GOA Trial Site Report

Investigation of the effect of phosphorous rate on canola sown outside of conventional planting windows.

Trial code:	GAMA010212
Season/year:	Winter 2021
Location:	Canowindra
Trial partners:	Viridis Ag, Rob Atkinson

Keywords

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

Key findings

- Phosphorous (P) applications improve yields.
- On average the later time of sowing (TOS) yielded close to 1.5 t/ha less than TOS1.
- All varieties had higher yields for the earlier sowing date.
- Increasing target populations from 10 to 60 plants/m^2 per increased yields.
- Hybrid Clearfield varieties out yielded open pollinated, triazine tolerant (TT) varieties of similar maturity when sowing was delayed.
- Population density was more important at the later TOS.

Background

Early sowing of canola (before the 25 April) has been shown through recent trial work to have a positive effect on crop yield. Sowing canola later, after 10 May, due to a delay in the seasonal break is quite common in Central West NSW, causing growers to either reducing canola areas or remove the crop from the rotation due to concerns over low profitability and possible crop failure.

Removal of canola from the rotation has several carry over issues for following crops, including diseases and weeds, as well as potential loss of income due to lack of commodity diversification. Canola needs to be maintained in the rotation, even in a late-sowing scenario, with agronomy manipulated to optimise its production.

Trial work by Grain Orana Alliance (GOA) in the drought conditions of 2018, showed that hybrid Clearfield canola varieties substantially out yielded similar maturity, open pollinated TT varieties when sown late. It is possible that the early, robust vigour of the hybrid lines enabled greater biomass accumulation with minimal rainfall, where the TT lines 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 showed 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. Having robust plant populations are also likely to become more important as sowing becomes later as there is less time for compensatory growth but needs further research.

This trial aims to investigate variety options (maturity and production systems) and plant population interactions to improve late sown canola performance.

Aim

To compare crop performance of a range of canola varieties to several different treatments, both in the optimal sowing window and late sown (outside the traditional planting window at Canowindra).

Treatments

- Variety (maturity rating and/or production system). Varieties selected were shorter season. quicker maturity options suited to later sowing dates.
- Phosphorous rates at sowing.
- Plant populations (low, medium and high).

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Methods

Trial details	
Date	Autumn 2021
Sowing configuration	275 mm row spacing. Knife point, press wheels N: 150 kg/ha urea, applied immediately before sowing (IBS) P (various rates, see below), IBS

Paddock history		**Soil test**	Nitrogen (N) (kg/ha)	Colwell P (ppm)	Sulfur (S) (ppm)
	2020 wheat				
	2019 canola	0-10 cm	20	34	6
	2017 pasture	10-90 cm	80		8

Time of sowing (TOS)	Sowing		Harvest	
	TOS 1	3/5/2021	2/12/2021	Later TOSs targeted to be >3 weeks outside the latest timing as recommended by the NSW DPI Winter crop variety sowing guide 2021, see **Figure 1**.
	TOS 2	2/6/2021	15/12/2021	

Varieties and target plant population (plant/m^2)	**Variety**	43Y92CL	45Y93CL	ATR Stingray®	Diamond	Hyola® 350 TT	HyTTec® Trophy
	Type	Imidazolinone tolerant hybrid		Triazine tolerant, open pollinated	Hybrid Conventional	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	1.0	1.0	0.5	0.8	1.2	1.0
	30	3.1	3.1	1.6	2.5	3.5	2.9
	60	6.2	6.2	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 4 factors. Tested to a 95% confidence interval.
Observations and measurements	• Soil testing • Plant establishment • Vegetation index (2) NDVI • Grain yield and quality	

Time of sowing and variety:

In this trial, TOS1 was towards the end of the 'ideal' window for most varieties (red bars Figure 1). The TOS2 is >3 weeks later than the optimal sowing window, as determined by the NSW DPI Winter crop sowing guide 2021 and was well outside when growers would plant in this region.

