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2019 Canola variety sowing guide for Western Australia



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Variety maturity, height and information in the relevant 'new varieties' section was provided from the company fact sheets/technical notes or directly from company representatives.

CBH Group provided data relating to the area of Western Australian canola varieties.

Acronyms and abbreviations

CBH	Co-operative Bulk Handling Ltd
CC	Conventional canola
CL	Clearfield®
DPIRD	Department of Primary Industries and Regional
EPR	End point royalties
GRDC	Grains Research and Development Corporation
Hy	hybrid
imi	imidazolinone
MET	Multi-environment trials
NVT	National Variety Trials
OP	Open pollinated
PV	Production Value (see page 6)
RR	Roundup Ready®
RZ	Rainfall zone
TT	Triazine tolerant

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2019 Canola variety guide for Western Australia

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Introduction to WA canola

There are several herbicide tolerance systems currently available in WA canola varieties.

- Triazine tolerant (TT); tolerant to selected triazine herbicides
- Roundup Ready® (RR); tolerant to Monsanto glyphosate herbicide
- Clearfield® (CL); tolerant of imidazolinone (imi) herbicides (and marketed as Clearfield®)
- Conventional canola (CC); does not have extra herbicide tolerance, but is tolerant of grass selective herbicides, as are the previous types.

There are also several 'stacked' varieties with tolerance to more than one herbicide group;

- Triazine tolerant and Roundup Ready® (TT+RR); tolerant to both triazine and glyphosate herbicides
- Triazine tolerant and Clearfield® (TT+CL); tolerant to both triazine and Clearfield® herbicides (new for 2019).

Always check suitability of herbicides by referring to herbicide label.

All canola varieties with RR tolerance were developed using single gene genetic modification (GM).

There are also different canola breeding types;

- Open pollinated (OP) and
- Hybrid (Hy).

Only TT canola is available for purchase as open pollinated varieties. Open pollinated seed is created through self pollination. Harvested OP seed is often retained on-farm for use at sowing. Hybrid seed is produced from managed crosses between different canola parent lines and is purchased each year.

Highlights for 2019

We have 13 new canola variety releases (so far) in 2018, as well as HyTTec® Trophy which was released in 2017 after the previous Canola variety guide was published.

The new varieties bring new opportunities;

1. The first variety with a combination of TT and Clearfield® tolerance, Hyola® 580CT. It is available for immediate use and can either follow Clearfield® crops or be used to broaden the weed control spectrum as both triazine and imidazolinone herbicides are registered for use in crop.
2. Inclusion of the new TruFlex® trait in Hyola® 410XX and the new stacked variety Hyola® 530XT with TT and glyphosate tolerance. The TruFlex® trait will allow for higher glyphosate rates and a wider application window, compared with the Roundup Ready trait. These two varieties will only be offered for sale if regulatory approvals are granted.

There are seven new TT varieties, four new RR varieties and two new Clearfield® varieties. 2017 NVT data is available for Advanta seeds varieties Hyola® 580CT, Hyola® 530XT and Hyola® 410XX, Pioneer varieties Pioneer 43Y29 (RR), and Pioneer 45Y93 (CL) and the Heritage seeds variety Saintry CL. Unfortunately, the remaining varieties have not been entered in NVT until this year so there is no NVT data available yet.

2017 canola varieties in WA

Open pollinated TT canola continues to be the backbone of WA canola farming at 78% of all canola area in WA for the 2017 growing season. TT hybrids accounted for a further 2%, bringing the proportion of TT canola to 80% in 2017 (Table 1). The proportion of canola sown to Roundup Ready varieties contracted to 18% of the area. This was related to the increase in canola area (from 1.2 in 2016 to 1.4 million Ha in 2017), with most of this increase being in TT canola and a small decrease in the area of GM canola sown, especially in the Geraldton zone.

Table 1 Proportion (% of total area) of canola herbicide systems in WA (Data courtesy of CBH Group)

	2014	2015	2016	2017
TT	79	72	74	80
RR	19	24	23	18
CL	1.9	1.7	1.6	1.3
TT+RR	0	1.7	1.5	0.9
CC	0.5	0.2	0.2	0.1

Table 2 Proportion (% of total area) of canola herbicide systems in CBH port zones for 2017 (Data courtesy of CBH Group)

	Esperance	Albany	Kwinana	Geraldton
TT	90.9	86.9	76.2	45.8
RR	5.3	10.9	22.3	52.9
CL	3.0	1.1	0.6	0.1
TT+RR	0.5	1.1	0.9	1.2
CC	0.3	0.0	0.0	0.0

There are differing proportions of TT/RR over the port zones. The highest proportion of TT is in the Esperance port zone (approximately 90% TT and 5% RR), followed by Albany (85/10), Kwinana (75/20) and Geraldton, where the RR proportion changed from 60% in 2016 to 50% in 2017 (Table 2).

Just two open pollinated TT varieties accounted for 67% of the WA canola crop in 2017. ATR Bonito was the most widely grown canola variety in 2017 (54%), with ATR Stingray at 13% (Table 3).

Hybrid TT varieties only account for 2% of WA canola. Hyola® 559TT remained the most popular hybrid TT variety, making up 0.6% of the total WA canola area.

Pioneer 43Y23 (RR) and Hyola® 404RR remain the most widely grown Roundup Ready (RR) varieties, at 5.3 and 4.8% of WA canola area. Pioneer 45Y88 (CL) was the most widely grown Clearfield® variety, although it was withdrawn from sale last year.

Table 3 Proportion (% of area sown) of canola varieties sown in WA 2013 to 2017 (Data courtesy of CBH Group)

Variety	Type	Release	2015	2016	2017
ATR Bonito	TT OP	2013	20.1	37.7	54.5
ATR Stingray	TT OP	2011	23.0	17.1	12.7
Pioneer 43Y23	RR Hy	2012	5.8	7.1	5.3
Hyola 404RR	RR Hy	2010	9.6	8.6	4.8
Nuseed GT-50	RR Hy	2012	4.1	3.2	2.9
ATR Mako	TT OP	2015	-	0.5	2.5
Thumper TT	TT OP	2011	2.8	2.6	2.1
Nuseed GT-53	RR Hy	2016	-	-	1.4
ATR Cobbler	TT OP	2007	3.2	1.5	0.9
Crusher TT	TT OP	2010	4.5	2.1	0.9
ATR Wahoo	TT OP	2013	0.8	0.8	0.9
ATR Gem	TT OP	2011	5.7	3.2	0.8
Sturt (TT)	TT OP	2012	2.9	2.0	0.7
Pioneer 45Y25	RR Hy	2015	0.1	0.8	0.7
Yetna	TT OP	2015	0.3	0.5	0.6
Hyola 559TT	TT Hy	2012	1.0	1.7	0.6
ATR Snapper	TT OP	2011	3.7	2.0	0.6
Hyola 650TT	TT Hy	2013	0.2	0.5	0.6
Pioneer 44Y24	RR Hy	2013	0.9	1.0	0.6
Pioneer 45Y88	CL Hy	2013	0.5	0.7	0.6
CB Telfer TT	TT OP	2008	1.3	0.4	0.5
3000TR	TT+RR Hy	2016	-	0.0	0.5
IH51 RR	RR Hy	2015	0.2	0.3	0.5
Nuseed GT-41	RR Hy	2012	1.2	0.6	0.4
Hyola 600RR	RR Hy	2015	0.3	0.4	0.4
Nuseed GT-42	RR Hy	2016	-	0.1	0.3
IH30 RR	RR Hy	2014	0.4	0.1	0.3
Hyola 525RT	TT+RR Hy	2014	1.3	1.4	0.2
Pioneer 44Y89	CL Hy	2015	0.1	0.1	0.2

Varieties shown are > 0.2% of planned canola crop area in 2017

The National Variety Trial (NVT) scheme

This report presents the results from the WA National variety trials from 2013–2017. There were 199 successful canola NVT trials in WA during this period.

