GOA Trial Site Report

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

Trial code:	GOMA007201
Season/year:	Winter 2020
Location:	'Aberdeen', Eugowra
Trial partners:	Kevin Norrie

Keywords

GOMA007, canola, late sowing, variety, population, TT, triazanine tolerant, Clearfield, conventional

Key findings

Late sown canola can perform well enough to be economically competitive with crops that might otherwise be sown, such as barley.

- For growers to have more confidence to maintain canola in the rotation, the selection of more vigorous varieties such as hybrids and using robust sowing rates are recommended.
- For the later time of sowings (TOS), the lowest population had the lowest yield.
- All varieties had higher yields for TOS1 than TOS2.
- The early TOS outyielding the later by more than 1 t/ha

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.

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GOA's work demonstrated that hybrid canola could be as good, or a more profitable 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 time, outside the traditional sowing window.

Methods

Trial details							
Establishment date	Autumn 2020						
Sowing configuration	275 mm row spacing, deep blade system (DBS), 150 kg/ha urea, 100 kg/ha MAP						
Paddock history	2019 grazing oats		**Soil test**	Nitrogen (kg/ha)	Colwell P (ppm)	Sulfur (ppm)	
	2018 lucerne		0-10cm	41	47	15	
	2017 lucerne		10-90cm	405			
Sowing timings	Time of sowing (TOS)		Harvest	Targeting 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)	7/5/2020	20/11/2020				
	Late (TOS2)	10/6/2020	30/11/2020				
Varieties and target plant population (plant/m²): a selection of quicker varieties to suit later sowing common to the region	**Variety**	43Y92	45Y91	Stingray	Diamond	Hyola 350 TT	Trophy
	Type	Hybrid	Hybrid	OP	OP	Hybrid	Hybrid
	Phenology	Mid-fast	Mid-slow	Fast	Fast	Fast	Mid-fast
	Maturity	Early	Mid	Early	Early	Early	Early - early mid
		Sowing rate (kg/ha)					
	10	1.0	0.9	0.5	0.9	1.2	0.7
	30	2.9	2.7	1.6	2.7	3.6	2.2
	60	5.9	5.4	3.2	5.4	7.3	4.4
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				

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

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

Table 1: Eugowra rainfall 2020 and the long-term average (LTA).

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	TOTAL
2020	30	71	66	101	86	62	81	47	41	78	47	36	**746**
LTA	57	50	46	41	44	51	48	48	46	54	48	49	**582**

Results

The sowing date is represented by the red bars on

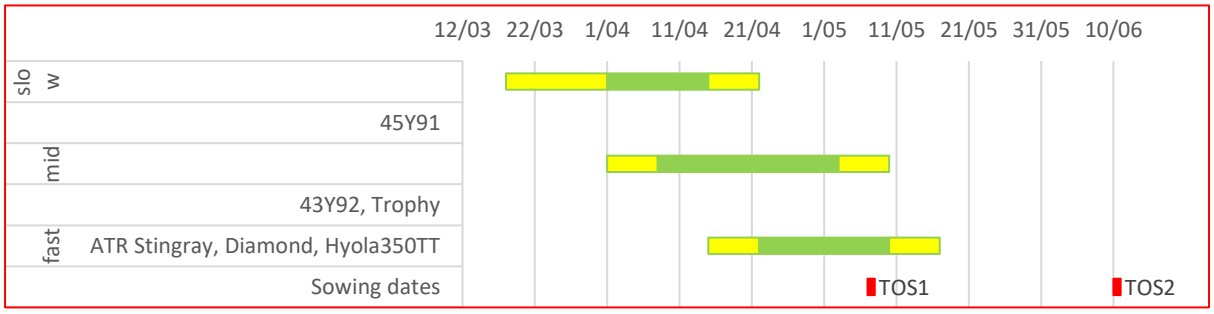

Figure 1 and shows that TOS1 is towards the end of the ideal window for most varieties.

The TOS2 is well over a month later than the recommendations (yellow and green bars), and well outside of what growers would consider in this environment.