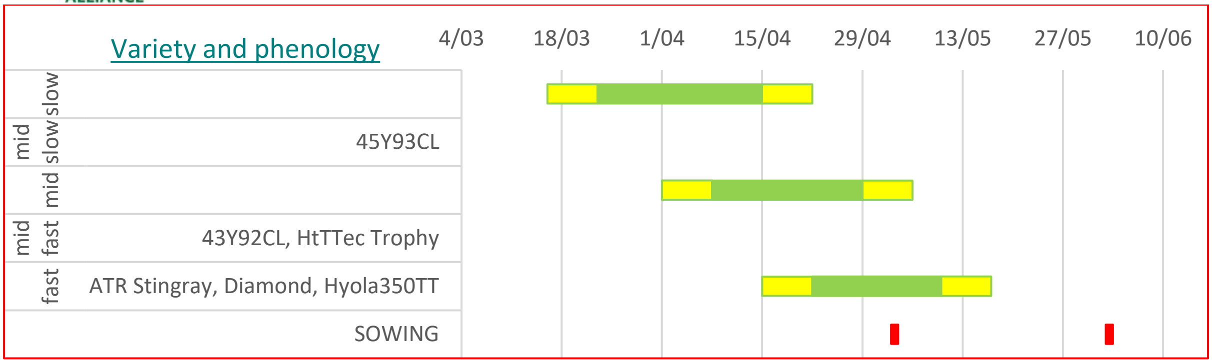

Figure 1. Trial sowing dates (red bars) and recommended sowing dates (NSW DPI Winter crop sowing guide 2021)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2021	61	76	101	1	34	88	79	76	72	44	130	46	**808**
LTA	60	54	47	43	44	50	52	50	47	58	55	56	**616**

Results

Plant establishment:

Plant establishments were close to the target populations for all varieties with differences between the populations within a variety and for TOS.

Yield:

There was a yield response to all the factors included in this trial (**Figure 2**)

- Increasing target populations from 10 to 60 plants/m^2 per increased yields
- TOS2 had a much lower yield than TOS1
- 45Y93 had the highest yield, close to 1.5 t/ha more than Stingray
- The highest rate of P (30 kg/ha) had the highest yield, more than 1 t/ha than where no P was applied.

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

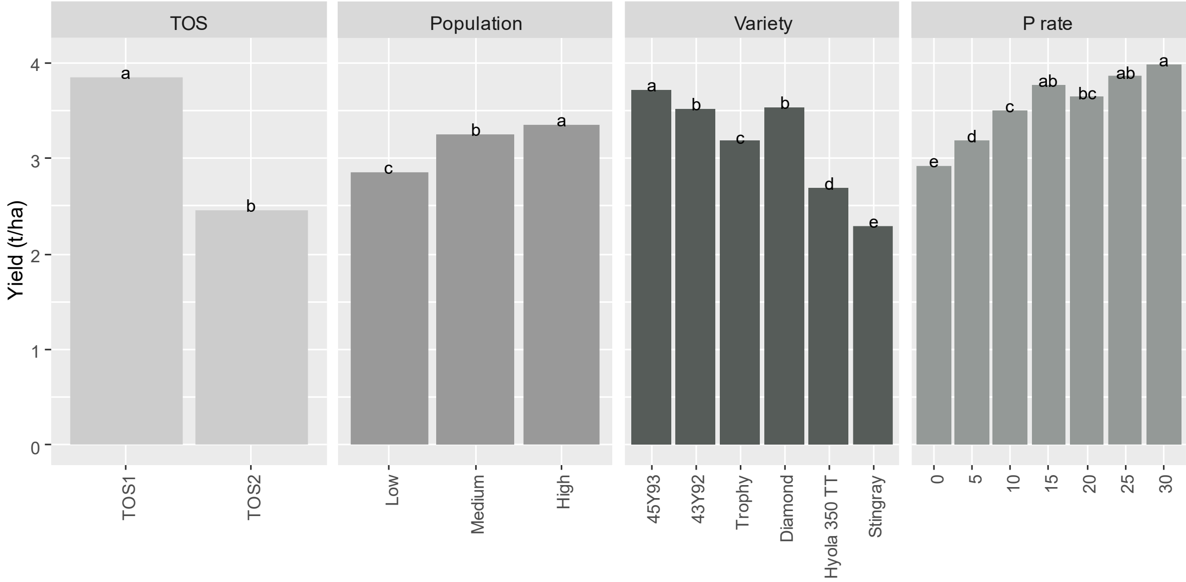

Figure 2. Canola yields as influenced by TOS, plant populations, variety and P rate. Results with the same letter within each factor are not significantly different.