The WA NVT trials comprise a mix of triazine tolerant (TT), Roundup Ready® (RR) and Clearfield® (CL) trials. TT+CL and TT+RR varieties are tested in the TT trials. Conventional canola (CC) is no longer included in WA NVT trials.

The long term MET analysis uses data from the 740 Australian NVT trials (WA, NSW, Vic and SA) from 2013-2017.

All trial results are available online, at nvtonline.com.au or on the NVT long term yield app. The National Variety Trial (NVT) scheme is a GRDC investment.

Early and Mid trials

Canola NVT trials are divided into Early and Mid trials (Figure 1). The Early trials are sown in shorter season environments that may suit early maturity varieties, largely in Agzones 1, 4 and 5. While Mid trials are sown in longer season environments, that may suit mid maturity varieties, largely in Agzones 3 and 6. Agzone 2 has a mix of both Early and Mid trials. Early and Mid trials have similar sowing times and have a similar complement of varieties.

Results from the Early and Mid series are analysed separately, requiring the results to be presented separately (Tables 5, 7 and 9).

NVT data analysis and Production Values (PVs)

NVT data is analysed in two steps to generate long term MET averages and PVs.

Single site analysis

The first step is analysing the data from each NVT site. Herbicide tolerance trials (TT, RR or CL) at the same location were analysed together, to reduce variability in the results. The analyses were used to examine the raw data, assess the spatial variability within trials and identify potential outliers.

Core statistics reported in this process include the trial mean (or average) yield and predicted yield for each variety in the trial.

The data for the trial mean yield and the 'single site predicted yields' are available at nvtonline.com.au under the 'Current trial results' tab.

Multi environment trial (MET) analysis

The second step is the multi environment trial (MET) analysis. A new MET analysis process has been used since 2017. Data from all trials across Australia from 2013-2017 were analysed together. The data from the single-site analyses were combined into a MET dataset, which incorporates all raw plot data, spatial models and outliers from the single site analysis. The analysis contains all trials conducted in Australia over the past five years and enables linkages between similar (and different) environments across the sample of geographic locations and growing seasons.

The analysis is robust because any issues with variable establishment or variable sites (for example, due to soil type or patchy insect attack) are accounted for by the linkages between environments meaning the predictions for affected varieties are not impacted.

Results of all trials in Australia are combined to generate a 'long term MET predicted yield' for each variety in each trial. A long term MET predicted yield is also generated for varieties that were not actually grown in these trials. Generation of this data is particularly valuable for the canola industry, with the rapid cycling of new varieties, meaning that variety yield estimates are not penalised if the variety was not included in high yielding trials.

The MET analysis also generates Production Values (PVs) which are a measure of any yield advantage (or disadvantage) for each variety, compared with the trial mean. This is simply the predicted yield minus the average yield of each trial. This PV allows us to isolate and compare differences between varieties and is the most reliable way to compare varieties, when all varieties are not present in every trial.

The PVs for varieties in WA trials are shown in Figures 2, 3 and 4. The associated Tables 5, 7 and 9 show the long term MET predicted yields, which are based on the trial data illustrated in the figures.

The long term MET predicted yields are available at nvtonline.com.au and the LongTerm yield app.

Oil concentration data

Oil concentrations are presented as the varietal difference compared with the average oil concentration of all varieties of the same herbicide tolerance system: TT, RR or CL (see Tables 5, 7 and 9). For example, in Table 5 the average oil concentration of TT trials is 44.6%. The oil for ATR Bonito is +1.5 percentage points different to the mean, so the average oil for ATR Bonito is 46.1%.

A single oil sample is analysed from each variety in each trial. Statistical models with effects for variety and trial were fitted to the oil data to give predicted oil concentrations by variety.

Relative value of yield and oil

Generally, yield impacts on crop financial value more than oil concentration. A relatively small yield increase of 100kg/ha will increase crop value by \$50/ha but a 1% increase in oil concentration will only contribute an extra \$7.50/t/ha to crop value (at \$500/t canola price).

The yield that is the same value as a 1% change in oil concentration (over 42%) is

- 15kg/ha for a 1t/ha crop
- 30kg/ha for a 2t/ha crop
- 45kg/ha for a 3t/ha crop.

These figures are consistent for any canola grain price, since the oil bonus is correlated with the canola price.

NVT agronomy

All NVT trials are treated with Impact-in-Furrow[®], at a rate of 400mL/ha.

Seeding rates are adjusted to target 40 plants/m² in the Early series trials and 50 plants/m² in the Mid series trials (see Figure 1 for locations).

Blackleg resistance data

The blackleg information is provided from the GRDC Factsheet, 2018 Spring Blackleg Management Guide. Please refer to this for further information about the importance of blackleg ratings, resistance groups and management of blackleg.

