



CANOLA

By Jackie Bucat, DPIRD

New for 2022

A new herbicide tolerance type, with a combination of both triazine tolerance (TT) and LibertyLink® (LL), will be available for 2022. There are twelve new variety releases including two open pollinated TT varieties, the first since 2015, and a new winter maturity release (see Table 1 for a list of all new releases).

InVigor® LT 4530P is triazine tolerant (TT) combined with LibertyLink® (LL). Varieties with LibertyLink® are tolerant of Liberty registered herbicide, with the active ingredient glufosinate. LibertyLink® allows in-crop use of a Group 10 herbicide, a new mode of action for Australian broadacre crops. This may be a useful tool to combat resistance, for example where ryegrass is resistant to clethodim or glyphosate. InVigor LT 4530P is an early-mid (4) maturity, with the PodGuard® trait. It has been released by BASF.

RGT Capacity TT is an early-mid (4) maturity TT variety being commercialised by Seed Force. It was among the highest yielding varieties of the Early series NVT and is moderately susceptible (MS) to blackleg.

Nutrien Ag Solutions has released two new open pollinated TT varieties, early-mid maturity (4) variety **DG Bidgee TT** and a mid-late maturity (6) variety **DG Murray TT**, which is similar maturity to ATR Wahoo. Bidgee is short for Murrumbidgee, following a river naming theme for Nutrien Ag Solutions TT canola varieties. DG Murray has been in the NVT since 2019, while DG Bidgee TT was entered for the first time in 2021. DG Bidgee TT has been rated MR to blackleg, while DG Murray TT has a rating of RMR. Both varieties are from a new blackleg group (H). The higher blackleg ratings, compared with ATR Bonito, will increase the level of variety resistance, and the different blackleg group will help to further reduce disease severity.

The new GT varieties achieved the highest yields in the Early and the Mid series NVT. **Nuseed Emu TF** achieved the highest predicted yields in the GT Early series, for all Agzones (1,2 and 4). It is an early (3) maturity variety, with the TruFlex® trait and has a MRMS blackleg rating. Nuseed Emu TF also has a relatively high oil content, 0.6% above the average of all GT varieties (Table 2).

In the Mid GT trials, new variety **Pioneer 44Y30 RR** was equal highest yielding, alongside InVigor® R 4520P. Pioneer 44Y30 RR has an early-mid (4) maturity with a MR blackleg rating. It is a Roundup Ready® (RR) variety.

Nutrien Ag Solutions has also released two GT varieties, **DG Lofty TF** and **DG Bindo TF**, following a mountain naming theme for the GT releases. Both varieties have the TruFlex® trait. DG Lofty is an early maturity variety, while DG Bindo TF is mid maturity. As 2021 was their first entry into the NVT, NVT data is not yet available for these varieties. Small quantities of seed will be commercially available in 2022.

Pacific Seeds has released **Hyola Battalion XC** with combined GT (TruFlex®) + CL resistance. Hyola Battalion XC is an early maturity variety with a R blackleg rating. It has the additional advantage of handling imidazolinone soil residuals and imidazolinone boom spray contamination as well as two modes of action for enhanced weed control.

Pioneer 45Y95 CL and **Hyola Equinox CL** are two new mid maturity CL varieties. Pioneer 45Y95 CL achieved the highest predicted CL yields for the state but was only included in the 2018 NVT trials and has not yet been assessed for blackleg rating. Hyola Equinox CL has a R blackleg resistance rating.

RGT Nizza CL is a new winter grain and graze variety from Seed Force.

