

# Comparison of canola varieties - including genetically modified options

Rebekah Allen and Kaidy Morgan  
Hart Field-Site Group

## Key findings

- Despite a dry spring, canola performed well at Hart in 2023 with oilseed yields ranging from 1.71 to 2.75 t/ha.
- Several varieties produced high yields including conventional variety Nuseed Diamond, Clearfield® varieties Nuseed Ceres and Pioneer PY421C, genetically modified varieties Nuseed Hunter (TruFlex®) and Pioneer 44Y30 RR (Roundup Ready®), ranging from 2.55 to 2.75 t/ha.
- Overall yield penalties were observed for TT canola options, achieving 2.02 t/ha, a grain yield reduction of up to 0.44 t/ha when compared to other technology traits.
- All varieties, except for HyTTec Trophy, HyTTec Velocity, PY520TC and RGT Capacity achieved oil content above 42%, contributing to oil premiums that improve gross margins (\$/ha).

## Aim

In 2021, South Australian mainland growers saw the 16-year moratorium on genetically modified (GM) canola for commercial use lift. The addition of glyphosate and glufosinate tolerant technologies (including dual tolerance) provides additional varietal options for 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

A trial was implemented to evaluate the performance of canola varieties at Hart, SA in 2023 (Table 1). The trial was designed as a multistratum split-plot design, with 30 canola varieties blocked by technology across three replicates.

Table 1. Trial details for canola variety comparison at Hart, SA in 2023.

<b>Plot size</b>	2.0 m x 10.0 m	<b>Starting soil N</b>	105 kg N/ha (depth to 90 cm)
<b>Seeding date</b>	April 21, 2023	<b>Fertiliser</b>	Seeding: DAP (18:20) Zn 1% + Impact @ 80 kg/ha
<b>Location</b>	Hart, SA		June 15: 37 kg N/ha (applied as urea)
<b>Harvest date</b>	November 1, 2023		August 16: 37 kg N/ha (applied as urea)
<b>Previous crop</b>	Oaten hay		

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<sup>2</sup>), flowering date (50% flower), crop yield (t/ha) and oil content (%). Canola partial gross margins (PGM) were also calculated for 2023 season as (grain yield x price) – (seed + herbicide cost).

Ten new varieties were included at Hart in 2023 including Triazine Tolerant (TT) varieties ATR-Swordfish, CT107 and Pioneer PY520 TC (stacked TT & Clearfield® tolerance), Hyola 410XX (TruFlex®), Nuseed Hunter (TruFlex®) stacked TruFlex® and Clearfield® varieties Hyola Battalion XC and Hyola Regiment XC and Clearfield® varieties Hyola Solstice CL, Nuseed Ceres and Pioneer PY421C.

## Results and discussion

### *Canola yield and oil content*

Excellent canola yields ranging from 1.71 – 2.75 t/ha were observed at Hart in 2023 (Table 2) and can be attributed to an April sowing after opening rains that favoured early crop establishment and biomass production. Of particular note, conventional variety Nuseed Diamond, Clearfield® varieties Nuseed Ceres, Pioneer PY421C and genetically modified varieties Nuseed Hunter (TruFlex®) and Pioneer 44Y30 RR (Roundup Ready®) produced yields of 2.55 – 2.75 t/ha.

Overall yield penalties were observed for TT canola options, achieving 2.02 t/ha, a grain yield reduction of up to 0.44 t/ha when compared to other technology traits.

Longer-term yield data at Hart (2021 – 2023) shows that Nuseed Diamond, Hyola Blazer TT, Nuseed Emu TF and Pioneer 44Y94 CL have performed well across multiple seasons within each technology (Table 3). Varieties that were evaluated over two seasons and performed well include RGT Baseline, SFR65-064TT, Pioneer 44Y30 RR and InVigor LR (Table 3). A number of newer lines trialed in 2023 also performed well but require further evaluation across multiple seasons.

Canola oil content (%) ranged from 41.4 – 45% with a number of varieties across herbicide technologies performing well. Varieties with superior oil content included Nuseed Quartz, RGT Baseline, Hyola Garrison XC, Hyola Regiment XC, Nuseed Emu TF, Pioneer 43Y92 CL and Pioneer 44Y94 CL. Nuseed Ceres also performed similarly, achieving both high yield and oil content.

Of the 30 varieties trialed, 26 achieved oil content above 42%, contributing to oil premiums (Table 2). The exceptions were HyTTec Trophy, HyTTec Velocity, Pioneer PY520 TC and RGT Capacity.