Yield and interactions between population, variety, TOS and P rate

There were interactions between the treatments as follows:

- **Population and variety (Figure 3):**

All varieties had a positive yield response from the low to the medium population, apart from 43Y92, which had no increase. ATR Stingray showed a strong yield response to increasing populations up to the high (~60 plants/m^2) target population.

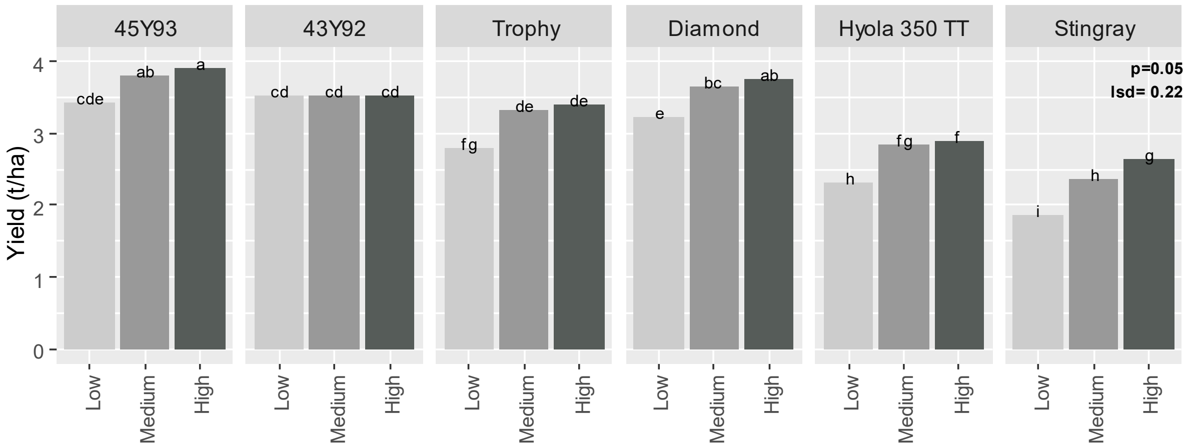

Figure 3. Canola yields as influenced by variety and population. Results with the same letter within each facet are not significantly different.

- **Timing and variety (Figure 4):**

45Y93 had the highest yield at both timings

Stingray had the lowest yield at both timings

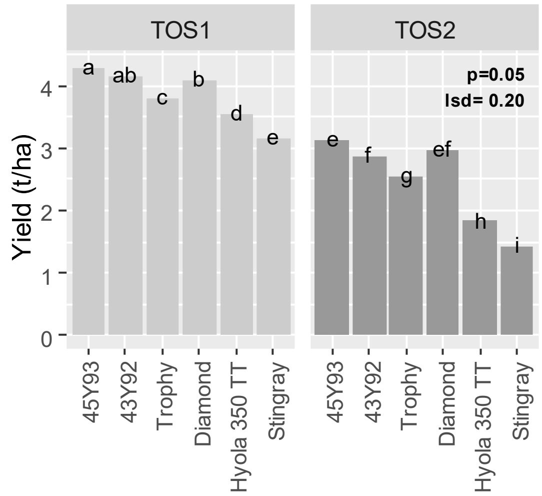

Figure 4. Canola yields as influenced by timing and variety. Results with the same letter within each facet are not significantly different.

- **Timing and population (Figure 5):**

Population density was more important for the later TOS. The high population treatments at TOS2 outyielded the low and medium populations. At TOS1, there was a penalty of >300 kg for the low population rates versus the higher plant populations.

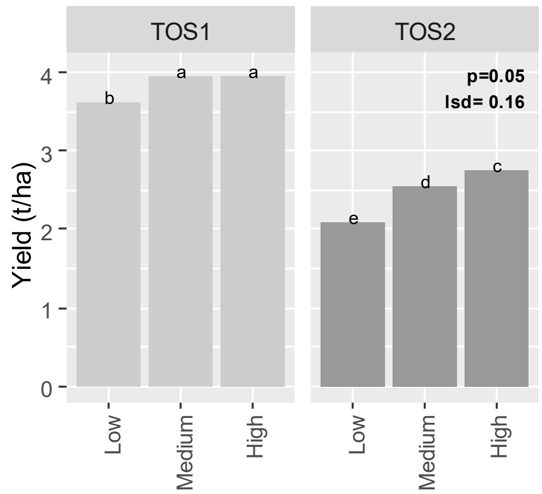

Figure 5. Canola yields as influenced by timing and population. Results with the same letter within each facet are not significantly different.