TABLE 1. New variety releases and canola herbicide tolerance groups

Herbicide tolerance	Abbreviation	Description	2021 variety releases		
			Name	Maturity	NVT data
Triazine tolerant	TT	Tolerant of selected triazine herbicides. Some varieties open pollinated.	<ul style="list-style-type: none"> DG Bidgee TT (OP) DG Murray TT (OP) RGT Capacity TT 	4 6 4	– 2019–2020 2019–2020
Triazine tolerant and glyphosate tolerant	TT+GT	Dual tolerance of TT and GT herbicides.	–	–	–
Triazine tolerant and Clearfield® tolerant	TT+CL	Dual tolerance of TT and CL herbicides. Intended for use in case of soil residues, and for use as either TT or CL or a combination where required.	–	–	–
Triazine tolerant and LibertyLink® tolerant	TT+LL	Dual tolerance of LibertyLink® (LL) and TT. LL has tolerance of Liberty® (glufosinate) herbicide.	<ul style="list-style-type: none"> InVigor® LT 4530P 	4.5	2020
Glyphosate tolerant	GT (RR or TF)	Tolerant of Monsanto glyphosate herbicide. Includes both Roundup Ready® and TruFlex® varieties.	<ul style="list-style-type: none"> DG Bindo TF DG Lofty TF Nuseed Emu TF Pioneer 44Y30 RR 	5 3 3 4	– – 2019–2020 2020
Glyphosate tolerant and Clearfield® tolerant	GT+CL	Dual tolerance of GT and CL herbicides. Intended for use in case of soil residues, and for use as either GT or CL tolerance or a combination where required.	<ul style="list-style-type: none"> Hyola® Battalion XC 	3.5	2020
Clearfield® tolerant	CL	Tolerant of imidazolinone (IMI) herbicides, marketed as Clearfield®.	<ul style="list-style-type: none"> Hyola® Equinox CL Pioneer 45Y95 CL 	5 5	2020 2018
Conventional canola	CC	Only tolerant to clopyralid and grass selective herbicides.	–	–	–
Clearfield® tolerant	CL	Winter maturity, commonly used for grain and graze.	<ul style="list-style-type: none"> RGT Nizza CL 	8.5	N/A

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (information provided by seed companies).

Note: 2021 season is first year of NVT for DG Bidgee TT, DG Bondo TF and DG Lofty TF. NVT data will be available online after 2021 harvest.

Twenty-one canola varieties have been withdrawn from sale:

- **TT varieties:** ATR Gem, DG 670TT, Hyola 350TT, Hyola 559TT, InVigor T3510, Pioneer 44T02 TT, Pioneer 45T03 TT, SF Turbine TT.
- **GT varieties:** DG 408RR, GT 41, GT 42, Hyola 404RR, Pioneer 43Y23, Pioneer 43Y29.
- **CL varieties:** Banker CL, Pioneer 44Y90 CL, Saintly CL.
- **Dual herbicide tolerance varieties:** TT+GT Hyola 530XT, TT+CL Hyola 580CT, GT+CL Hyola 540XC.
- **Winter grain and graze CL variety:** SF Edimax CL.

Choosing a canola variety

Considerations when selecting canola varieties:

- Determine the appropriate type of herbicide tolerance required as successful weed control is a key benefit from growing canola. Damage from imidazolinone (IMI) soil residues can be avoided by using CL or CL herbicide tolerant combinations, where appropriate.
- Target varieties with proven high yields and reliability across seasons and yield ranges. The GRDC NVT data is a source of high-quality scientific data (Tables 4 to 13).
- Select the highest blackleg resistance rating possible to support integrated blackleg management (Table 2).
- Match maturity to sowing time. Use longer maturity varieties with early sowings and shorter maturity varieties with later sowings or target a variety that is adaptable to most sowing times.
- Balance risk with profit, such as using high-yielding hybrid TT varieties where there is high yield potential, and lower yielding, low cost, open pollinated (OP) varieties in low yield or high-risk situations.
- Consider likely oil content, especially with early sowing when oil benefits are likely to be greatest. However, generally yield impacts crop profit more than oil concentration (Table 2).
- Consider the advantages of either the TruFlex® trait (where glyphosate control options can be extended to the start of flowering) or PodGuard® trait (which reduces pod shatter at maturity), to your system.



Current canola varieties available for 2022

Canola varieties are available with a range of herbicide tolerances (TT, GT and CL) and in double combinations of TT+GT, TT+CL, GT+CL and a new combination TT+LL (Table 1). Varieties with a combination of herbicide tolerance are often referred to as having ‘stacked’ tolerance. There is very little conventional canola grown in WA, due to lack of chemical options for radish control. Ryegrass control is also difficult due to its widespread resistance to group A grass herbicides in the WA wheatbelt.

Canola is available as open pollinated (OP) or hybrid breeding types. Open pollinated seed is created through self-pollination. Harvested OP seed is often retained on-farm for use at sowing. Only TT and conventional canola are available for purchase as OP varieties (Table 2). Hybrid seed is produced from managed crosses between different canola parent lines and must be purchased each year.

