Comparison of canola varieties; including genetically modified options

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Key findings

- Canola varieties performed exceptionally well at Hart in 2022, yielding 2.55 – 3.29 t/ha resulting from above average rainfall.
- Oil content (%) was high across the trial, achieving > 49%, leading to oilseed premiums for growers.
- The highest yielding GM varieties were; Pioneer 44Y30 RR (3.29 t/ha), InVigor LR (3.15 t/ha), InVigor R 4520 (3.17 t/ha) and dual tolerance variety Nuseed Emu TF (3.13 t/ha).
- New conventional variety Outlaw yielded similarly to current commercial varieties Nuseed Diamond and Nuseed Quartz, achieving an average of 3.0 t/ha.
- Triazine tolerant varieties also yielded well ranging between 2.55 – 3.03 t/ha. The highest yielding varieties were HyTTec Trophy, InVigor T 4510, RGT Capacity TT, SF Dynatron TT, RGT Baseline and testing line SFR65-064TT.
- All canola varieties were profitable at Hart in 2022, with gross margins ranging from $1,244 – $1,610 per hectare. Gross margin and yield data from 2021 shows the importance of variety selection on return ($/ha) with a number of varieties performing well in lower rainfall years at Hart.

Introduction

In 2021, South Australian mainland growers saw the 16-year moratorium on genetically modified (GM) crops lifted for commercial use. The addition of glyphosate and glufosinate tolerant technologies in canola (including dual tolerance), provide additional varietal options for mainland growers with in-crop herbicide registrations (Group 9 & 10) new to broadacre agriculture.

An ongoing variety trial compares the performance of new canola varieties, including genetically modified (GM) options; Roundup Ready®, TruFlex® and LibertyLink®, alongside current conventional, Triazine Tolerant (TT) and Clearfield® (CL) varieties.

Methodology

Plot size	2.0 m x 10.0 m	**Fertiliser**	Seeding: DAP (18:20) Zn 1% + Impact @ 80 kg/ha
Seeding date	June 9, 2022		July 22: Easy N (42.5:0) @ 70 L/ha
Location	Hart, SA		Aug 17: Easy N (42.5:0) @ 90 L/ha
Harvest date	December 1, 2022	**Soil available N**	62 kg N/ha (depth to 90 cm)
Previous crop	Oaten hay		

In 2022 there were 28 canola varieties trialed at Hart, each technology was set up as a randomised block design with three replicates. The trial was managed with the appropriate application of pesticides to ensure a weed, insect and disease-free canopy. All plots were assessed for crop establishment (plants/m^2), NDVI (Normalised Difference Vegetation Index) to measure crop vigour, flowering date (50% flower), crop yield (t/ha) and oil content (%). Canola gross margins were also calculated for the 2021 and 2022 seasons.

Results and discussion

Oilseed yield and oil content

Canola varieties yielded exceptionally well at Hart in 2022, with yields ranging between 2.55 – 3.29 t/ha. This was a result of above average annual and growing season rainfall and was in contrast to 2020, where canola yields were below average, achieving 0.66 – 1.26 t/ha.

New conventional variety Outlaw yielded similarly to current commercial varieties, Nuseed Diamond and Nuseed Quartz, achieving an average of 3.0 t/ha. Outlaw was a new variety trialed at Hart and is an early-maturing open pollinated (OP) variety. Oil content for these three conventional varieties was high ranging from 49.4 – 50.2%.

Triazine tolerant varieties also yielded well ranging between 2.55 – 3.03 t/ha. The highest yielding varieties were HyTTec Trophy, InVigor T 4510, RGT Capacity TT, SF Dynatron TT, RGT Baseline and testing line SFR65-064TT yielding an average of 2.97 t/ha. Similar to conventional varieties, oil content was high, ranging from 48.7 – 50.2%.

Yield performance for new genetically modified varieties was excellent, achieving yields above 3 t/ha. The highest yielding GM varieties were; Pioneer 44Y30 RR (3.29 t/ha), InVigor LR (3.15 t/ha), InVigor R 4520 (3.17 t/ha) and dual tolerance variety Nuseed Emu TF (3.13 t/ha). Pioneer 44Y30 RR and InVigor LR also achieved very high oil content > 50%, similarly to Hyola 410XX and Hyola Garrison XC.