### *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 of up to 37 days. This means it is ideal for canola to start of 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). First flower (growth stage 60 – first flowers open) occurred from July 10 to August 11 at Hart in 2023. Early maturing variety Nuseed Diamond was the first to flower with RGT Baseline TT (SFR65-059TT) the last to flower on August 11. Most varieties had reached 50% flower by late July – early August (Figure 1).

Table 2. Summary of canola yield (t/ha) and oil content (%) for varieties trialed at Hart in 2023. Shaded values in each column show the highest performing varieties across the trial. Partial gross margin (\$/ha) was also calculated ((grain yield x price) – (seed + herbicide cost)) and should be used as a guide only. Costings based on 2024 forecasted pricing only and are sourced from the Farm Gross Margin Guide, 2024. Costings do not include oil premiums or discounts, expected to be an additional 1.5% of the price per tonne for every 1% oil content above or below 42% (PGM shading represents varieties which would receive a premium in 2023).

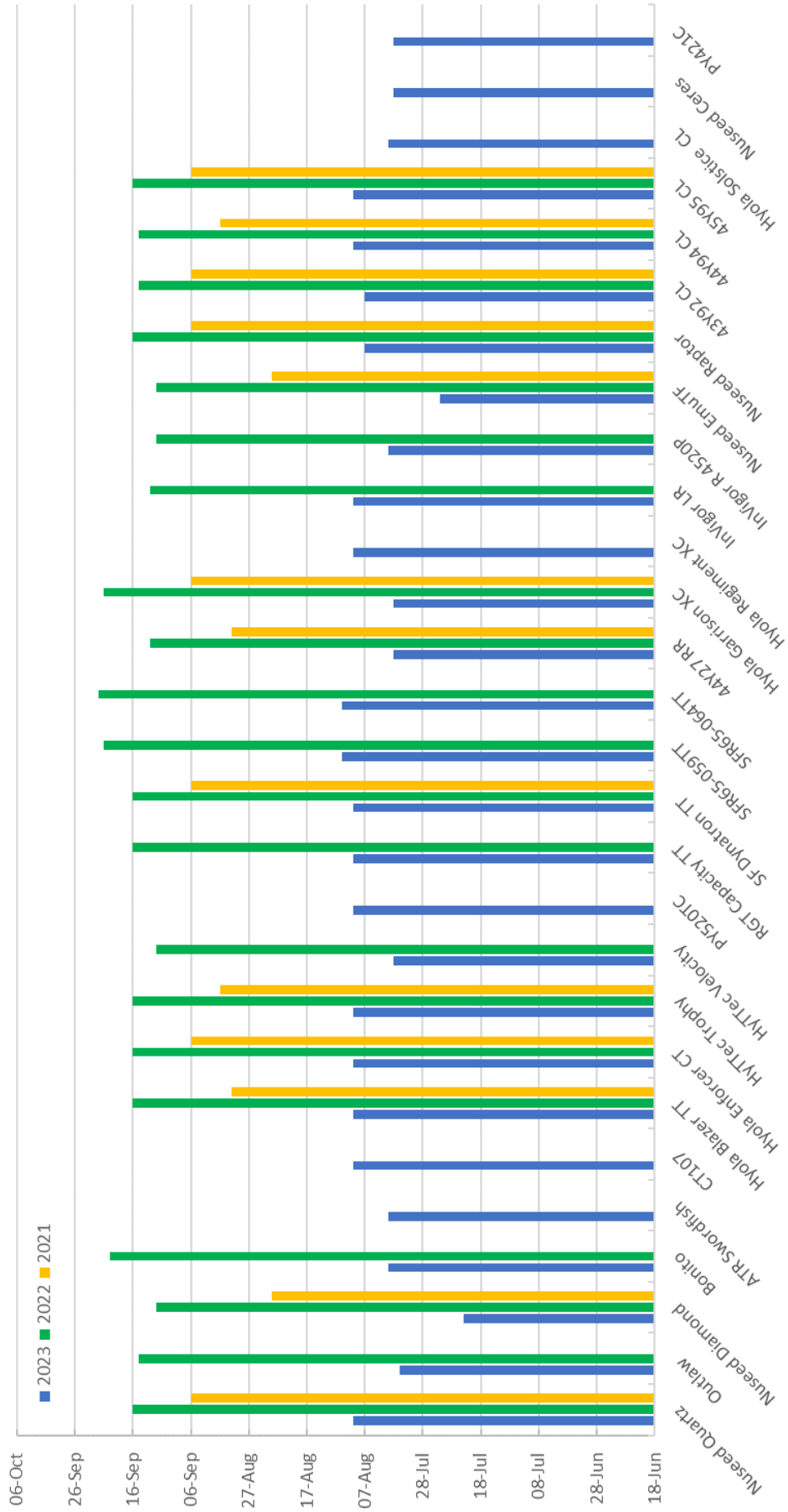
Technology	Variety	Yield (t/ha)	Oil content (%)	Partial gross margin (\$/ha)	Yield (t/ha)	Oil content (%)
Conventional	Outlaw <sup>(b)</sup>	2.26 <sup>f-h</sup>	43.0 <sup>d-h</sup>	\$1,350	2.46 <sup>b</sup>	43.4 <sup>ab</sup>
	Nuseed <sup>®</sup> Quartz	2.39 <sup>h-j</sup>	44.4 <sup>k-p</sup>	\$1,437		
	Nuseed <sup>®</sup> Diamond	2.75 <sup>l</sup>	43.1 <sup>d-i</sup>	\$1,668		
Triazine Tolerant (TT) & dual triazine Clearfield <sup>®</sup> (CT)	ATR-Bonito <sup>(b)</sup>	1.86 <sup>ab</sup>	43.0 <sup>d-i</sup>	\$1,081	2.02 <sup>a</sup>	42.6 <sup>a</sup>
	ATR-Swordfish <sup>(b)</sup>	1.71 <sup>a</sup>	43.4 <sup>e-k</sup>	\$981		
	CT107	2.14 <sup>ef</sup>	43.4 <sup>d-k</sup>	\$1,260		
	Hyola <sup>®</sup> Blazer TT	2.07 <sup>c-f</sup>	43.1 <sup>d-j</sup>	\$1,214		
	Hyola <sup>®</sup> Enforcer CT	2.12 <sup>def</sup>	42.5 <sup>a-e</sup>	\$1,238		