Varieties are available with a wide range of harvest maturities, from early (3) to mid-late (6) and winter types (Table 2). It is generally recommended that variety maturity is matched with season length. Use later maturity varieties in longer season environments or with early seeding to make maximum use of the long growing season and reduce the risk of frost at the end of flowering and during grain fill. Conversely, use shorter maturity varieties in short growing environments or with late seeding, as these can produce relatively high yields in a short period of time before terminal drought. However, recent DPIRD research has shown that an adaptable early-mid variety can be relatively high yielding at both early and late seeding times (grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2021/02/when-to-take-advantage-of-early-seeding-opportunities-for-canola-in-wa).

The GT group includes both TruFlex® and Roundup Ready® types (Table 2). The TruFlex® trait has an extended spray window until the start of flowering, and allows greater flexibility of herbicide applications compared with Roundup Ready® types. Always check suitability of herbicides by referring to the herbicide label. All GT canola varieties were developed using single gene genetic modification (GM), licensed from Bayer.

Some GT varieties have the PodGuard® trait (Table 2). PodGuard® reduces seed shatter at maturity, which can reduce seed shatter loss with direct heading and reduce seed loss risk from later harvesting.

TABLE 2. Herbicide tolerance, harvest maturity, oil content, blackleg ratings and commercial information of current canola varieties

Herbicide tolerance	Variety	Harvest maturity	Oil content (diff. to mean)	Blackleg resistance rating	Blackleg group	PodGuard®	EPR \$/t	Release year	Seed access
TT (OP)	AFP Cutubury	4	-	-	-	-	4	2020	Agronomy for Profit
TT (OP)	ATR Bonito	4	0.7	MS	A	-	5	2013	Nuseed
TT (OP)	ATR Mako	4	-1.3	MR-MS	A	-	5	2015	Nuseed
TT (OP)	ATR Stingray	3	0.3	MR-MS	C	-	-	2011	Nuseed
TT (OP)	ATR Wahoo	6	0.2	MS	A	-	5	2013	Nuseed
TT (OP)	DG Bidgee TT	4	-	MR	H	-	5	2021	Nutrien Ag Solutions
TT (OP)	DG Murray TT	6	0.7	R-MR	H	-	5	2021	Nutrien Ag Solutions
TT	Hyola® Blazer TT	4.5	0.1	R	ADF	-	-	2020	Pacific Seeds
TT	HyTtec® Trident	3	0.1	R	AD	-	10	2019	Nuseed
TT	HyTtec® Trifecta	5	0.2	R	ABD	-	10	2020	Nuseed
TT	HyTtec® Trophy	4	-0.2	R-MR	AD	-	10	2017	Nuseed
TT	InVigor® T 4510	4.5	-0.8	MR-MS	BF	-	-	2016	BASF
TT	InVigor® T 6010	6	-0.2	MS	BC	-	-	2020	BASF
TT	RGT Capacity TT	4	-0.6	MS	B	-	10	2021	Seed Force
TT	SF Dynatron TT	5	0.6	MS	BC	-	10	2020	Seed Force
TT	SF Ignite TT	5	-0.7	MR-MS	BF	-	10	2017	Seed Force
TT	SF Spark TT	3	0.6	MR	ABDS	-	10	2018	Seed Force
TT (OP)	Yetna	4	-	-	-	-	4	2015	Agronomy for Profit
TT+RR	BASF 3000 TR	4	-0.1	MS-S	B	-	-	2016	BASF
TT+CL	Hyola® Enforcer CT	5	-0.1	R	ADF	-	-	2020	Pacific Seeds
TT+LL	InVigor® LT 4530P	4.5	-1.0	MR	R	P	-	2021	BASF
GT (TF)	DG Lofty TF	3	-	-	-	-	-	2021	Nutrien Ag Solutions
GT (TF)	DG Bindo TF	5	-	-	-	-	-	2021	Nutrien Ag Solutions
GT (TF)	Hyola® 410XX	4.5	1.1	R-MR	ABD	-	-	2018	Pacific Seeds
GT (RR)	InVigor® R 3520	3	0.0	MR	?	-	-	2017	BASF
GT (TF)	InVigor® R 4022P	4	0.1	MR-MS	ABC	P	-	2019	BASF
GT (TF)	InVigor® R 4520P	4.5	-0.8	MS	BF	P	-	2020	BASF
GT (RR)	InVigor® R 5520P	5.5	-0.2	MR-MS	ABC	P	-	2016	BASF
GT (TF)	Nuseed Condor TF	5	0.9	R	ABD	-	-	2020	Nuseed
GT (TF)	Nuseed Emu TF	3	0.6	MR-MS	AB	-	-	2021	Nuseed
GT (RR)	Nuseed GT-53	5	-0.3	R	ABDF	-	-	2016	Nuseed
GT (TF)	Nuseed Raptor TF	4	0.2	R	AD	-	-	2019	Nuseed
GT (RR)	Pioneer 44Y27 RR	4	-0.2	MR	B	-	-	2017	Pioneer
GT (RR)	Pioneer 44Y30 RR	4	0.2	MR	AB	-	-	2021	Pioneer
GT (RR)	Pioneer 45Y28 RR	5	1.0	MR	BC	-	-	2018	Pioneer