All canola varieties were profitable at Hart in 2022, with gross margins ranging from $1,244 – $1,610 per hectare (excluding oil premiums) (Table 3). It was evident that seasonal conditions in 2022 were favourable for canola production, with decile 8 growing season rainfall (355 mm) and decile 10 annual rainfall (519 mm) contributing to grain yield potential. At Hart in 2021, rainfall was below average for most months (excluding July and late August), contributing to yield reduction through reduced soil moisture and nitrogen, contributing to crop stress. Gross margins and yield data from 2021 show the importance of variety selection on return ($/ha) with a number of varieties performing well in lower rainfall years at Hart, and more broadly across the Mid-North region (Table 3).

Flowering

Field trials conducted across five years (2014 – 2018) through the GRDC Optimised Canola Profitability project have shown that the optimum start of flowering (OSF) date for canola at Hart is from July 25, with a large OSF window up to 37 days. This means it is ideal for canola to start flowering between July 25 and August 31 to minimise heat and water stress (Lilley 2018), however flowering dates will vary depending on crop phenology of varieties (time from sowing to flowering).

The first varieties to flower at Hart prior to August 31, 2021 were earlier maturing varieties Nuseed Diamond, HyTTec Velocity, InVigor R 4520P, Nuseed Emu TF and 43Y92 CL from late August (Figure 1).

Table 1. Summary of oilseed yield (t/ha) and oil content (%) for canola varieties trialed at Hart in 2022. Shaded values in each column show the highest performing varieties in each technology.

Technology	Variety	Yield (t/ha)	% of average	Oil content (%)	% of average
Conventional	Outlaw(b)	2.96	99	50.2	101
	Nuseed® Quartz	2.99	100	49.4	99
	Nuseed® Diamond	3.04	101	49.5	100
	Average	**3.00**	**100**	**49.7**	**100**
	LSD (P≤0.05)	**NS**		**NS**	
Triazine tolerant & dual triazine and imidazolinone tolerant varieties (CT)	ATR-Bluefin(b)	2.55	89	49.3	100
	ATR-Bonito(b)	2.69	94	50.2	102
	Hyola® Blazer TT	2.88	100	49.4	101
	Hyola® Enforcer CT	2.80	97	48.3	98
	HyTTec® Trophy	2.94	102	48.1	98
	HyTTec® Velocity	2.81	98	49.1	100
	InVigor® T 4510	2.91	101	48.8	99
	Renegade TT (b)	2.89	101	49.1	100
	RGT Capacity™ TT	3.03	106	49.5	101
	SF Dynatron TT	3.00	104	49.4	101
	RGT Baseline	2.99	104	49.1	100
	SFR65-064TT	2.99	104	48.7	99
	Average	**2.87**	**100**	**49.08**	
	LSD (P≤0.05)	**0.12**		**NS**	
Genetically modified	Pioneer® 44Y27 RR	3.01	99.26	49.33	99
	Pioneer® 44Y30 RR	3.29	108.64	50.10	101
	Hyola® 410XX	2.77	91.40	50.73	102
	Hyola® Battalion XC	2.79	92.13	49.40	99
	Hyola® Garrison XC	2.91	96.22	50.67	102
	InVigor® LR	3.15	103.92	50.50	101
	InVigor® R 4520	3.17	104.61	48.60	98
	Nuseed® Emu TF	3.13	103.29	49.83	100
	Nuseed® Raptor TF	3.04	100.52	49.10	99
	Average	**3.03**	**100**	**49.81**	**100**
	LSD (P≤0.05)	**0.21**		**0.87**	
Imidazolinone tolerant varieties	Pioneer® 43Y92 CL	2.80	95.19	50.07	100
	Pioneer® 44Y94 CL	3.21	109.20	50.23	100
	Pioneer® 45Y95 CL	3.08	104.61	49.23	98
	Hyola® Equinox CL	2.68	91.00	51.10	102
	Average	**2.94**	**100**	50.16	**100**
	LSD (P≤0.05)	**0.18**		0.54	

Imidazolinone tolerant varieties = Clearfield® technology (CL)

Table 2. Long term yield data for canola varieties at Hart from 2021 – 2022.

