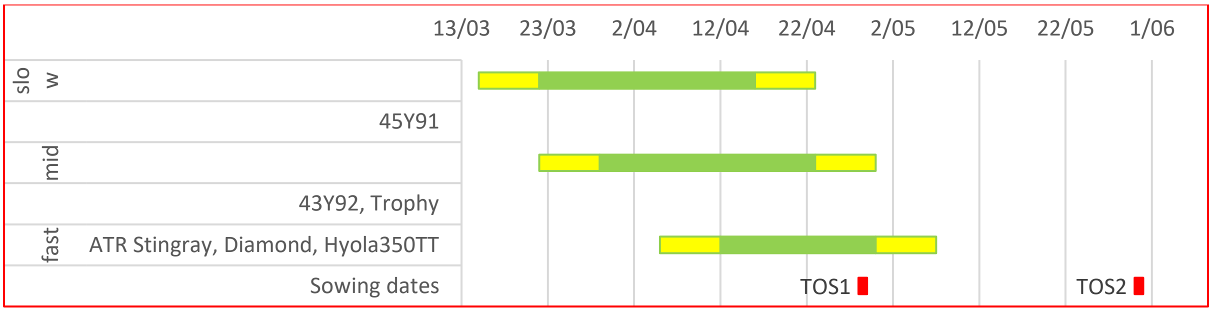


Figure 1. Sowing windows[1] (yellow and green bars) and actual sowing dates (red bars).

Plant establishment: There were differences between the populations within a variety and TOS's, except for Trophy at TOS1, which has similar populations at the high and medium targets (**Figure 2**).