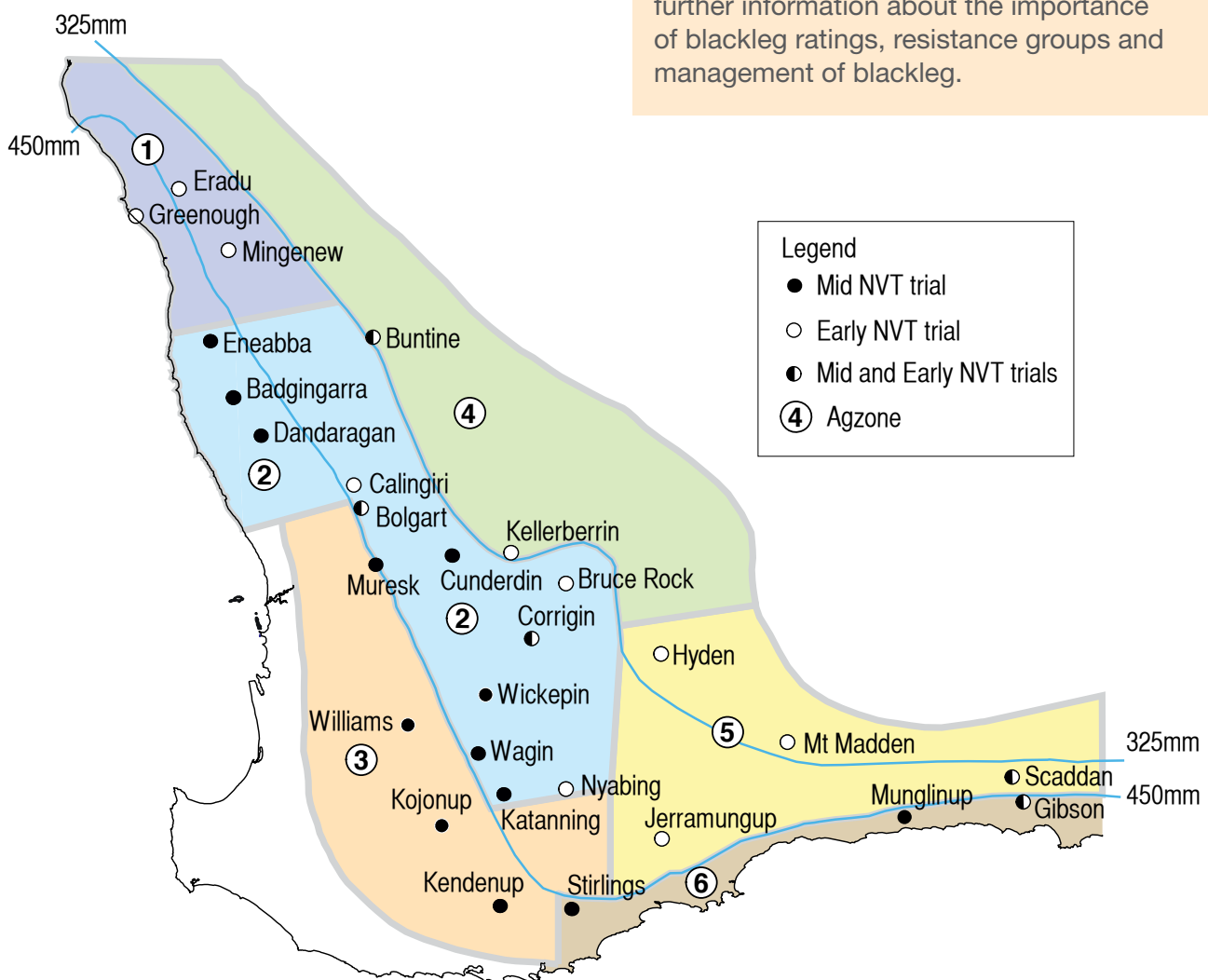


Figure 1 Distribution of Mid and Early NVT trials across Agzones in Western Australia

Triazine tolerant and 'stacked' TT+CL and TT+RR canola varieties

New TT hybrid varieties

- **InVigor® T 3510** New TT hybrid from BASF (formerly owned by Bayer). Early maturity, short-medium height. Entered into NVT for the first time in 2018, so yield data is not included in this report. InVigor® T 3510 is in 16 NVT trials in 2018 and data will be available after harvest from NVT online.
- **SF Spark TT** New release from Seed Force. Early maturity (3) TT hybrid. Medium plant height. Resistant (R) Blackleg rating for bare seed. Entered into NVT for the first time in 2018 (7 trials). SF Spark TT has the best blackleg resistance rating (R).
- **HyTTec® Trophy** (released in 2017 after variety guide publication) Early-mid maturity (4) TT hybrid variety from Nuseed. Medium height. High yields in many 2017 trials, as indicated by high long term MET yields in Table 4. End point royalty (EPR) applies.
- **Hyola® 550TT** Mid maturity (5) TT hybrid from Advanta seeds. Medium-short plant height. Entered into 12 NVT trials for the first time in 2018. Blackleg resistance groups are ABDF.
- **Pioneer 45T03(TT)** Mid season (5) maturity TT hybrid from Pioneer. Entered in 13 NVT trials for the first time in 2018.

New TT+CL hybrid variety

- **Hyola® 580CT** Hyola® 580CT has a combination of TT and CL tolerance, released by Advanta Seeds. Hyola® 580CT is medium height with mid (harvest) maturity although flowers early (similar to early maturity varieties) when sown in late March to end of April. The official blackleg rating is R-MR with resistance groups BC.

This is the first variety release with a combination of Clearfield® and TT herbicide tolerance. It is suited for low levels of group B imi residues as well as Clearfield® weed control options, including control of brome grass, barley grass, ryegrass, fumitory and dock.

New TT+RR hybrid variety

- **Hyola® 530XT** Mid maturity, medium plant height new variety from Advanta seeds. Hyola® 530XT was in the single successful WA TruFlex® NVT site at Kojonup in 2017. Provisional R-MR blackleg resistance rating for bare seed (Internal Advanta rating) with blackleg groups ABD.

This is the first variety release of the new TruFlex® technology and triazine tolerance combined. The TruFlex® trait will allow for higher glyphosate rates and a wider application window, compared with the Roundup Ready trait. Hyola® 530XT will only be offered for sale if regulatory approval is granted.

Hybrid TT varieties withdrawn from sale; Hyola® 525RT, Hyola® 725RT and DG 560TT.

OP varieties Sturt (TT), ATR Gem, Crusher TT and Thumper TT are no longer available for sale. They are included in the report as they were grown over a significant area in 2017, and growers may still have retained seed.

Buying TT canola for seed and selling canola grain

Some varieties have an end point royalty (EPR) whereby money is collected at point of sale. This is a risk sharing arrangement between growers and the company. It is imperative that growers continue to pay EPRs to support further OP releases. HyTTec Trophy is the first hybrid variety to have an EPR.

Purchase commercially available seed from licensees. (Table 2). All canola varieties have plant breeder rights (PBR) and are not free to trade. Harvested crop can be retained on-farm for use as seed. However, seed from hybrid crops is not the same as the parent and can have reduced performance.

Table 4 Licensees of Triazine tolerant, and TT+CL and TT+RR varieties (new varieties highlighted)

	Variety	Maturity	Release	NVT data	Licensee	EPR
TT OP	ATR Stingray	3	2011	13-17	Nuseed	
	Sturt (TT)	3	2012	13-14	Not for sale	5
	ATR Mako	4	2015	14-17	Nuseed	5
	ATR Bonito	4	2013	13-17	Nuseed	5
	ATR Gem	4	2011	13-15	Not for sale	
	Yetna	4	2015	2015	Agronomy for Profit	4
	Crusher TT	5	2010	13	Not for sale	
	Thumper TT	6	2011	13	Not for sale	
	ATR Wahoo	6	2013	13-17	Nuseed	5
TT Hy	Hyola 350TT	3	2017	17	Advanta Seeds	
	InVigor T 3510	3	2018	none	BASF	
	SF Spark TT	3	2018	none	Seed Force	
	HyTTec Trophy	4	2017	17	Nuseed	10
	Pioneer 44T02 (TT)	4	2016	15-17	Pioneer	
	InVigor T 4510	4	2016	16-17	BASF	
	SF Turbine TT	4	2015	15-17	Seed Force	
	SF Ignite TT	5	2017	16-17	Seed Force	
	Hyola 559TT	5	2012	13-17	Advanta Seeds	
	Pioneer 45T03T (TT)	5	2018	none	Pioneer	
	Hyola 550TT	5	2018	none	Advanta Seeds	
	DG 670TT	6	2017	16-17	Seednet	
	Hyola 650TT	6	2013	13-17	Advanta Seeds	
	TT+CL Hy	Hyola 580CT	5	2018	17	Advanta Seeds
TT+RR Hy	3000TR	3	2016	15-17	BASF	
	Hyola 530XT	5	2018	17	Advanta Seeds	

TT yield, oil and blackleg information

Yield is the most important factor when deciding between commercial TT varieties, but growers in higher rainfall areas or short rotations will also need to consider blackleg resistance. Oil concentration is the third factor to consider. With a range of high yielding varieties already available, it is good to use yield and oil data from NVT when choosing a variety.

Figure 2 illustrates variety yield performance, across the range of trial yields and locations (Agzones), as well as indicating the number of WA trials. Yields from each Agzone reflect the growing conditions, where the higher rainfall zones of Agzone 3 and 6 tend to have the highest yielding trials.

The long term yields from the TT Multi Environment Trials (or long term MET yields) are presented in Table 5, along with oil results and blackleg data.

2018 GRDC Blackleg management guide update

ATR Gem now Moderately susceptible (MS) and Hyola® 559 TT Moderately Resistant (MR) for bare seed blackleg resistance.