Varieties listed in alphabetical order within herbicide tolerance groups; ■ new varieties are highlighted in yellow.

Varieties are hybrid except where OP specified.

Herbicide tolerance: TT = Triazine Tolerant, GT = Glyphosate Tolerant (RR = Roundup Ready type, TF = TruFlex® type), LL = LibertyLink (glufosinate tolerant), CL = Clearfield (Imidazolinone tolerant).

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (provided by seed companies).

Oil content averages: TT = 44.5, GT = 45.0 and CL = 45.3 (data from 2016-2020 NVT).

Blackleg resistance rating key: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, VS = very susceptible.

^= provisional result.

Blackleg information from GRDC Blackleg Management Guide 2021 Spring Fact Sheet, see further information at: grdc.com.au/GRDC-FS-BlacklegManagementGuide

[Table 2. continued following page...]

TABLE 2. Herbicide tolerance, harvest maturity, oil content, blackleg ratings and commercial information of current canola varieties (cont'd)

Herbicide tolerance	Variety	Harvest maturity	Oil content (diff. to mean)	Blackleg resistance rating	Blackleg group	PodGuard®	EPR \$/t	Release year	Seed access
GT(TF)+CL	Hyola® Battalion XC	3.5	-0.8	R	ADF ^	-	-	2021	Pacific Seeds
GT(TF)+CL	Hyola® Garrison XC	4	0.0	R	ADF	-	-	2020	Pacific Seeds
CL	Hyola® Equinox CL	5	0.6	R	ADF	-	-	2021	Pacific Seeds
CL	Pioneer 43Y92 CL	3	-0.4	R-MR	B	-	-	2017	Pioneer
CL	Pioneer 44Y94 CL	4	1.5	R-MR	BC	-	-	2020	Pioneer
CL	Pioneer 45Y93 CL	5	1.0	R-MR	BC	-	-	2018	Pioneer
CL	Pioneer 45Y95 CL	5	0.8	-	C	-	-	2021	Pioneer
Winter (CL)	Hyola® 970CL	9	-	R	H	-	-	2018	Pacific Seeds
	Hyola® Feast CL	8	-	R	H	-	-	2020	Pacific Seeds
	Phoenix CL	8.5	-	R	B	-	-	2018	AGF Feeds
	RGT Nizza CL	8	-	R	B	-	12	2021	Seed Force

Varieties listed in alphabetical order within herbicide tolerance groups; ■ new varieties are highlighted in yellow.

Varieties are hybrid except where OP specified.

Herbicide tolerance: TT = Triazine Tolerant, GT = Glyphosate Tolerant (RR = Roundup Ready type, TF = TruFlex® type), LL = LibertyLink (glufosinate tolerant), CL = Clearfield (imidazolinone tolerant).

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (provided by seed companies).

Oil content averages: TT = 44.5, GT = 45.0 and CL = 45.3 (data from 2016-2020 NVT).

Blackleg resistance rating key: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, VS = very susceptible.

^ = provisional result.

Blackleg information from GRDC Blackleg Management Guide 2021 Spring Fact Sheet, see further information at: grdc.com.au/GRDC-FS-BlacklegManagementGuide

A price premium is paid for oil content above 42% (bonification payment). The relative oil content of current varieties is shown in Table 2. Varieties with relatively high oil content are:

- TT- ATR Bonito, DG Murray TT, SF Dynatron TT and SF Spark TT
- GT- Hyola 410XX, Pioneer 45Y28, Nuseed Condor TF and Nuseed Emu TF
- CL- Pioneer 44Y94 CL and Pioneer 45Y93.