- **Timing and P rate (Figure 6):**

Yield increased as the rate of P increased

Yields increased up to 10 kg/ha at TOS2, and 15 kg/ha at TOS1

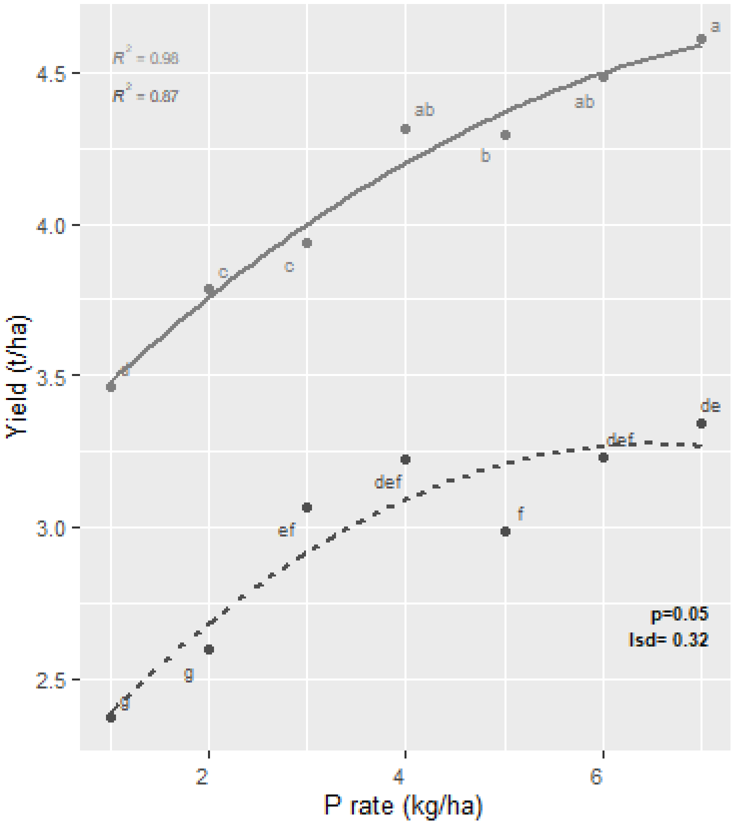

Figure 6. Canola yields as influenced by TOS and P rate. Results with the same letter within each facet are not significantly different.

Oil content

- Varied considerably between varieties. 45Y93 was >0.5% lower than either Trophy or Diamond, while 43Y92 was >1.5 % lower.
- Oil content was higher for TOS1 than TOS2
- Oil content was higher for medium and high plant populations
- There was not a consistent oil response to P**.**