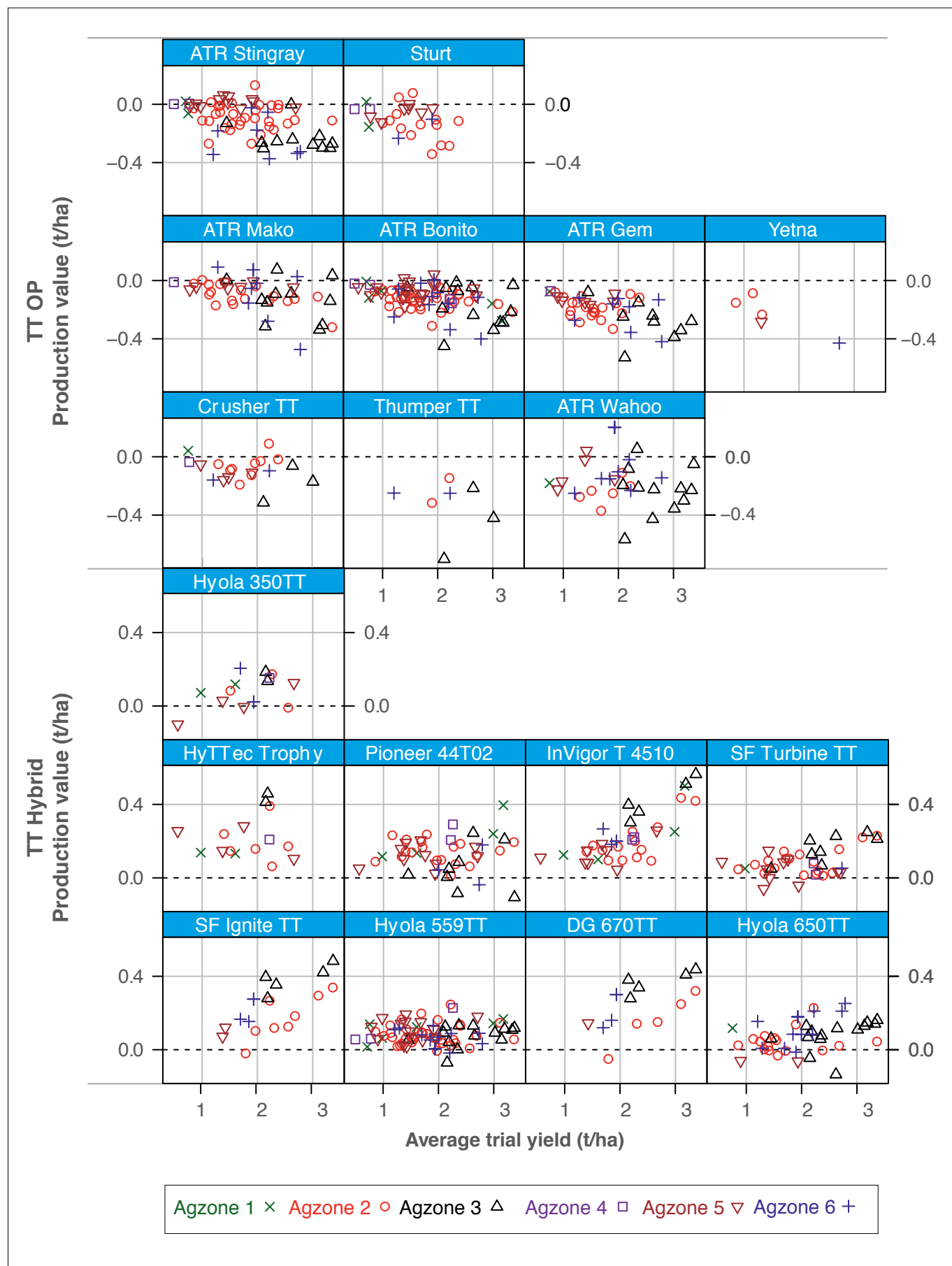


Figure 2a Comparative yield of TT varieties according to site yield and Agzone. Varieties organised by maturity. Data from WA NVT trials 2013-2017 (Note different vertical axes for OP and Hybrid)

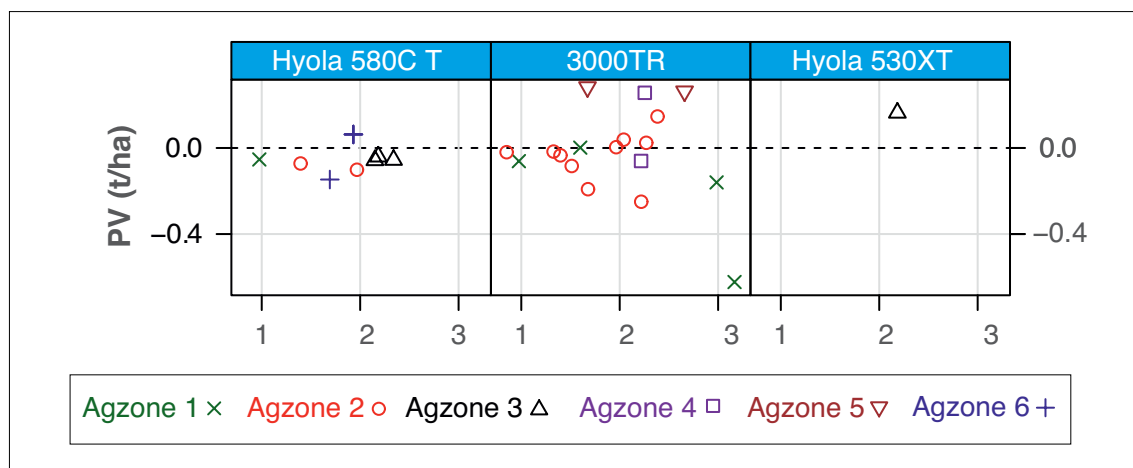


Figure 2b Comparative yield of TT+CL and TT+RR varieties according to site yield and Agzone
Data from WA NVT trials 2013-2017

Table 5 TT and TT+CL and TT+RR long term MET yield and oil from WA NVT trials 2013-2017 and blackleg resistance information

			Long term MET yield (% of group trial average)								Oil	Blackleg		
Average trial yield (t/ha)			0.5 – 1	1 – 1.5		1.5 – 2		2 – 2.5		2.5 – 3.5	Difference to mean (44.6%)	Resistance rating bare seed	Resistance rating +Jockey®	Group
Early = short, Mid = long season sites			Early	Early	Mid	Early	Mid	Early	Mid	Mid				
Type	Variety	Maturity												
TT OP	ATR Stingray	3	98	100	89	98	93	99	93	93	0.8	MR	R	C
	Sturt (TT)		92	95	87	95	92	95	91		-0.5	MS-S ²⁰¹⁶	-	C
	ATR Mako	4	97	97	94	98	94		91	94	0.0	MR	R	A
	ATR Bonito		92	95	90	95	94	95	92	94	1.5	MS	MR	A
	ATR Gem		90	90	87	93	90	93	90	91	1.2	MS	-	A
	Yetna		78	87	83					86	-2.6	MS ²⁰¹⁷	-	-
	Crusher TT	5	99	95	93	99	98	99	101	101	-1.1	MR-MS ²⁰¹⁴	-	-
	Thumper TT	6			85		92	96	95	95	0.5	R ²⁰¹⁴	-	E
	ATR Wahoo		78	84	83		90	86	94	93	0.6	MS	R-MR	A
TT Hy	Hyola 350TT	3	110		105	107	106	107	105	105	-0.6	R	-	ABDF
	HyTTec Trophy	4	111		113	108		106	118	116	-0.5	R-MR	R	ABD
	Pioneer 44T02 (TT)		112	108	112	108	107	108	105	105	0.3	R-MR	R	ABD
	InVigor T 4510		110	103	106	107	109	106	111	111	-0.2	MR-MS	R	BF
	SF Turbine TT		104	100	105	103	105	102	105	106	-0.7	MR-MS	R-MR	BF
	SF Ignite TT	5			100		106		110	109	-0.2	MR	R	BF
	Hyola 559TT		109	109	106	106	104	106	102	103	1.4	MR	-	ABD
	DG 670TT	6			99		105		110	109	-0.5	MR	R	BF
	Hyola 650TT		101	93	102	101	102	100	104	104	0.5	R	-	ABD
TT+CL Hy	Hyola 580CT	5	94		95		96		99		-1.2	R-MR	-	BC
TT+RR Hy	3000TR	3	99	112	101	99		101	90		0.5	MS-S	MR	B
	Hyola 530XT	5							108		1.1	-	-	ABD