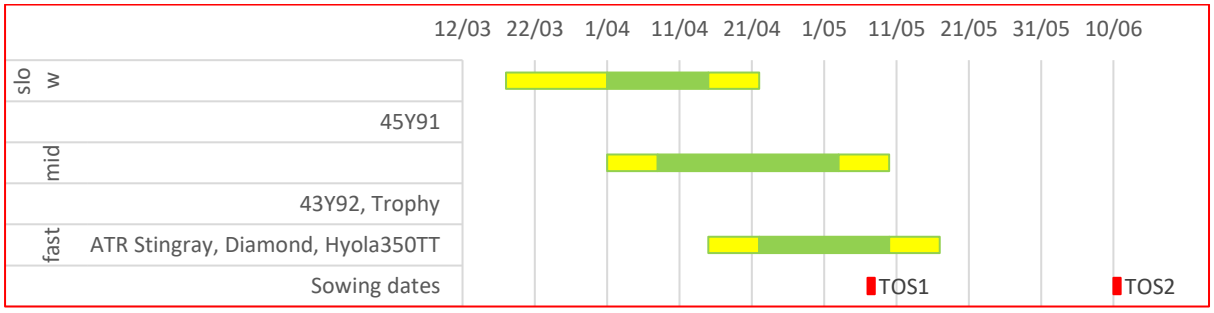

Figure 1. Sowing windows[1] and actual sowing dates

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

Plant establishment: Plant establishments were close to or above targeted populations for all varieties with differences between the populations within a variety and timing (**Figure 2**).