The blackleg resistance rating is the best variety defence against blackleg. Varieties with a resistant (R) blackleg rating are available in all herbicide tolerance types (Table 2). Resistance groups are a secondary consideration, and the recommendation is to change resistance groups entirely (no shared letters) where monitoring has identified yield loss and the same cultivar has been grown for three or more years. Limiting canola rotation to one year in three remains the primary method to combat blackleg. Refer to the GRDC Blackleg management guide (grdc.com.au/GRDC-FS-BlacklegManagementGuide) for more information.

All canola varieties have plant breeder rights and are not free to trade. Canola seed must be purchased from registered commercial sellers (Table 2). Harvested TT canola can be retained on-farm for use as seed but retained seed from hybrid crops will not be the same as the parents and is likely to have reduced performance.

Some varieties have an end point royalty (EPR) to be paid per tonne of harvested grain sold. Traditionally this only applied to OP varieties, to help recoup costs on farmer grown seed. However, EPRs now also apply to many hybrid TT varieties (Table 2).

Most canola varieties grown in WA are spring types, however some winter types are also available (Table 2). Winter canola can be grown as a dual-purpose crop, for both grazing and grain production. Winter types need a long period of cold (vernalisation) before flowering initiation. This provides a longer opportunity for grazing the vegetative crop, compared with shorter maturity cultivars (spring types). Winter varieties are only suitable for cooler southern areas. For example, Hyola 970CL did not flower when grown at South Perth, as there was not enough cold to supply its vernalisation requirements. Winter varieties are not included in the NVT, so yield data is not reported in this guide.

The National Variety Trials (NVT) program and MET analysis

The purpose of the NVT program is to assist Australian grain growers decide which varieties to grow, through provision of independent comparative information about commercially available varieties. Varieties are grown side by side under standardised protocols. Information is generated for yield, disease resistance ratings and quality. The results of the WA canola trials are reported here. The NVT program is a GRDC investment.

Long Term MET results are the most accurate and reliable means of interpreting NVT data. Generating the MET data involves two stages of analysis. First, the data is analysed from each individual NVT trial with herbicide tolerance trials (TT, GT or CL) at the same location analysed together to reduce variability in the results.

In the second stage of the analysis, all raw plot data and spatial models from the single site analysis of individual NVT sites are combined spatially (across all sites in Australia) and temporally (across growing seasons) to produce the multi-environment trial (MET) dataset. In this analysis, relationships between variety performances are established by comparing results from similar environments. Any issues with variable establishment or variable sites (e.g. different soil types or insect attack in one part of a trial) are accounted for by linkages between environments, so there is little effect on the yield predictions of affected varieties. Results of all trials in Australia are combined to generate a 'long-term MET predicted yield' for each variety in each trial.

The MET analysis generates a predictive yield even when a variety is not present in a trial. This is achieved by comparing the variety's performance with other varieties in similar environments to the trial/s in question (as shown in shaded cells in Tables 4–13). The predictive yield capacity of the MET analysis is extremely useful as new canola varieties are often released with limited NVT testing.

Predicted yields from individual NVTs are available from nvtonline.com.au under the 'trial results' tab. The long-term MET predicted yields are available at NVT Online (nvt.grdc.com.au) by accessing the 'yield reporter' tab and are presented here in Tables 4–13.

In this guide MET results are presented when the variation explained by the MET data model over all the trials is at least 80% (termed 'data accuracy' for NVT online) and the Variance Accounted For (VAF) in individual trials is at least 25%. Where the VAF is less than 25%, the results might not reflect variety differences. Data accuracy of 80% and VAF of 25% are the default settings on NVT online, although they can be adjusted.

MET values are displayed where varieties were present in at least two trials (Tables 4–13).

A five-year weighted average has been calculated from the MET data for each Agzone (Tables 5–8 and 10–13) and for the Statewide results (Table 4 and 9) for the Early and Mid series. Caution should be exercised when looking at the weighted average as it masks varietal performance over seasons within an Agzone.

NVT Results 2016–2020

This guide presents predicted yields from the long-term Multi-Environment Trial (MET) analysis of all WA National Variety Trials (NVT) from 2016–2020. There were 204 canola trials in WA during this period.

Locations of the canola variety trials are shown in Figure 1. NVT ‘Early’ trials are sown in shorter-season environments in northern and eastern areas that generally suit short-maturity varieties, largely in Agzones 1, 2, 4 and 5. While ‘Mid’ trials are sown in longer-season environments, that may suit longer maturity varieties, largely in Agzones 2, 3 and 6.