[1] 2 Adapted from "Winter Crop Variety Sowing Guide 2019", NSW DPI

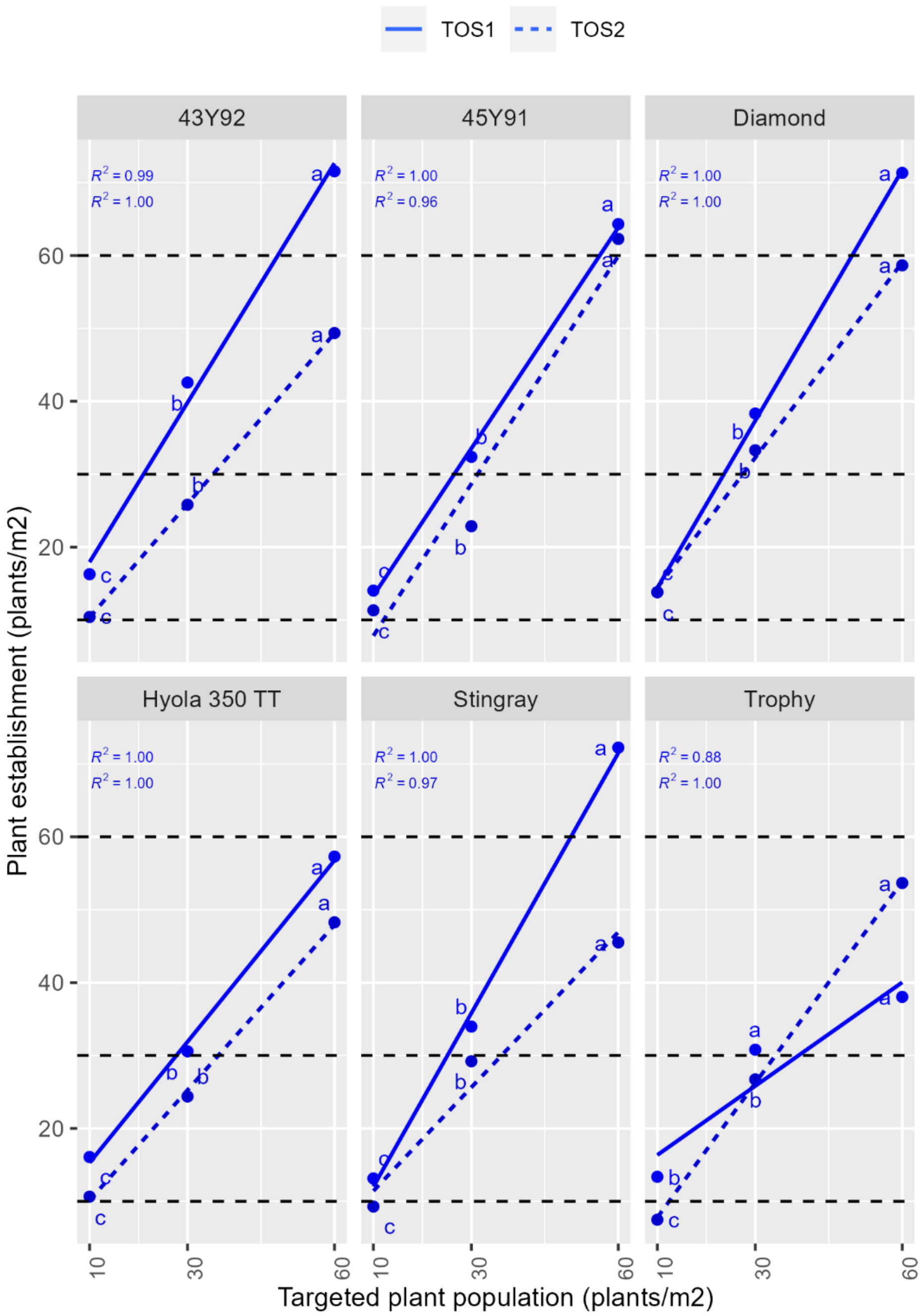


Figure 2. Plant establishment versus the actual targeted population. Horizontal dashed lines are targets of 10, 30 and 60 plants/m^2. Treatments with the same letter within a variety and TOS are not significantly different.

Vegetation index (VI): was assessed 52 and 83 days after sowing TOS 2 and TOS 1 respectively. There were significant differences between sowing timings, varieties and populations in most cases (

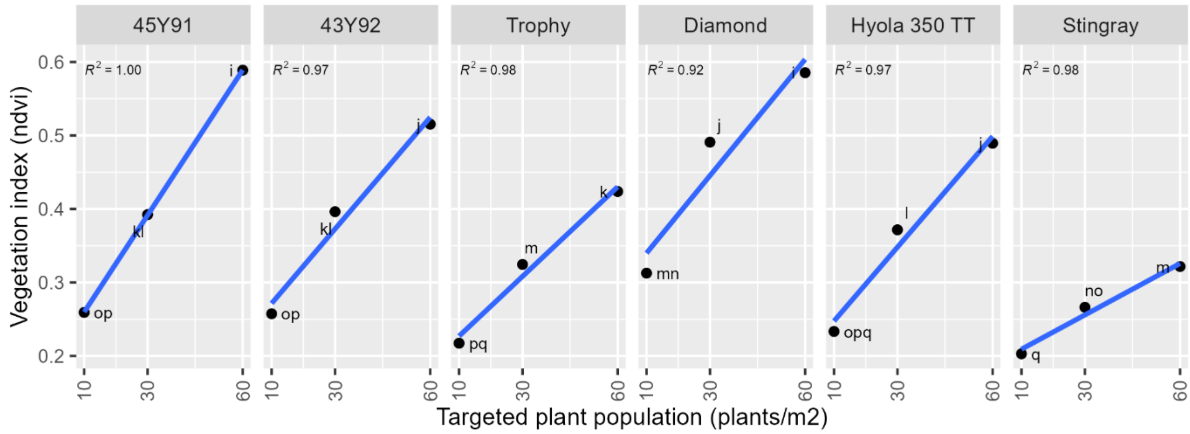


Figure 3).