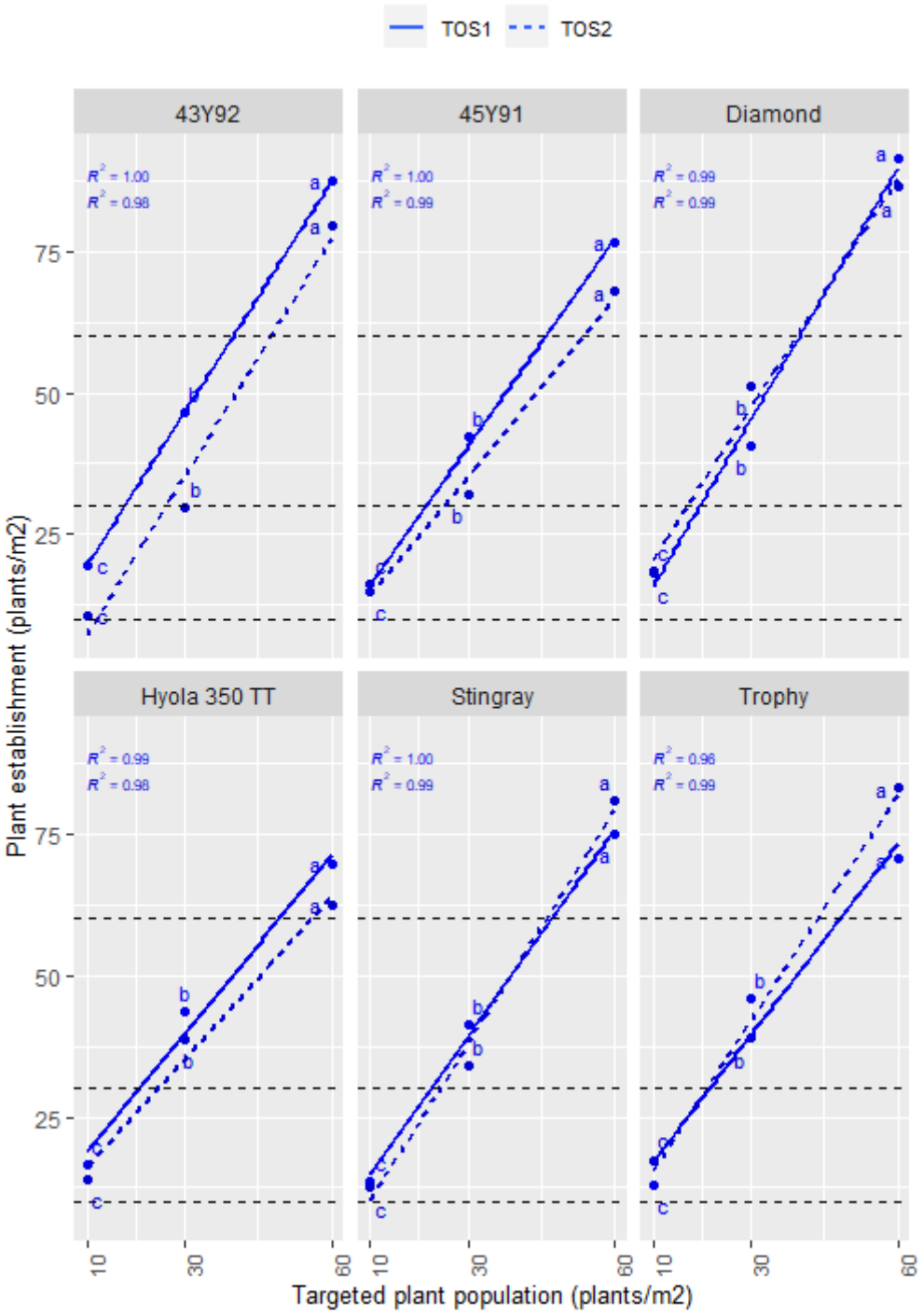

Figure 2. Plant establishment versus targeted plant population. Horizontal dashed lines are target of 10, 30 and 60 plants/m^2. Treatments with the same letter within a variety and timing are not significantly different.

Yield: Increasing target populations from 10 to 30 plants/m^2 increased yields, regardless of variety or TOS. The TOS2 had a lower yield than TOS1 and there were considerable yield differences between varieties (**Figure 3**).

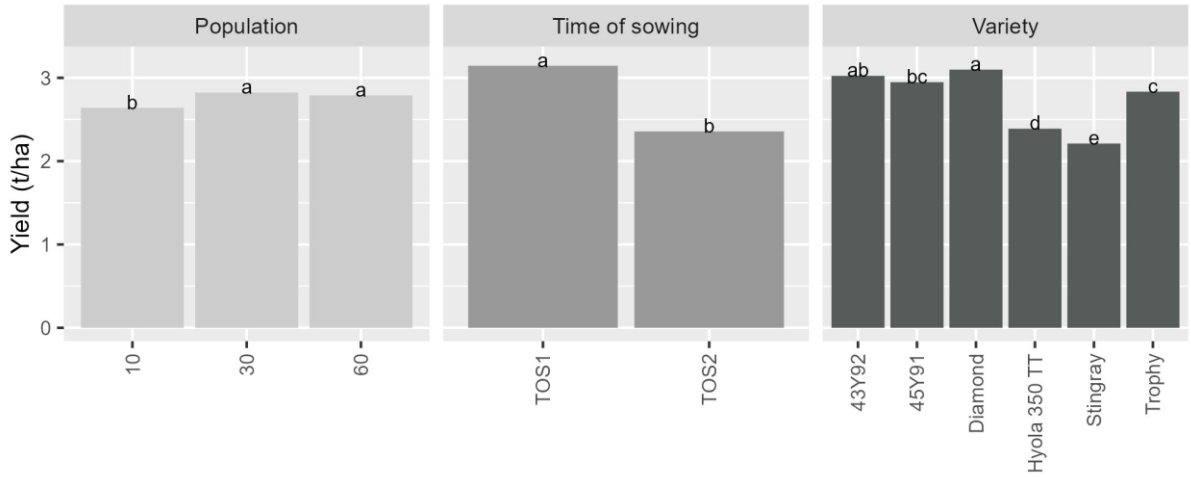

Figure 3. Canola yields (t/ha) by plant populations, TOS and variety. Results with the same letter within each treatment are not significantly different.

There were interactions between all the treatments (**Figure 4**)

Population and variety: (Figure 4A) Trophy and Stingray tended towards higher yields with increasing populations, Diamond tended to decrease while the others showed little or no response.