The Early- and Mid-series trials have similar sowing times. These were the last week of April for most

trials in 2016, the end of April to mid-May in 2017, around 25 May in 2018 (apart from a few in late April), late April to 7 June in 2019 and early May in 2020.

Table 3 lists the location of the WA trials and the table numbers relating to their data in this guide. NVT data aggregated over the state is presented in Table 4 for the Early-series and in Table 9 for the Mid-series trials. Additional Agzone data is presented in Tables 5–8 for the Early-series trials and Tables 10–13 for the Mid-series trials.

All trial results are available online, at nvtonline.com.au or via the NVT long-term yield app.

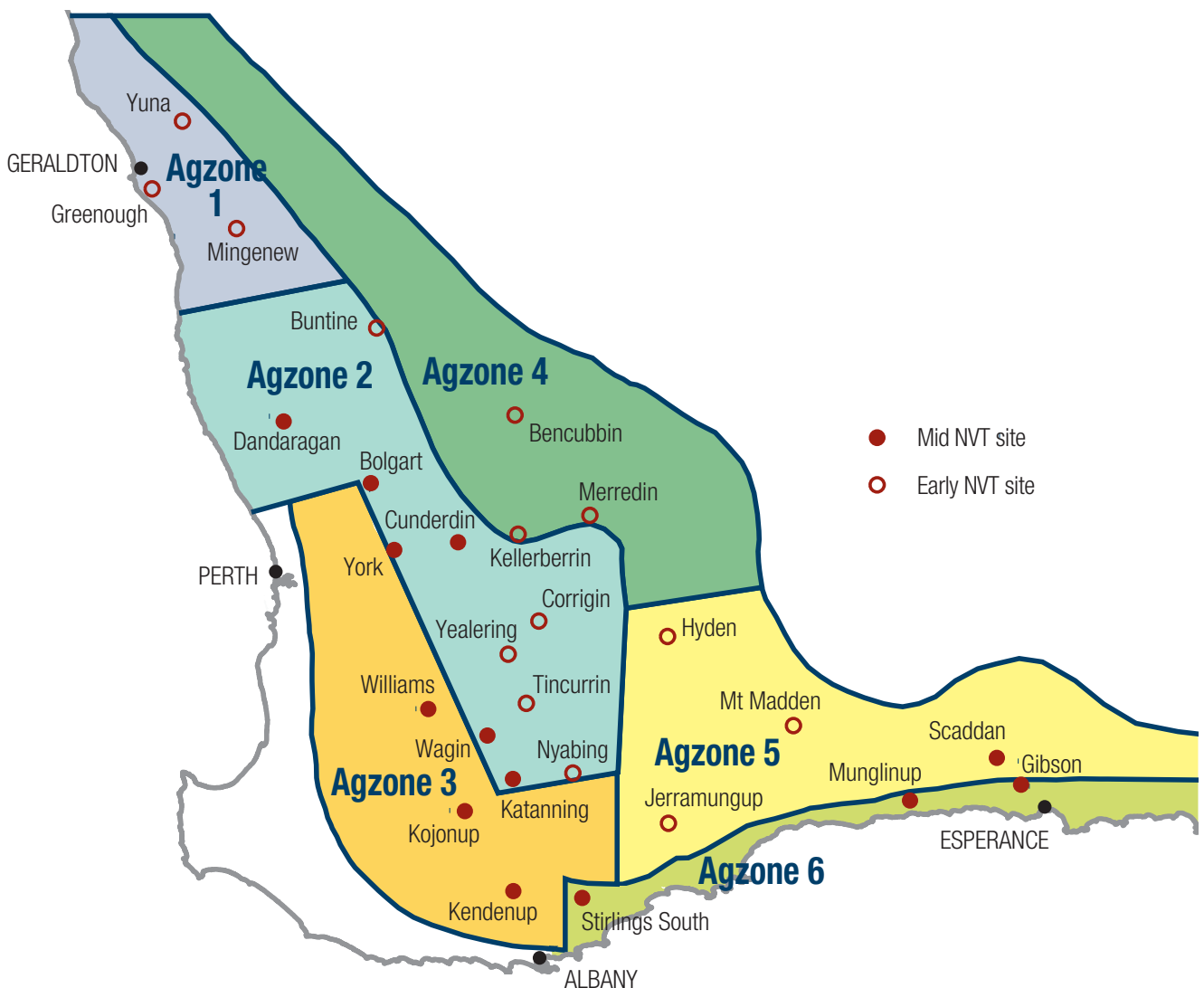


FIGURE 1. Location of Mid and Early series canola NVT across Western Australian Agzones