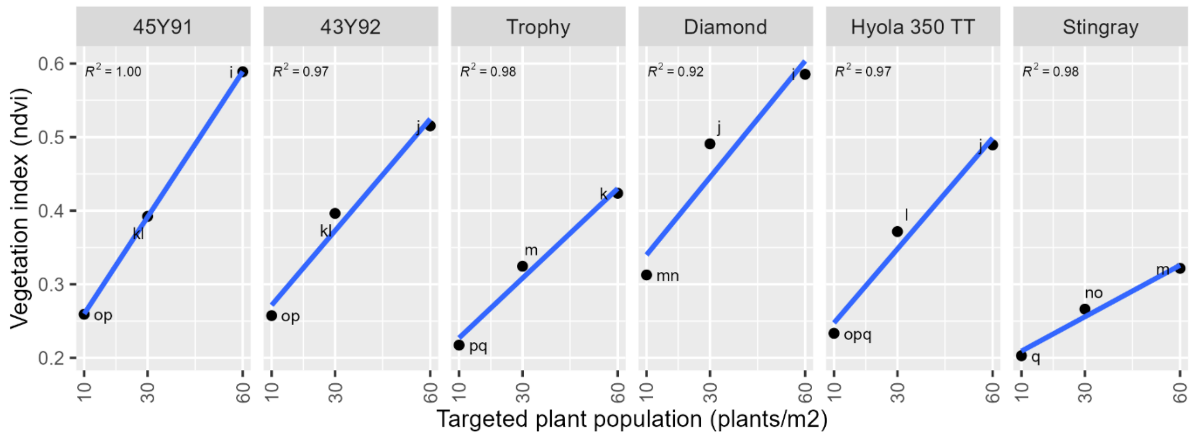


Figure 3. Vegetation index assessed 83 days after TOS2 using a handheld NDVI GreenSeeker. Treatments with the same letter are not significantly different.

Yield: Increasing target populations from 10 to 30 plants/m^2, regardless of variety or time of sowing increased yields. TOS2 had a much lower yield