Timing and variety: (Figure 4B) All varieties had higher yields for TOS1 than TOS2. The increase in yields was more that 0.5 t/ha for all varieties, except Diamond and Hyola 350.

Timing and population: (Figure 4C) At the later TOSs the lowest population had the lowest yield, while TOS1 with the highest population had a lower yield than the median.

Timing and phosphorus: (Figure 4D) There was a modest response to P at both TOSs.

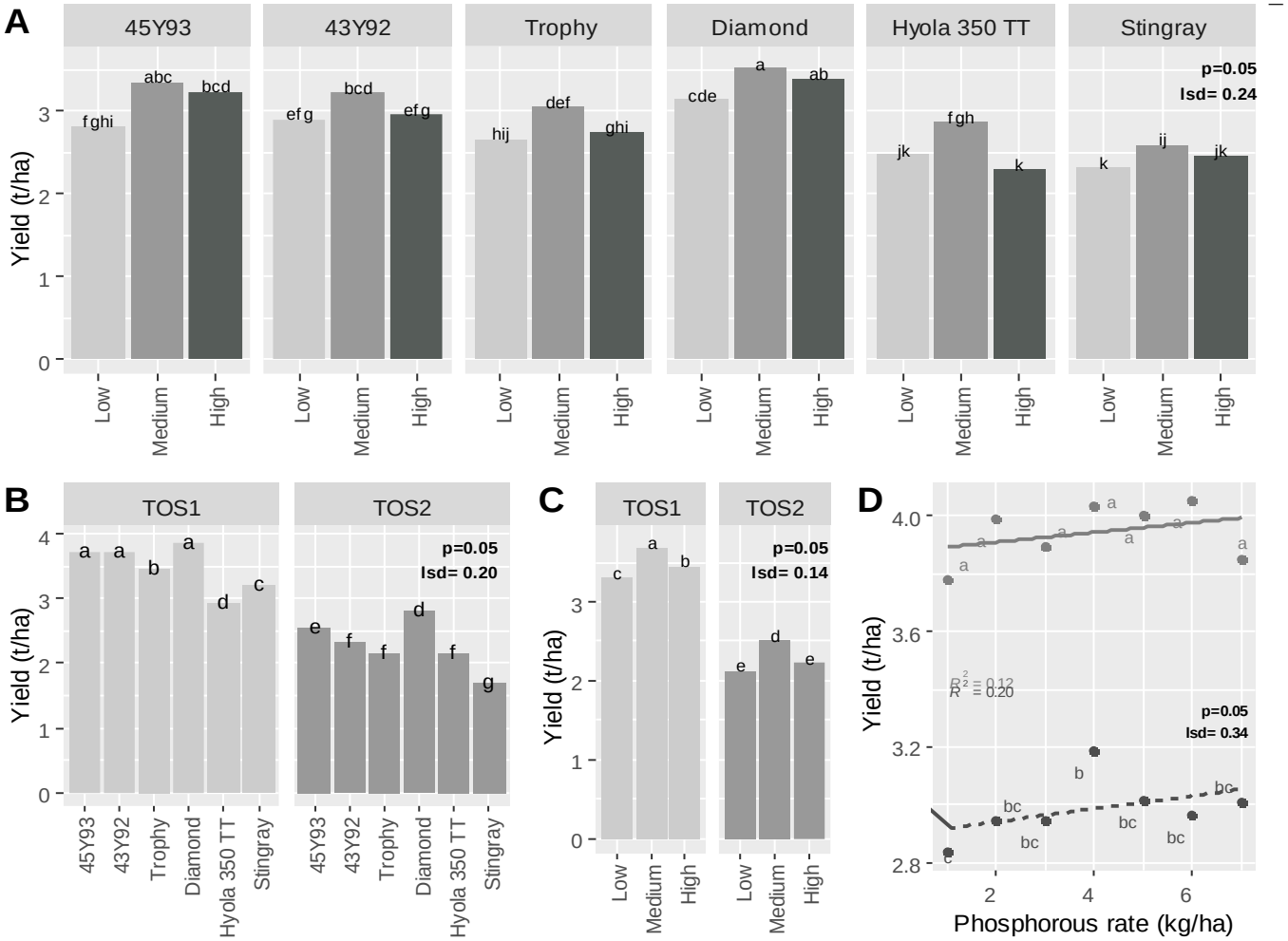

Figure 4. Canola yields as influenced by A. plant populations and variety, B. TOS and variety, C. TOS and population and D. TOS and P rate. Results with the same letter within each facet are not significantly different.