TABLE 3. Table reference, Agzone location and trial number for Early and Mid series WA canola NVT 2016–2020

NVT Series	Herbicide tolerance	Statewide	Agzone 1	Agzone 2	Agzone 3	Agzone 4	Agzone 5	Agzone 6
Early		Table 4	Table 5	Table 6	-	Table 7	Table 8	-
	TT	(41)	(8)	(13)	-	(9)	(11)	-
	GT	(32)	(8)	(11)	-	(9)	(4)*	-
	CL	(10)	(5)*	-	-	(3)*	(2)*	-
Mid		Table 9	-	Table 10	Table 11	-	Table 12	Table 13
	TT	(51)	-	(19)	(14)	-	(5)	(13)
	GT	(38)	-	(15)	(11)	-	(1)*	(11)
	CL	(25)	-	(7)*	(12)*	-	-	(7)*

* Data not presented in the guide, refer to NVT online for information.

RESULTS FOR EARLY SERIES NVT

TT and TT combination varieties

HyTTec Trident was the highest yielding TT variety in the NVT long-term yield predictions for Agzones 1, 2, 4 and 5 (Tables 5–8), and combined Agzones (Table 4). HyTTec Trident has early maturity (3) and has the highest blackleg rating (R). After HyTTec Trident, the highest yielding early-mid (4 or 4.5) maturity group varieties were InVigor T 4510, the new variety, RGT Capacity TT, and HyTTec Trophy. InVigor T 4510 and HyTTec Trophy have been tested across most seasons, (2016 to 2020), so yield results are considered to be more accurate. The mid (5) maturity SF Dynatron TT has comparable yield predictions to the early-mid varieties mentioned. However, RGT Capacity TT and SF Dynatron TT have a blackleg rating of MS.

The NVT yields of the OP variety ATR Bonito were 28% lower than HyTTec Trident and around 20% lower than the other hybrids discussed above (Table 4). Yield differences may be slightly less on-farm, when using the best practice OP agronomy (large seed and high seeding rates). NVT data for new TT OP varieties will be available online after the 2021 harvest. Leading hybrids are likely to be most profitable for situations of high yield potential. OP varieties are likely to be suitable for lower yield or high-risk situations and a guaranteed seed supply, given seed can be retained on farm.

In addition to TT, a range of herbicide tolerance combinations are available: TT+CL (i.e. Hyola Enforcer CT) for imidazolinone residue concerns and for additional weed control, TT+GT (i.e. BASF

3000TR) and TT+LL (i.e. InVigor LT 4530P), which can be used to help combat resistant weeds. In certain situations, the weed control benefits of these varieties will outweigh their lower yields compared to straight TT varieties.

GT and GT combination varieties

The new variety Nuseed Emu TF achieved the highest predicted yields of the GT varieties for the Early series NVT (Tables 4–8). Nuseed Emu TF is an early (3) maturity variety, with the TruFlex® trait and a relatively high oil content (0.6% above the average for GT varieties).

In the early-mid maturity group, Pioneer 44Y27 RR achieved the highest yields, while in the mid (5) maturity group Nuseed Condor TF delivered the highest yields followed by Pioneer 45Y28 RR. Pioneer 44Y27 RR has been tested in 31 trials over all seasons (2016 to 2020), so the results are robust. Nuseed Condor TF has the TruFlex® trait and a blackleg resistance rating of R. Both Nuseed Condor TF and Pioneer 45Y28 RR have relatively high oil content, around 1% higher than the average of all GT varieties (Table 2).

A range of varieties achieved yields within 5% of each other: the early maturity InVigor R 3520, early-mid varieties InVigor R 4022P, Hyola 410XX, InVigor R 4520P and the mid maturity variety GT-53, although yields were slightly lower than varieties already discussed in this section (Table 4).

The new GT+CL variety Hyola Battalion XC has a shorter maturity and slightly higher yields than Hyola Garrison XC (Table 4).