	HyTTec <sup>®</sup> Trophy	2.13 <sup>def</sup>	41.7 <sup>abc</sup>	\$1,255		
	HyTTec <sup>®</sup> Velocity	2.18 <sup>efg</sup>	41.4 <sup>a</sup>	\$1,284		
	Pioneer <sup>®</sup> PY520 TC	2.11 <sup>def</sup>	41.4 <sup>a</sup>	\$1,239		
	RGT Capacity <sup>™</sup> TT	1.87 <sup>abc</sup>	41.6 <sup>ab</sup>	\$1,084		
	SF Dynatron <sup>®</sup> TT	1.93 <sup>bcd</sup>	43.5 <sup>e-m</sup>	\$1,123		
RGT Baseline <sup>™</sup>	2.02 <sup>b-e</sup>	45.0 <sup>p</sup>	1,179			
SFR65-064TT	2.07 <sup>def</sup>	42.5 <sup>b-e</sup>	\$1,217			
Genetically modified (glyphosate or glufosinate tolerant)	Pioneer <sup>®</sup> 44Y27 RR	2.4 <sup>hij</sup>	43.0 <sup>d-g</sup>	\$1,417	2.48 <sup>b</sup>	44.0 <sup>b</sup>
	Pioneer <sup>®</sup> 44Y30 RR	2.63 <sup>kl</sup>	44.7 <sup>nop</sup>	\$1,567		
	Hyola <sup>®</sup> Garrison XC	2.37 <sup>g-j</sup>	44.7 <sup>mop</sup>	\$1,385		
	Hyola <sup>®</sup> Regiment XC	2.35 <sup>ghi</sup>	44.8 <sup>op</sup>	\$1,369		
	InVigor <sup>®</sup> LR	2.54 <sup>ijk</sup>	44.6 <sup>l-p</sup>	\$1,508		
	InVigor <sup>®</sup> R 4520P	2.39 <sup>hij</sup>	42.1 <sup>a-d</sup>	\$1,410		
	Nuseed <sup>®</sup> Emu TF	2.48 <sup>ijk</sup>	44.2 <sup>g-p</sup>	\$1,470		
	Nuseed <sup>®</sup> Hunter	2.68 <sup>kl</sup>	43.4 <sup>e-k</sup>	\$1,598		
	Nuseed <sup>®</sup> Raptor TF	2.49 <sup>ijk</sup>	43.6 <sup>e-n</sup>	\$1,479		
Clearfield <sup>®</sup> (CL)	Pioneer <sup>®</sup> 43Y92 CL	2.24 <sup>fgh</sup>	44.4 <sup>k-p</sup>	\$1,314	2.45 <sup>b</sup>	43.5 <sup>b</sup>
	Pioneer <sup>®</sup> 44Y94 CL	2.51 <sup>ijk</sup>	43.7 <sup>f-o</sup>	\$1,491		
	Pioneer <sup>®</sup> 45Y95 CL	2.27 <sup>fgh</sup>	43.3 <sup>e-k</sup>	\$1,333		
	Hyola <sup>®</sup> Solstice CL	2.47 <sup>ijk</sup>	42.7 <sup>c-f</sup>	\$1,468		
	Nuseed <sup>®</sup> Ceres	2.62 <sup>kl</sup>	44.2 <sup>j-p</sup>	\$1,565		
	Pioneer <sup>®</sup> PY421 C	2.55 <sup>jkl</sup>	43.4 <sup>e-l</sup>	\$1,520		
	<b>P Value</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>		<b>&lt;0.001</b>	<b>&lt;0.001</b>