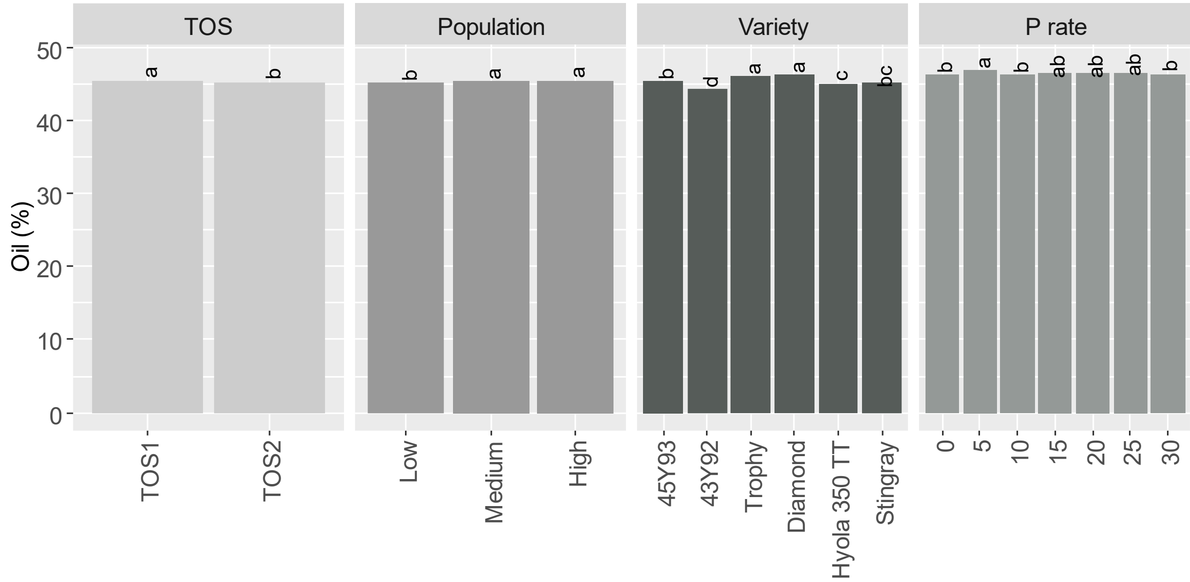

Figure 7. Canola oil% as influenced by TOS, plant populations, variety and P rate. Results with the same letter within each facet are not significantly different.

Discussion

The 2021 season was good for canola production, with a relatively mild and wet finish to the season. These conditions suited the earlier TOS and the hybrid varieties, with yields >4 t/ha.

The variety yields were similar at both TOS's, with 45Y93 highest and Stingray the lowest. The difference between the highest and lowest yielding varieties was >1.5 t/ha for TOS2 and closer to 1 t/ha at TOS1. This suggests that selecting the right variety becomes more important when sowing outside the recommended windows, with the TT varieties being the poorer performers. TT canola varieties typically have 10–15% lower yields than conventional varieties, so this is not unexpected[2]**.**

Plant populations also affected yields. At both TOS's a target of 10 plants/m^2 was not enough to maximise yields, however 30 plants/m^2 was enough when sown at TOS1. Yields were maximised for TOS2 where a population of 60 plants/m^2 was targeted. Canola has a very good ability to compensate for poor plant populations, but in high yielding or late sowing scenarios, higher populations (> 30 plants/m2) achieved higher yields.

Phosphorous application improved yields. Similar rates at both TOS's provided similar yield increases, plateauing at 10 – 20 P kg/ha. Phosphorus appears to be equally important at both TOS's and would suggest that although sowing later may restrict the yield potential, removing P altogether may limit yields.

As expected, there was a big difference in yields between the 2 TOS's. On average the late timing (TOS2) yielded close to 1.5 t/ha lower than TOS1. This yield was still robust and reflective of the season averaging nearly 2.5 t/ha (regardless of variety or sowing rate). This result needs to be compared to what alternative crops may suit a late sowing and their relative gross margins.

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

Selection of higher performing varieties, targeting robust plant populations and maintaining P rates will optimise production regardless of TOS. Optimising production increases the economic argument for maintaining canola in the rotation with later TOSs, while maintaining the benefits of disease and weed breaks.

Conclusion

Canola can obtain good yields and be maintained in the rotation in late sowing scenarios.

Sowing varieties with higher yield potential, ensuring that populations are well above 10 plants/m^2 and maintaining P rates will improve the chances of growing a profitable crop.