than the earlier sowing and there were considerable yield differences between varieties (**Figure 4**). There was no interaction between any of the variables when assessed using a factorial design, for example, the yield pattern of varieties TOS1 was similar to TOS2.

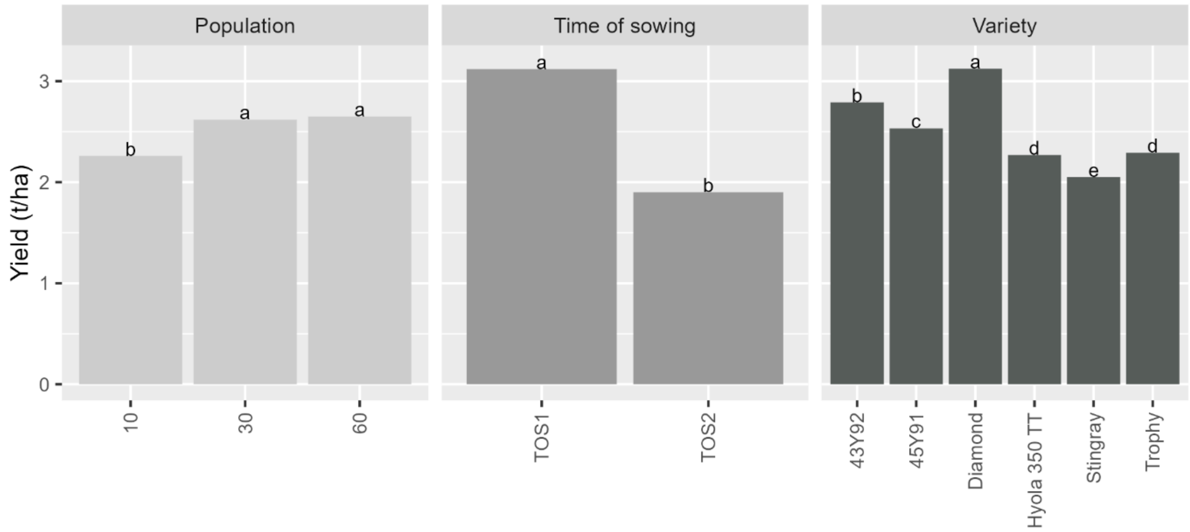
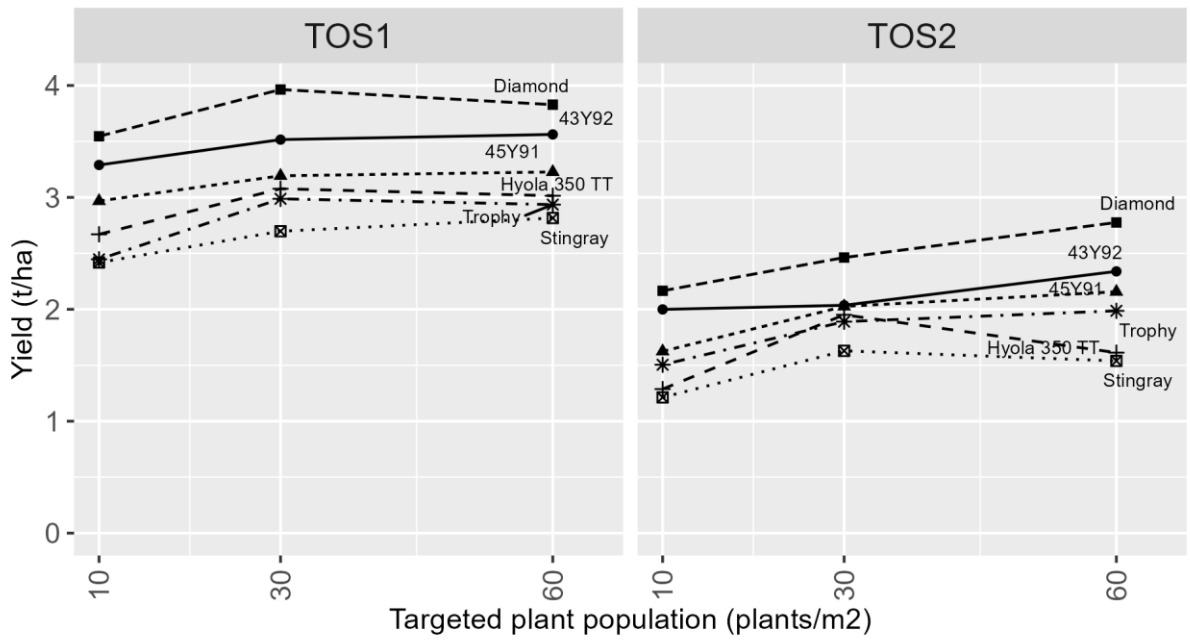