Clearfield<sup>®</sup> technology = Imidazolinone tolerant varieties

Table 3. Long-term yield data for canola varieties at Hart from 2021 – 2023. Average yield data for each variety is benchmarked within herbicide technology.

Technology	Variety	% Average			Yield (t/ha)
		2021	2022	2023	2022
Conventional	Outlaw <sup>(b)</sup>		99	92	2.26
	Nuseed <sup>®</sup> Quartz	98	100	97	2.39
	Nuseed <sup>®</sup> Diamond	102	101	111	2.75
	<b>Average</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>2.47</b>
Triazine tolerant (TT) & dual triazine and imidazolinone tolerant varieties (CT)	ATR-Bluefin <sup>(b)</sup>	72	89		
	ATR-Bonito <sup>(b)</sup>	78	94	92	1.86
	ATR Swordfish <sup>(b)</sup>			85	1.71
	CT107			106	2.14
	Hyola <sup>®</sup> Blazer TT	108	100	103	2.07
	Hyola <sup>®</sup> Enforcer CT	107	97	105	2.12
	HyTTec <sup>®</sup> Trophy	97	102	106	2.13
	HyTTec <sup>®</sup> Velocity		98	108	2.18
	InVigor <sup>®</sup> T 4510	123	101		
	Pioneer <sup>®</sup> PY520 TC			104	2.11
	Renegade TT <sup>(b)</sup>		101		
	RGT Capacity <sup>™</sup> TT	95	106	93	1.87
	SF Dynatron <sup>®</sup> TT	105	104	96	1.93
	RGT Baseline <sup>™</sup>		104	100	2.02
	SFR65-064TT		104	103	2.07
	<b>Average</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>2.02</b>
Genetically modified (glyphosate or glufosinate tolerant)	Pioneer <sup>®</sup> 44Y27 RR	114	99	97	2.40
	Pioneer <sup>®</sup> 44Y30 RR		109	106	2.63
	Hyola <sup>®</sup> 410XX	95	91		
	Hyola <sup>®</sup> Battalion XC	88	92		
	Hyola <sup>®</sup> Garrison XC	98	96	96	2.37
	Hyola <sup>®</sup> Regiment XC			95	2.35
	InVigor <sup>®</sup> LR		104	102	2.54
	InVigor <sup>®</sup> R 4520P		105	96	2.39
	Nuseed <sup>®</sup> Emu TF	113	103	100	2.48
	Nuseed <sup>®</sup> Hunter			108	2.68
	Nuseed <sup>®</sup> Raptor TF	105	101	101	2.49
		<b>Average</b>	<b>100</b>	<b>100</b>	<b>100</b>
Clearfield <sup>®</sup> (CL)	Pioneer <sup>®</sup> 43Y92 CL	100	95	92	2.24
	Pioneer <sup>®</sup> 44Y94 CL	110	109	103	2.51
	Pioneer <sup>®</sup> 45Y95 CL	96	105	93	2.27
	Hyola <sup>®</sup> Equinox CL		91		
	Hyola <sup>®</sup> Solstice CL			101	2.47
	Nuseed <sup>®</sup> Ceres			107	2.62
	Pioneer <sup>®</sup> PY421 C			104	2.55
		<b>Average</b>	<b>100</b>	<b>100</b>	<b>100</b>
Sowing date	May 3	June 9	April 21		
Apr-Oct rain (mm)	231	355	236		
Annual rain (mm)	401	519	355		

Figure 1. Flowering dates (50% flower) for canola varieties trialed at Hart in 2021 – 2023 (not all data shown).



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## Useful Resources

2024 South Australian Crop Sowing Guide. Available online: [www.sagit.com.au](http://www.sagit.com.au)

Canola Flowering calculator. Available online: <https://www.canolaflowering.com.au/>



*Photo: Hart's regional intern Kaidy Morgan inspecting 2023 canola variety trial.*