		% Trial average		Yield (t/ha)
Technology	**Variety**	**2021**	**2022**	**2022**
Conventional	Outlaw(b)		99	2.96
	Nuseed® Quartz	98	100	2.99
	Nuseed® Diamond	102	101	3.04
	Average	**100**	**100**	**3.00**
Triazine tolerant (TT) & dual triazine and imidazolinone tolerant varieties (CT)	ATR-Bluefin(b)	72	89	2.55
	ATR-Bonito(b)	78	94	2.69
	Hyola® Blazer TT	108	100	2.88
	Hyola® Enforcer CT	107	97	2.80
	HyTTec® Trophy	97	102	2.94
	HyTTec® Trifecta	99		
	HyTTec® Trident	120		
	HyTTec® Velocity		98	2.81
	InVigor® T 4510	123	101	2.91
	Renegade TT(b)		101	2.89
	RGT Capacity™ TT	95	106	3.03
	SF Dynatron TT	105	104	3.00
	SF Spark	97		
	RGT Baseline		104	2.99
	SFR65-064TT		104	2.99
	Average	**100**	**100**	**2.87**
Genetically modified	Pioneer® 44Y27 RR	114	99	3.01
	Pioneer® 44Y30 RR		109	3.29
	Pioneer® 45Y28 RR	115		
	Hyola® 530 XT	71		
	Hyola® 410XX	95	91	2.77
	Hyola® Battalion XC	88	92	2.79
	Hyola® Garrison XC	98	96	2.91
	InVigor® LR		104	3.15
	InVigor® R 4520P		105	3.17
	InVigor® R 4022P	102		
	Nuseed® Emu TF	113	103	3.13
	Nuseed® Raptor TF	105	100	3.04
	Average	**100**	**100**	**3.03**
Imidazolinone tolerant varieties	Pioneer® 43Y92 CL	100	95	2.80
	Pioneer® 44Y94 CL	110	109	3.21
	Pioneer® 45Y95 CL	96	105	3.08
	Hyola® Equinox CL		91	2.68
	Saintly(b)	108		
	Banker CL	86		
	Average	**100**	**100**	**2.94**
	Sowing date	May 3 (dry)	June 9	
	Apr-Oct ran (mm)	231	355	
	Annual rain (mm)	401	519	

Table 3. Gross margins for trialed conventional, Roundup Ready®, TruFlex®, CL and TT canola technologies. Input costs and sale price sourced from: Farm Gross Margin and Enterprise Planning Guide, 2022.

Technology	Variety	2022 Grain yield (t/ha)	Partial gross margin $/ha 2021	2022
Conventional	Outlaw(b)	2.96		$ 1,478
	Nuseed® Quartz	2.99	$ 190	$ 1,500
	Nuseed® Diamond	3.04	$ 223	$ 1,537
Triazine Tolerant	ATR-Bluefin(b)	2.55	-$ 105	$ 1,169
	ATR-Bonito(b)	2.69	-$ 68	$ 1,470
	Hyola® Blazer TT	2.88	$ 78	$ 1,411
	Hyola® Enforcer CT	2.80	$ 72	$ 1,353
	HyTTec® Trophy	2.94	$ 24	$ 1,455
	HyTTec® Velocity	2.81		$ 1,360
	InVigor T® 4510	2.91	$ 153	$ 1,433
	Renegade TT (b)	2.89		$ 1,419
	RGT Capacity™ TT	3.03	$ 13	$ 1,521
	SF Dynatron TT	3.00	$ 62	$ 1,499
	RGT Baseline	2.99		$ 1,492
	SFR65-064TT	2.99		$ 1,492
Genetically modified	Pioneer® 44Y27 RR	3.01	$ 135	$ 1,413
	Pioneer® 44Y30 RR	3.29		$ 1,610
	Hyola® 410XX	2.77	$ 32	$ 1,244
	Hyola® Battalion XC	2.79	$ 2	$ 1,258
	Hyola® Garrison XC	2.91	$ 52	$ 1,342
	InVigor ®LR	3.15		$ 1,512
	InVigor® R 4520	3.17		$ 1,526
	Nuseed® Emu TF	3.13	$ 130	$ 1,497
	Nuseed® Raptor TF	3.04	$ 86	$ 1,434
Imidazolinone tolerant varieties	Pioneer® 43Y92 CL	2.8	$ 186	$ 1,335
	Pioneer® 44Y94 CL	3.21	$ 250	$ 1,635
	Pioneer® 45Y95 CL	3.08	$ 158	$ 1,540
	Hyola® Equinox CL	2.68		$ 1,247