Figure 4. Canola yields (t/ha) as influenced by plant populations, TOS and variety. Results with the same letter within each factor are not significantly different.



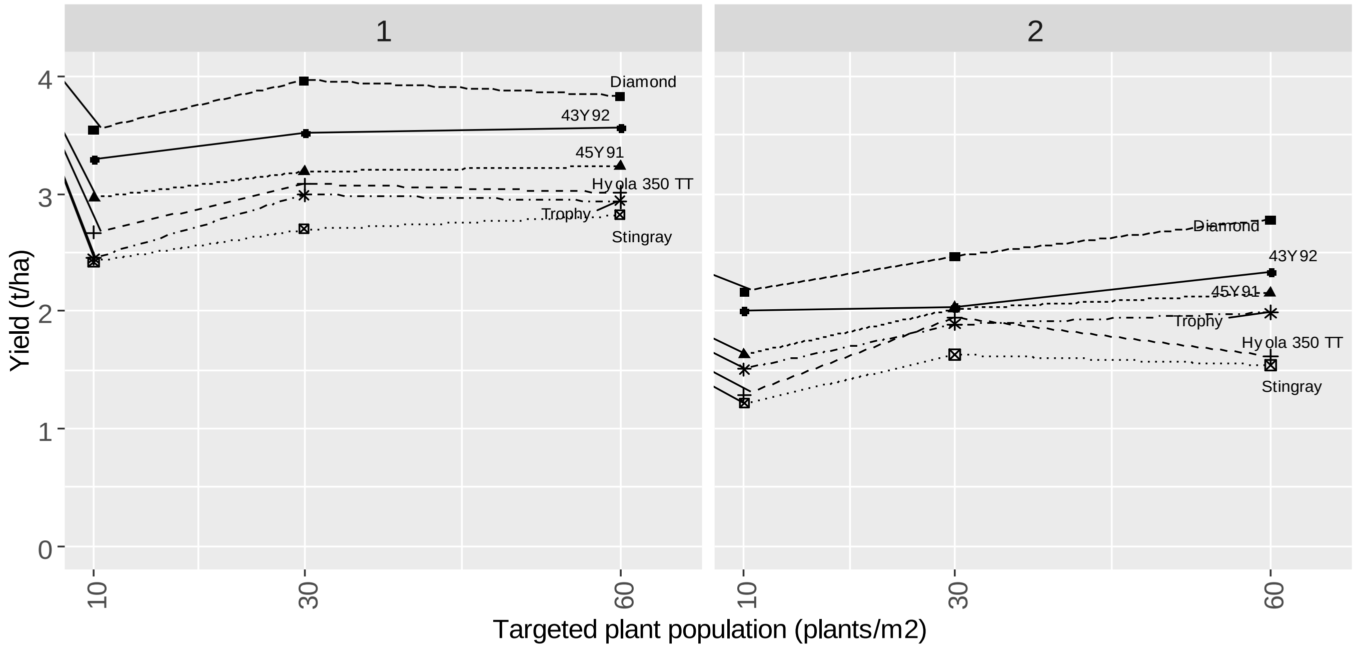


Figure 5. Canola yields (t/ha) as influenced by plant populations, time of sowing and variety.

Discussion

2020 was a very good year for canola production with a relatively mild and wet spring finish to the season **(Table 1)**. This may have suited some of the longer varieties and it could be hypothesised that in a tighter finish that 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[2]. As such the VI data (

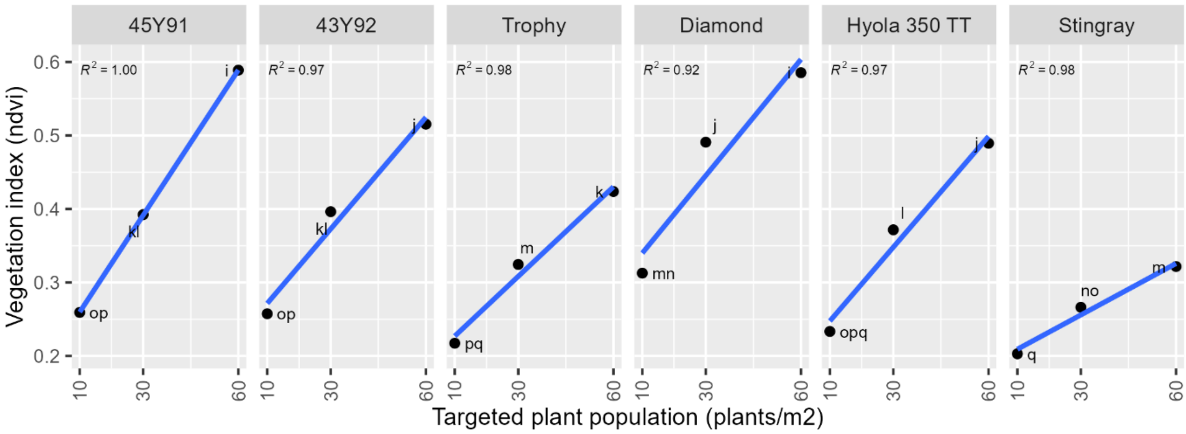


Figure 3) shows that for TOS2, the higher yielding varieties such as Diamond had much higher early vegetation compared to Stingray (at all populations), a trend reflected in the yield. This suggests that varieties that accumulate early biomass have the higher yield potential, even under tough finishes.

As expected, TOS had a big bearing on yield, with TOS1 outyielding TOS2 by more than 1t/ha. Population proved to be equally as important at both timings, with the target population of 10

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

plants/m^2 being too low to optimise yield, there was also little benefit from increasing the population above 30 plants/m^2.

There was a large varietal response, Diamond performed very well and when it was sown well outside its recommended window almost out-yielded Stingray, planted in its optimal window.

Perhaps one reason that growers lack confidence in the late sowing of canola is due to variable past experiences using underperforming varieties. This work would suggest that the use of better genetics and ensuring adequate plant populations could remove a much of the risk associated with late sown canola.