Acknowledgements

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DISCLAIMER — TECHNICAL

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Appendix: Results table

TOS	VARIETY	POPULATION	P rate (kg/ha)	Plant establishment (plants/m^2)		Yield (t/ha)		Oil (%)	
TOS1	45Y93	Low	20	15.7	st	4.1	cdefg	45.5	fghijk
TOS1	45Y93	Medium	20	30	qr	4.4	abc	45.6	efghij
TOS1	45Y93	High	20	57.2	efgh	4.4	abcd	44.9	jklmno
TOS1	43Y92	Low	20	17	st	4.3	bcdef	44.1	qr
TOS1	43Y92	Medium	20	49	ghijklm	4.2	bcdefg	43.9	r
TOS1	43Y92	High	20	83.7	ab	4.1	defgh	44.1	pqr
TOS1	Trophy	Low	20	14.2	st	3.5	klmn	46.5	bcd
TOS1	Trophy	Medium	20	38	opqr	3.9	ghij	46.4	bcde
TOS1	Trophy	High	20	80.3	abc	4	efghi	46.4	bcd
TOS1	Diamond	Low	20	16.7	st	3.8	hijk	46.3	bcde
TOS1	Diamond	Medium	20	50.3	ghijk	4.3	bcde	46.7	abc
TOS1	Diamond	High	20	87.8	a	4.2	bcdefg	46.3	bcdef
TOS1	Hyola 350 TT	Low	20	16	st	3.3	nop	45.3	hijklm
TOS1	Hyola 350 TT	Medium	20	34.7	opqr	3.7	ijkl	45.2	ijklmn
TOS1	Hyola 350 TT	High	20	61.2	ef	3.6	jklm	45.5	ghijkl
TOS1	Stingray	Low	20	13.7	st	2.7	rst	45.3	hijklm
TOS1	Stingray	Medium	20	38.6	nopqr	3.3	mnop	45.6	efghij
TOS1	Stingray	High	20	71.8	cd	3.5	klmn	46	cdefghi
TOS2	45Y93	Low	20	9.7	st	2.7	rs	45.3	hijklm
TOS2	45Y93	Medium	20	31.7	pqr	3.2	nop	45.4	ghijklm
TOS2	45Y93	High	20	59.1	efg	3.5	lmn	45.8	defghi
TOS2	43Y92	Low	20	12.4	st	2.8	qrs	44.8	klmnop
TOS2	43Y92	Medium	20	38.5	opqr	2.9	qrs	44.5	nopqr
TOS2	43Y92	High	20	73.3	cd	3	pqr	44.8	lmnopq
TOS2	Trophy	Low	20	11.6	st	2.1	uvw	45	jklmno
TOS2	Trophy	Medium	20	35.7	opqr	2.7	rs	46	cdefgh
TOS2	Trophy	High	20	73.7	bcd	2.8	qrs	46.1	cdefg
TOS2	Diamond	Low	20	15.1	st	2.6	st	45.6	efghij
TOS2	Diamond	Medium	20	39.1	mnopq	3	pqr	46.3	bcde
TOS2	Diamond	High	20	64.7	de	3.3	mno	46.3	bcde
TOS2	Hyola 350 TT	Low	20	8.8	t	1.4	x	44.2	opqr
TOS2	Hyola 350 TT	Medium	20	19	s	2	vw	44.6	mnopqr
TOS2	Hyola 350 TT	High	20	39.7	lmnopq	2.2	uv	45.2	ijklmn
TOS2	Stingray	Low	20	10.3	st	1	y	44.2	opqr
TOS2	Stingray	Medium	20	29.4	r	1.5	x	44.9	jklmnopq
TOS2	Stingray	High	20	51.7	fghi	1.8	w	45.4	ghijklm
TOS1	Diamond	Medium	0	48.7	hijklmn	3.5	lmn	46.3	bcdef
TOS1	Diamond	Medium	5	54.5	fgh	3.8	hijk	47.3	a
TOS1	Diamond	Medium	10	43	ijklmno	3.9	fghij	46.4	bcde
TOS1	Diamond	Medium	15	51.8	fghij	4.3	abcde	46.7	abc
TOS1	Diamond	Medium	20	50.3	ghijk	4.3	bcde	46.7	abc
TOS1	Diamond	Medium	25	49.3	ghijkl	4.5	ab	46.9	ab
TOS1	Diamond	Medium	30	51.8	fghij	4.6	a	46.5	abcd
TOS2	Diamond	Medium	0	40.3	klmnop	2.4	tu	46.3	bcde
TOS2	Diamond	Medium	5	36.7	opqr	2.6	st	46.7	abc
TOS2	Diamond	Medium	10	40	lmnopq	3.1	opq	46.3	bcdef
TOS2	Diamond	Medium	15	41.7	jklmno	3.2	nop	46.3	bcde
TOS2	Diamond	Medium	20	39.1	mnopq	3	pqr	46.3	bcde
TOS2	Diamond	Medium	25	39.2	lmnopq	3.2	nop	46.4	bcd
TOS2	Diamond	Medium	30	42	jklmno	3.3	mno	46.3	bcdef
lsd				9.9		0.3		0.8	

Note: data analysed using ASREML, as a simplified ANOVA using time of sowing as the mainplot effect.