Varieties ordered first by maturity then by overall yield average. Highest yielding varieties highlighted in each yield group.

Maturity: Information provided by licensees. Maturity Key; 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late, 7 = late.

Blackleg: Blackleg data provided from the GRDC 2018 Blackleg Management Guide, unless otherwise specified. Refer to this for further information. Orange shading highlights ratings of MR-MS or lower. # Jockey® seed dressing contains fluquinconazole. Blackleg rating key; R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, VS = very susceptible.



Open pollinated TT varieties

The early maturity ATR Stingray showed competitive yields, particularly in the Early trials, as well as good oil content, and would be well suited to low rainfall areas (Table 5).

The early-mid varieties ATR Mako, ATR Bonito and Crusher TT were the highest yielding open pollinated TT varieties and are widely adapted across environments (Early and Mid trials) and the yield range 0.5-3t/ha. ATR Bonito had the highest oil content of all TT varieties. ATR Mako would be most suitable for higher rainfall areas, due to its stronger blackleg resistance (R with Jockey®). Yetna may be selected for its ability to tolerate some group B herbicide soil residues.

The longer maturity varieties ATR Wahoo and Thumper TT had competitive yields in the higher yielding, longer season environments. ATR Wahoo has lower blackleg resistance than ATR Mako and Thumper TT has not been tested since 2014.

Hybrid TT varieties

The higher yields of TT hybrids is evident since hybrid varieties have positive Production values (PVs), as well as higher long term MET averages (Table 5), while open pollinated varieties generally have negative PVs (Figure 2).

Hyola® 350TT has competitive yields across the early trials and up to 2t/ha in the Mid trials.

In the early-mid maturity class (4), HyTTec Trophy, and InVigor T 4510 were leaders across the yield range and Pioneer 44T02 (TT) up to 2t/ha (Table 5). WA trials show that these varieties have some high PVs with HyTTec Trophy and Pioneer 44T02

highest in the 1-2 t/ha range and InVigor T 4510 with particularly high PVs at sites over 3 t/ha (Figure 2). Match blackleg pressure with variety resistance. HyTTec Trophy and 44T02 have the best blackleg resistance ratings in this class (R-MR).

For the longer maturity varieties, Hyola® 559TT had competitive yield up to around 2t/ha, with high oil content and MR blackleg resistance. SF Ignite TT and DG670TT were among the yield leaders for the higher yielding longer season environments, both with MR blackleg resistance for bare seed (Table 5 and Figure 2).

TT+CL variety

Hyola® 580CT is the first variety to have combined TT and Clearfield® technology, which will offer a wider range of weed control options. Although Hyola® 580CT has a mid maturity for windrowing timing, it would not be suited to early sowing in long season environments, since it flowers quickly with March or April sowing.

TT+RR varieties

Growers have access to two TT+RR varieties in 2019. 3000TR is well suited to low-mid rainfall regions, but high pressure blackleg situations should be avoided. Hyola® 530XT is the first variety release with the new TruFlex® extended glyphosate treatment time (up to first flowers). NVT testing of the TruFlex® trait has been limited to one successful NVT trial in 2017 at Kojonup. Blackleg testing for the GRDC Blackleg management guide adult resistance ratings will not occur until trade barriers to this new technology have been cleared.

Roundup Ready® and TruFlex® canola varieties

New RR and TruFlex varieties

Pioneer 43Y29 (RR) New early (3) maturity RR hybrid from Pioneer. Medium-short plant height.

Hyola® 410XX New release from Advanta Seeds, incorporating Monsanto's TruFlex® technology trait. Early-mid maturity, medium plant height with high oil content. Provisional Resistant (R) blackleg resistance rating for bare seed (Internal Advanta rating) and ABD resistance groups.

This is the first TruFlex® variety. The TruFlex® trait will allow for higher glyphosate rates and a wider application window, compared with the Roundup Ready trait. Hyola® 410XX will only be offered for sale in 2019 if regulatory approvals are granted.

InVigor® 4020P Early mid maturity (4) RR hybrid with Podguard™. Medium plant height. There is no NVT data available since InVigor R 4020P was entered into NVT for the first time in 2018. It has been entered into all 17 RR NVT trials this year.

Pioneer 45Y28 (RR) Mid season (5) maturity RR hybrid from Pioneer. Seed not available for 2019 use but expected to be available for sale in commercial quantities for 2020. Yield performance not reported here but results from six trials in 2017 available from nvtonline.com.au.

Nuseed GT-42 is still available for sale but yield data was mistakenly omitted from this report. Nuseed GT-42 has the highest blackleg resistance rating of R with ABDF resistance groups.

Varieties withdrawn from sale; Hyola® 600RR

Buying RR or TruFlex® canola for seed and selling canola grain

Growers need to sign a License and Stewardship Agreement (LSA) with Monsanto before taking delivery of any Roundup Ready or TruFlex® seed. The License and stewardship agreement gives the grower the right to purchase and plant Roundup Ready or TruFlex® canola seed and the grower agrees to deliver grain from their crop only to an authorised grain handler and to

Table 6 Licensees of Roundup Ready varieties (new varieties highlighted)

Variety	Maturity	Release	NVT data	Licensee
Pioneer 43Y23 (RR)	3	2012	13-17	Pioneer
InVigor R 3520	3	2017	16-17	BASF
Pioneer 43Y29 (RR)	3	2018	17	Pioneer
Pioneer 44Y27 (RR)	4	2017	16-17	Pioneer
Hyola 410XX	4	2018	17	Advanta Seeds
DG 408RR	4	2017	16-17	Seednet
Hyola 404RR	4	2010	13-17	Advanta Seeds
Nuseed GT-41	4	2012	13-17	Nuseed
DG 460RR	4	2016	14-17	Seednet
InVigor R 4020P	4	2018	none	BASF
Pioneer 45Y28 (RR)	5	2018	17	Pioneer
Hyola 506RR	5	2017	13,16,17	Advanta Seeds
Pioneer 45Y25 (RR)	5	2015	13-17	Pioneer
Nuseed GT-53	5	2016	14-17	Nuseed
InVigor R 5520P	5	2016	15-17	BASF
IH51 RR	5	2015	14-17	BASF

declare grain as Roundup Ready or TruFlex®. There is a technology fee for Roundup Ready canola technology, which is paid at the point of purchase. This fee was \$8.00/kg in 2018.