Conclusion

Late sown (~month later than recommended timing) canola can perform well enough to be economically competitive with crops that might otherwise be sown, such as barley, and allow for rotations to be maintained with the following recommendations:

- use varieties with higher yield potential
- Ensure plant populations are well above 10 plants/m^2.

Acknowledgements

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DISCLAIMER — TECHNICAL

Appendix: full list of results

			Plant establishment		Yield		Oil		Vegetation index	
			(plants/m2)		(t/ha)		(%)		NDVI	
Time of sowing	Variety	Target population	p.v.[1]	s1[3]	p.v.[1]	s1[2]	p.v.[1]	s1[2]	p.v.	s1
1	43Y92	High	71.6	ab	3.6	bc	42.7	ab	0.86	a
	45Y91	High	64.3	abc	3.2	def	40.7	fghi	0.83	abc
	Diamond	High	71.3	ab	3.8	ab	42.4	bc	0.78	de
	Hyola 350 TT	High	57.3	cde	3.0	efgh	42.5	abc	0.77	def
	Stingray	High	72.2	a	2.8	ghi	42.6	abc	0.77	def
	Trophy	High	38.0	hij	2.9	fghi	41.5	def	0.79	bcde
	43Y92	Low	16.3	mnopq	3.3	cde	42.1	bcd	0.81	bcd
	45Y91	Low	14.0	opq	3.0	fghi	40.2	hij	0.81	bcd
	Diamond	Low	13.8	opq	3.5	bcd	42.8	ab	0.75	ef
	Hyola 350 TT	Low	16.1	nopq	2.7	ijk	42.2	bcd	0.69	gh
	Stingray	Low	13.1	pq	2.4	kl	42.7	ab	0.63	i
	Trophy	Low	13.4	pq	2.4	kl	41.0	efgh	0.68	h
	43Y92	Medium	42.6	ghi	3.5	bcd	41.8	cde	0.83	ab
	45Y91	Medium	32.4	jkl	3.2	ef	41.1	efg	0.83	abc
	Diamond	Medium	38.3	hij	4.0	a	42.6	ab	0.80	bcde
	Hyola 350 TT	Medium	30.6	jkl	3.1	efg	42.3	bc	0.77	def
	Stingray	Medium	34.0	ijk	2.7	hijk	43.3	a	0.73	fg
	Trophy	Medium	30.8	jkl	3.0	efghi	42.0	bcd	0.78	cde
2	43Y92	High	49.4	efg	2.3	lm	39.6	jklmn	0.52	j
	45Y91	High	62.3	bcd	2.2	lmn	38.5	o	0.59	i
	Diamond	High	58.7	cde	2.8	ghij	40.0	ijk	0.59	i
	Hyola 350 TT	High	48.3	efgh	1.6	oqr	38.9	mno	0.49	j
	Stingray	High	45.5	fgh	1.5	qr	40.3	ghij	0.32	m
	Trophy	High	53.7	def	2.0	n	38.6	o	0.42	k
	43Y92	Low	10.4	q	2.0	n	40.0	ijkl	0.26	op
	45Y91	Low	11.3	q	1.6	pq	38.9	no	0.26	op
	Diamond	Low	13.8	opq	2.2	lmn	39.8	jkl	0.31	mn
	Hyola 350 TT	Low	10.6	q	1.3	rs	38.7	o	0.23	opq
	Stingray	Low	9.3	q	1.2	s	40.2	ij	0.20	q
	Trophy	Low	7.5	q	1.5	qrs	39.7	jklmn	0.22	pq
	43Y92	Medium	25.8	klmn	2.0	mn	39.3	klmno	0.40	kl
	45Y91	Medium	22.9	lmnop	2.0	mn	40.0	ijkl	0.39	kl
	Diamond	Medium	33.3	ijk	2.5	jkl	39.2	lmno	0.49	j
	Hyola 350 TT	Medium	24.4	klmno	2.0	no	39.7	jklm	0.37	l
	Stingray	Medium	29.2	jkl	1.6	pq	40.1	ijk	0.27	no
	Trophy	Medium	26.7	klm	1.9	nop	38.9	mno	0.32	m
lsd	lsd	lsd	10.0	na	0.3	na	0.9	na	0.05	na