Timing and population and variety: see Figure 5

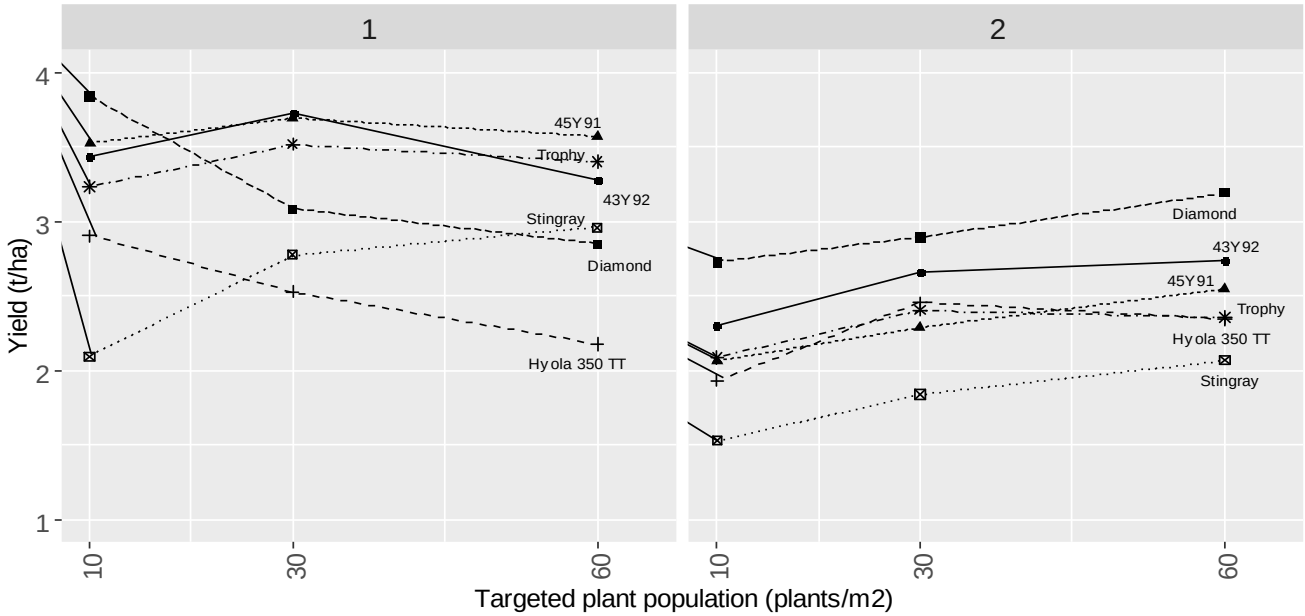

Figure 5. Canola yields (t/ha) as influenced by plant populations, time of sowing and variety.

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 maybe 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[2] suggesting that varieties that accumulate the earliest biomass have the higher yield potential, even under tough finishes.

As expected, sowing date had a big influence on yield, with TOS1 outyielding TOS2 more than 1 t/ha, however the yields achieved were at the later timing were still very robust. Having a higher population was more important at the later TOS likely due to the reduced time for compensatory growth by the plant. The target population of 10 plants/m^2 was too low to optimise yield while there was little benefit from increasing the population >30 plants/m^2 for either TOS.

There was a large varietal response in this trial. Diamond performed very well and even when it was sown well outside its recommended window, outyielding both Stingray and Hyola 350 that was planted in their 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.

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

Conclusion

Late sown canola can perform well enough to be economically competitive with crops that might otherwise be sown, such as barley.