Roundup Ready seed can be purchased from licensees each year. The license and stewardship agreement does not permit using harvested crops for seed nor farmer-to-farmer trading. TruFlex® varieties will only be offered for sale when regulatory approvals are granted.

RR yield, oil and blackleg information

Figure 3 shows variety yield performance, across the range of trial yields and locations (Agzones), and the number of WA trials.

Long term MET average yields, oil and blackleg results are provided in Table 7. Varieties are listed by maturity groups. The Roundup Ready® varieties are a competitive group, with only 20% difference between all varieties listed. Similar benefits can often make variety choice difficult but this also indicates that either option is suitable.

2018 GRDC Blackleg management guide update

Pioneer 44Y27 (RR) has been reclassified up to R-MR for the blackleg resistance with bare seed. Nuseed GT-41 is now MR.

In the early maturity group (maturity 3 in Table 7) Pioneer 43Y23 is truly adaptable, leading yields across the spectrum as well as MR blackleg resistance rating, although a lower oil content. InVigor® 3520 was also competitive for yields up to 2.5t/ha, in the shorter season Early trials series with a neutral oil content (-0.1)(Table 7 and Figure 3). The new Pioneer 43Y29 is somewhat behind for long term MET yields although was higher yielding than Pioneer 43Y23 in five out of eight 2017 NVT trials and has a higher oil content.

Pioneer 44Y27 (RR) was the yield leader in the early-mid maturity (4) group. This high yielding variety has impressive production values. Its minimum production value was 0.2t/ha (above the trial average yield) from a 2016 trial at Buntine, and a maximum cluster around 0.7t/ha from trials at Greenough, Bolgart, Kojonup and Dandaragan (Figure 3). Pioneer 44Y27 is well suited to high yielding environments, especially since the blackleg rating was reassessed as R-MR.

DG408 (RR) has also proved to be adaptable with high long term MET yield across the yield



spectrum. DG408 also has the highest oil content of the RR varieties at average 45.6%. DG 408RR is best limited to lower blackleg pressure areas (MS bare seed blackleg rating).

Hyola® 404RR and Nuseed GT-41 had competitive yields for sites 1-1.5t/ha. Both varieties have similar Production Value profiles

Table 7 RR long term MET yield and oil from WA NVT trials 2013-2017 and blackleg resistance information

		Long term MET yield (% of group trial average)								Oil	Blackleg		
Average trial yield (t/ha)		0.5 – 1	1 – 1.5		1.5 – 2		2 – 2.5		2.5 – 3.5	Difference to mean (45.9%)	Resistance rating bare seed	Resistance rating +Jockey®	Group
Early = short, Mid = long season sites		Early	Early	Mid	Early	Mid	Early	Mid	Mid				
Variety	Maturity												
Pioneer 43Y23 (RR)	3	113	116	120	110	114	110	109	113	-1.8	MR	R	B
InVigor R 3520		114			111	107	110		104	-0.1	MR	R	-
Pioneer 43Y29 (RR)		106			107		105	110		-0.1	MR	-	BC
Pioneer 44Y27 (RR)	4	121		120	119	118	115	116	119	-0.4	R-MR	R	B
Hyola 410XX								114		1.3	-	-	ABD
DG 408RR		114		118	111	113	111	106	113	1.7	MS	R-MR	AC
Hyola 404RR		110	114	113	106	107	107	99	104	1.0	R-MR	-	ABD
Nuseed GT-41		105	109	106	103	103	104	97	101	-1.1	MR	R	ABF
DG 460RR		98	90	105	101	106	98	110	108	0.7	MR	R	A
Hyola 506RR	5	117	116	113	114	112		113	114	0.4	R	-	ABD
Pioneer 45Y25 (RR)		112	104	115	113	115	109	118	118	0.0	MR	R	BC
Nuseed GT-53		109	107	124	108	117	107	111	118	-0.9	R	R	ABDF
InVigor R 5520P				100		106		110	108	-0.9	MR	R	AC
IH51 RR		100	100	102	101	101	101	96	99	-1.4	MR-MS	R-MR	A

Varieties ordered first by maturity then by overall yield average. Highest yielding varieties highlighted in each yield group.

Maturity: Information provided by licensees. Maturity Key; 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late, 7 = late.

Blackleg: Blackleg data provided from the GRDC 2018 Blackleg Management Guide, unless otherwise specified. Refer to this for further information. Orange shading highlights ratings of MR-MS or lower. # Jockey® seed dressing contains fluquinconazole. Blackleg rating key; R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, VS = very susceptible.

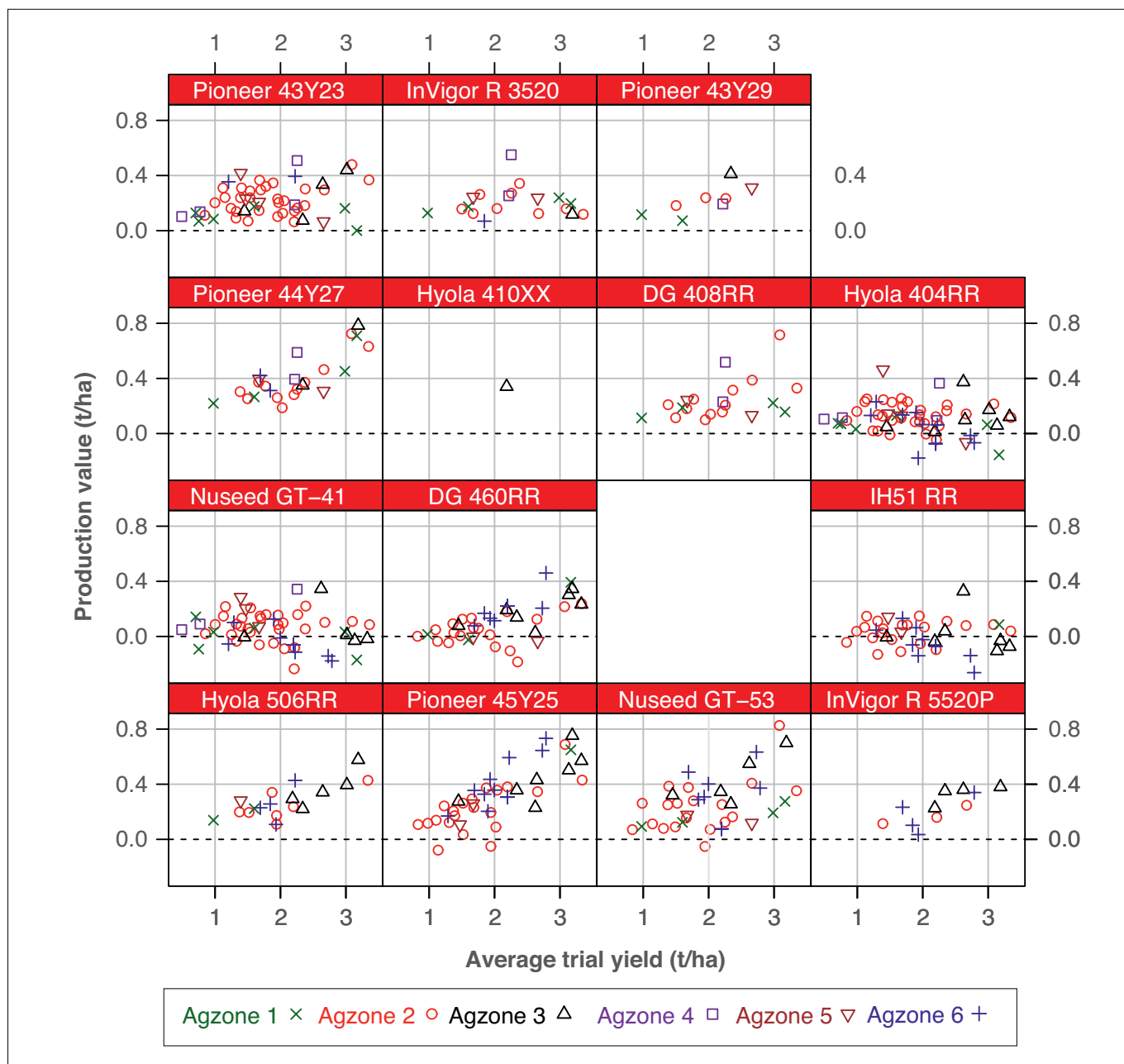


Figure 3 Comparative yield of RR varieties according to site yield and Agzone. Varieties organised by maturity. Data from WA NVT trials 2013-2017