**This data should be used a guide and is based on 2021 and 2022 forecasted pricing only.*

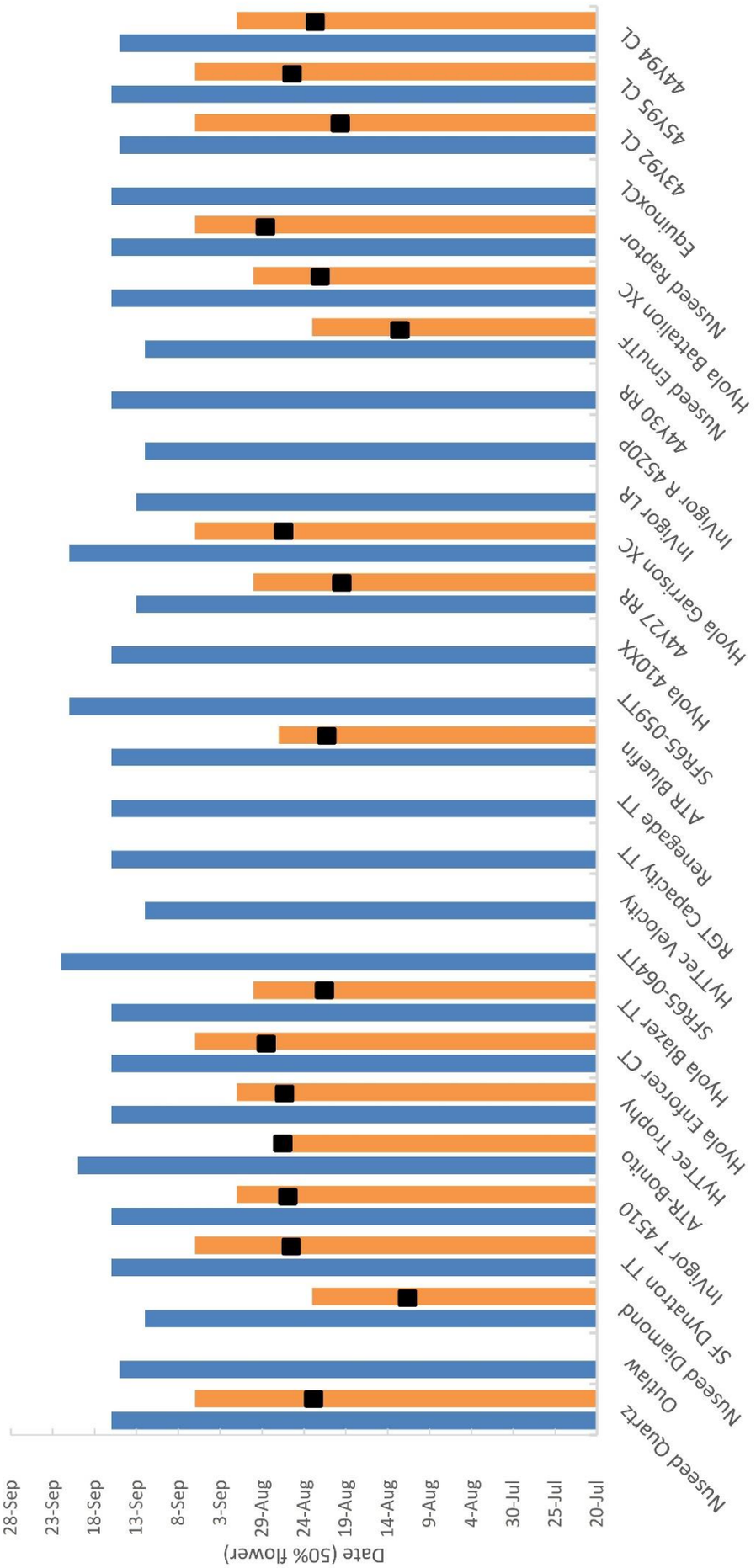

Figure 1. Flowering dates (50% flower) for canola varieties trialed at Hart in 2021 – 2022. The black squares (■) indicate start of flowering dates for canola trialed in 2021.

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References

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Useful Resources

Canola Flowering calculator
https://www.canolaflowering.com.au/