For growers to have more confidence in maintain canola in the rotation selection of more vigorous varieties such as hybrids and using robust sowing rates are recommended.

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 the Norrie family at Eugowra who hosted this trial.

DISCLAIMER — TECHNICAL

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Appendix: Results table

Time of sowing	Variety	Target population	Plant establishment (plants/m2)		Vegetation index (ndvi)		Yield (t/ha)		Oil (%)	
			p.v.[1]	s1[2]	p.v.[3]	s1[1]	p.v.[2]	s1[3]	p.v.[1]	s1[2]
1										
	43Y92	High	87.4	ab			3.3	cdef	41.5	ghijk
	45Y91	High	76.5	bcd			3.6	abc	42.0	cdefghij
	Diamond	High	91.5	a			2.8	hijk	39.7	n
	Hyola 350 TT	High	69.7	cde			2.2	pqrs	41.4	ijkl
	Stingray	High	75.0	bcde			3.0	fghij	43.0	ab
	Trophy	High	70.7	cde			3.4	bcde	43.7	a
	43Y92	Low	19.7	klm			3.4	bcde	42.4	bcdefg
	45Y91	Low	14.9	m			3.5	abcd	42.7	bcd
	Diamond	Low	18.6	lm			3.8	a	41.9	defghijk
	Hyola 350 TT	Low	16.5	lm			2.9	ghij	42.6	bcdef
	Stingray	Low	13.6	m			2.1	qrs	42.8	abc
	Trophy	Low	13.1	m			3.2	defg	42.8	abc
	43Y92	Medium	46.4	gh			3.7	ab	41.4	hijkl
	45Y91	Medium	42.3	ghij			3.7	ab	42.0	cdefghij
	Diamond	Medium	40.8	ghij			3.1	efghi	42.4	bcdefgh
	Hyola 350 TT	Medium	43.5	ghi			2.5	klmno	42.0	cdefghij
	Stingray	Medium	41.2	ghij			2.8	ijkl	43.0	ab
	Trophy	Medium	46.0	gh			3.5	abcd	42.6	bcde
2										
	43Y92	High	79.5	abcd	0.8	ab	2.7	ijklm	41.8	efghijk
	45Y91	High	67.8	de	0.8	a	2.5	klmno	41.1	jklm
	Diamond	High	86.2	ab	0.7	abcde	3.2	defgh	40.2	mn
	Hyola 350 TT	High	62.5	ef	0.8	abc	2.3	nopqr	41.7	fghijk
	Stingray	High	80.8	abcd	0.7	abcd	2.1	rs	42.4	bcdef
	Trophy	High	83.1	abc	0.8	ab	2.4	nopqr	42.1	bcdefghi
	43Y92	Low	10.7	m	0.6	e	2.3	opqr	41.9	defghijk
	45Y91	Low	16.1	m	0.6	cde	2.1	rs	41.1	klm
	Diamond	Low	18.1	lm	0.7	bcde	2.7	ijklm	41.3	ijkl
	Hyola 350 TT	Low	14.1	m	0.6	de	1.9	s	42.1	cdefghi
	Stingray	Low	12.5	m	0.6	de	1.5	t	42.1	bcdefghi
	Trophy	Low	17.4	lm	0.7	cde	2.1	qrs	42.6	bcdef
	43Y92	Medium	29.7	jkl	0.8	ab	2.7	jklmn	41.8	efghijk
	45Y91	Medium	32.1	ijk	0.7	bcde	2.3	opqr	41.1	jklm
	Diamond	Medium	51.3	fg	0.8	a	2.9	ghij	40.6	lmn
	Hyola 350 TT	Medium	38.6	ghij	0.8	abc	2.5	lmnop	41.7	fghijk
	Stingray	Medium	34.1	hij	0.7	cde	1.8	st	42.3	bcdefgh
	Trophy	Medium	38.9	ghij	0.8	abc	2.4	mnopq	42.4	bcdef
lsd										
			13.6		0.1		0.3		0.9	

[1] predicted value

[2] values with the same letter for each variable are not significantly different