(Figure 3). Hyola® 404RR had good oil (1% above average) and R-MR blackleg resistance. DG460RR had lower long term MET yields but with good oil content (0.9% above average).

Hyola® 410XX results were limited to the single successful TruFlex® WA NVT trial at Kojonup and a single site in NSW. Results for yield and oil are positive but need confirmation, as does the company preliminary R blackleg rating.

The Mid maturity group have competitive yields and it is fitting that there are variety options with the best blackleg resistance ratings. Hyola® 506RR proved high yielding and adaptable across sites and yield levels, combined with

reasonable oil (46.3 average) and the highest (R) blackleg resistance rating, so is well suited for all sites. Pioneer 45Y25 (RR) is also widely adaptable with especially high yields at high yielding sites, although a slightly lower (MR) blackleg resistance rating. Nuseed GT-53 was a yield leader for the longer season higher yielding sites with a blackleg resistance rating of R making it an excellent choice for longer season areas.

InVigor® 5520P and IH51RR offer PodGuard™ technology, and may suit growers who value reduced yield risk with delayed harvest. InVigor® 5520P had production values around 0.4t/ha in Agzone 3 (Figure 3).

Clearfield® canola varieties

New Clearfield® varieties;

Pioneer 45Y93 (CL) – Early flowering mid maturity (5) Clearfield® hybrid from Pioneer.

Saintly CL – New Clearfield® hybrid variety from Heritage seeds. Mid maturity (5) with medium plant height.

Buying CL canola for seed and selling canola grain

Purchase commercially available seed from licensees. Seed from hybrid crops is not the same as the parent and can have lower yields, so retaining hybrid seed is not recommended.

CL yield, oil and blackleg information

With the 2017 release of the early maturity Pioneer 43Y92 (CL), WA growers have a good range of Clearfield® varieties, across all maturities. The early maturity Pioneer 43Y92 (CL) and the early-mid varieties Pioneer 44Y90 (CL) and Saintly CL showed reliability and adaptability with high yields across Early and Mid sites and from high to low yielding sites (Figure 4, Table 9).

Table 8 Licensees of Clearfield (CL) canola varieties (new varieties highlighted)

Variety	Maturity	Release	NVT data	Licensee
Pioneer 43Y92 (CL)	3	2017	16-17	Pioneer
Pioneer 44Y90 (CL)	4	2015	15-17	Pioneer
Saintly CL	4	2018	15,17	Heritage Seeds
Pioneer 45Y93 (CL)	5	2018	17	Pioneer
Banker CL	5	2016	14-15,17	Heritage Seeds
Pioneer 45Y91 (CL)	5	2016	16-17	Pioneer
Hyola 575CL	5	2010	13-17	Advanta Seeds

In the mid maturity class, Pioneer 54Y93 (CL) had leading yields across the long term MET analysis while Banker CL had competitive yields in the higher yielding Mid series, although lower oil percentage (Table 9). The Pioneer varieties all have blackleg resistance rating of R-MR, while Saintly CL has a bare seed resistance rating of MR.

There were no changes to the blackleg resistance ratings from the 2018 GRDC Blackleg management guide.

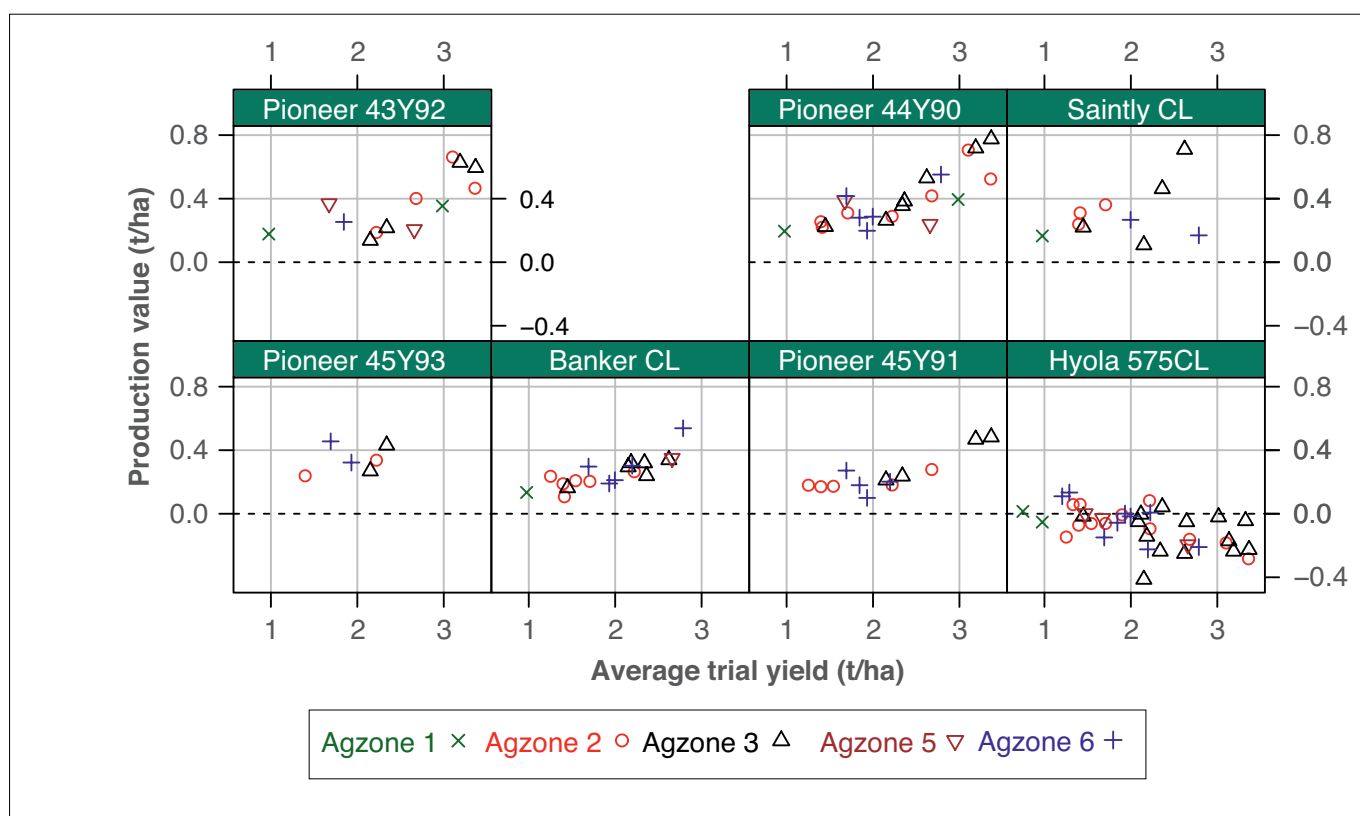


Figure 4 Comparative yield of CL varieties according to site yield and Agzone. Varieties organised by maturity. Data from WA NVT trials 2013-2017

Table 9 CL long term MET yield and oil from WA NVT trials 2013-2017 and blackleg information

		Long term MET yield (% of group trial average)						Oil	Blackleg		
Average trial yield (t/ha)		0.5 – 1	1 – 1.5		1.5 – 2	2 – 2.5	2.5 – 3.5	Difference to mean (45.8%)	Resistance rating bare seed	Resistance rating +Jockey®	Group
Early = short, Mid = long season sites		Early	Early	Mid	Mid	Mid	Mid				
Variety	Maturity										
Pioneer 43Y92 (CL)	3	119			115	113	116	0.3	R-MR	R	B
Pioneer 44Y90 (CL)	4	122		118	116	115	118	0.4	R-MR	R	B
Saintly CL		115		118	114	110	114	0.6	MR	R	B
Pioneer 45Y93 (CL)	5			117	117	116		0.1	R-MR		BC
Banker CL		110		112	113	113	114	-0.6	MR-MS	R	A
Pioneer 45Y91 (CL)				111	110	110	112	0.1	MR	R	B
Hyola 575CL		98	111	101	97	95	95	-1.0	R		BF

Varieties ordered first by maturity then by overall yield average. Highest yielding varieties highlighted in each yield group.

Maturity: Information provided by licensees. Maturity Key; 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late, 7 = late.

Blackleg: Blackleg data provided from the GRDC 2018 Blackleg Management Guide, unless otherwise specified. Refer to this for further information. Orange shading highlights ratings of MR-MS or lower. # Jockey® seed dressing contains fluquinconazole. Blackleg rating key; R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, VS = very susceptible.

Canola seed commercialisation companies

Advanta Seeds

hyola.com.au

Steve Lamb +61 (0)429 619 103

Tristan Wilson-Kerrigan +61 (0)448 014 892

Agronomy for Profit

Peter Norris +61 (0)428 850 850

BASF

(Previously owned by Bayer)

myseed.com.au/canola/

David Peake +61 (0)408 780 577

Heritage Seeds

heritageseeds.com.au

Steve Amery +61 (0)409 000 398

Nuseed

nuseed.com.au

Andrew Suverijn +61 (0)409 484 702

Andrew Royce +61 (0)427 466 916

Michael Hickey +61 (0)438 913 106

Pioneer Brand Seeds

pioneerseeds.com.au

Peter Bostock +61 (0)427 549 826

Erinn McCartney +61 (0)400 557 076

Tony Munns +61 (0) 429 861 092

Rob Bagley +61 (0) 428 212 652

Owen Boxall +61 (0) 428 899 024

Seednet

seednet.com.au

David Clegg +61 (0)408 630 641

Seed Force

seedforce.com

Nevenka McLennan +61 (0) 491 211 104

David Leah +61 (0)447 565 457

Calculating your seeding rates

After you have chosen the most suitable variety, it is important to choose the best seeding rate for your crop. You need to have;

1. seeds/kg (seed size)
2. germination %
3. target density
4. estimated field establishment (FE)

Seeding rate formula

$$\text{Seeding rate} = \frac{\text{target density} \times 10\,000}{\text{FE} \times \text{seeds per kg} \times \text{germination}}$$

(Use the decimal format for FE, for example 0.75)

Or use the online DPIRD seeding rate calculator at agric.wa.gov.au/n/4319

Find out the seed size (seeds/kg) and germination % from your seed supplier. You need to choose your target density and estimate your field establishment, which is the proportion of viable seeds that emerge after sowing.

Optimum canola density

The optimum canola density has been assessed in 24 DPIRD canola density trials across WA. The optimum canola density for the medium rainfall zone is 25-40 plants/m² for hybrids and 40-50 plants/m² for OP varieties. (Table 10). The optimum canola density is lower for hybrid seed, compared with OP seed, largely based on the higher seed cost of hybrid seed.

Table 10 Optimum canola density (plants/m²) for WA rainfall zones (RZ)

	Low RZ	Med RZ	High RZ
Hybrid	25-35	25-40	40-60
OP	30-40	40-50	50-70

From DPIRD research by B French, M Seymour and R Malik

Estimating field establishment (FE)

The expected field establishment varies with the conditions at seeding and the type of seed (Table 11). Hybrids usually have better establishment than open pollinated varieties, so under reasonable seeding conditions you may expect 65% field emergence with hybrid seed, but only 50% for open pollinated seed. Recent DPIRD research has shown that this difference is largely due to the different seed size, since hybrid seed is generally bigger than open pollinated seed.



Table 11 Expected (FE%) for hybrid and OP seed

	Seeding conditions			
	Excellent	Reasonable	Dry sown	Tough
Hybrid	80	65	60	< 45
OP	65	50	45	< 35

Seed sizes and example seeding rates

Seed size is variable from variety to variety and harvest to harvest. Generally, hybrids have bigger seed than OP varieties. The common range of seed sizes is shown in Table 13. Also some example seeding rates have been calculated using the target density for the medium rainfall zone (Table 10) and reasonable seeding conditions for estimating FE (Table 11). That is target density of 30 plants/m² and field establishment of 65% for hybrid seed, 45 plants/m² target and 50% FE for OP seed. 98% germination was used for both seed types.

Table 12 Seed sizes and example seeding rates

Seed size	seeds/kg	seeds/10 cm	seed size (mg)	seed dia. (mm)	Hybrid seeding rate (kg/ha)	OP seeding rate (kg/ha)
V small	350,000	61	2.9	1.6	1.4	2.7
Small	300,000	58	3.3	1.7	1.6	3.1
Medium	250,000	54	4	1.8	1.9	3.7
Large	200,000	50	5	2	2.4	4.6
V large	150,000	46	6.7	2.2	3.2	6.2

Dia.=diameter. Seed size (mg) = Thousand seed weight (g). See text for seeding rate information.

Some farmers are grading large quantities (>100t) of harvested OP seed over 2mm sieves to select enough large seed to use at seeding. This is different to the common practice of grading the best seed from around 25t retained OP seed, which is likely to result in small to medium sized seed.

Where large OP seed is used, the rates could be lower than that suggested in table 12, since large OP seed is likely to have similar emergence to hybrid seed.

Measure seed size in retained OP seed

Use the DPIRD guide to estimate the seed size of your retained OP seed by lining up seed along 10cm of ruler length. at agric.wa.gov.au/n/4274

Check your field establishment

It is a good idea to check your field establishment and is easy to do. Take a 1m length and count the plants in one row. Do this at random over the paddock and calculate the average. Then use the appropriate multiplication factor from Table 13 To convert from plants/m row to plants/m². For example at 1 foot row spacing, use the 3.3 multiplication factor, so if your average number of plants/m row is 10, then you have 33 plants/m² (3.3 x 10).

Table 13 Use appropriate multiplication factor to convert plants/m row to plants/m²

Row spacing (cm)	Row spacing (inches)	Multiplication factor	Plants/m row at 30 plants/m ²
17.5	7	5.7	5.3
20.0	8	5.0	6.0
22.5	9	4.4	6.8
25.0	10	4.0	7.5
27.5	11	3.6	8.3
30.5	12	3.3	9.0
38.0	15	2.6	11.5

NVT



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