TABLE 4. Yield of canola varieties in EARLY[^] series NVT (AGZONES 1, 2, 4 and 5 combined), expressed as a percentage of site mean yield for each trial year (2016–2020), and the weighted average over the five-year period

WA EARLY TT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		2.04	1.60	1.47	1.00	1.70	-
		Variety	No. trials	(9)	(8)	(7)	(8)	(9)	(41)
TT	3	HyTTec Trident	(27)	121	120	124	121	119	121
TT	3	SF Spark TT	(18)	105	103	108	104	106	105
TT (OP)	3	ATR Stingray	(19)	88	89	87	88	89	88
TT	4.5	InVigor T 4510	(41)	112	112	112	112	110	112
TT	4	RGT Capacity TT	(10)	112	112	112	112	110	112
TT	4	HyTTec Trophy	(26)	110	112	110	112	108	110
TT	4.5	Hyola Blazer TT	(11)	106	114	101	112	102	107
TT (OP)	4	ATR Bonito	(41)	93	93	93	93	94	93
TT	5	SF Dynatron TT	(17)	110	114	109	113	108	111
TT+CL	5	Hyola Enforcer CT	(14)	100	104	96	103	98	100
TT+GT (RR)	4	BASF 3000 TR	(25)	98	93	102	94	101	98
TT+LL	4.5	InVigor LT 4530P	(9)	103	105	102	105	102	103
WA EARLY GT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		2.30	1.89	1.85	1.06	1.71	-
		Variety	No. trials	(7)	(6)	(5)	(6)	(8)	(32)
GT (TF)	3	Nuseed Emu TF	(10)	116	114	122	114	122	118
GT (RR)	3	InVigor R 3520	(32)	103	102	105	102	105	103
GT (RR)	4	Pioneer 44Y27 RR	(31)	111	111	111	110	111	111
GT (TF)	4	InVigor R 4022P	(14)	106	106	103	105	103	105
GT (TF)	4.5	Hyola 410XX	(14)	104	103	104	103	104	104
GT (TF)	4.5	InVigor R 4520P	(14)	102	103	99	102	99	101
GT (TF)	4	Nuseed Raptor TF	(11)	99	100	96	99	96	98
GT (TF)	5	Nuseed Condor TF	(6)	112	112	106	111	105	109
GT (RR)	5	Pioneer 45Y28 RR	(6)	107	108	103	107	104	106
GT (RR)	5	Nuseed GT-53	(16)	101	101	100	101	100	101
GT (TF)+CL	3.5	Hyola Battalion XC	(8)	101	100	101	100	101	101
GT (TF)+CL	4	Hyola Garrison XC	(14)	99	99	96	99	95	98

Varieties grouped by herbicide tolerance type, then major maturity group, and listed in decreasing yield. Source: NVT Online, nvtonline.com.au

[^] EARLY series NVT trials are sown in shorter season environments (see Figure 1).

Varieties with only a single successful trial are not included.

■ Shaded cells indicate variety was not present in trials, value shown is predicted yield from MET analysis.

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (information provided by seed companies).

TABLE 5. Yield of canola varieties in AGZONE 1 EARLY^ series NVT, expressed as a percentage of site mean yield for each trial year (2016–2020), and the weighted average over the five-year period

AGZONE 1 EARLY TT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		2.95	1.15	1.50	1.07	2.38	-
		Variety	No. trials	(2)	(2)	(1)	(2)	(1)	(8)
TT	3	HyTTec Trident	(5)	123	131	121	122	115	124
TT	3	SF Spark TT	(3)	102	108	110	105	105	106
TT	4.5	InVigor T 4510	(8)	115	117	109	112	107	113
TT	4	HyTTec Trophy	(5)	116	115	104	112	106	112
TT	4.5	Hyola Blazer TT	(2)	123	108	88	110	100	109
TT (OP)	4	ATR Bonito	(8)	92	90	94	93	96	93
TT	5	SF Dynatron TT	(3)	119	115	101	112	105	112
TT+CL	5	Hyola Enforcer CT	(2)	109	99	89	102	97	101
TT+GT (RR)	4	BASF 3000 TR	(7)	87	98	110	95	102	97
AGZONE 1 EARLY GT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		3.11	1.29	1.48	1.33	2.54	-
		Variety	No. trials	(2)	(2)	(1)	(2)	(1)	(8)
GT (TF)	3	Nuseed Emu TF	(2)	103	124	136	112	116	116
GT (RR)	3	InVigor R 3520	(8)	98	104	110	102	104	103
GT (RR)	4	Pioneer 44Y27 RR	(8)	112	115	112	110	108	112
GT (TF)	4	InVigor R 4022P	(3)	111	106	98	105	102	106
GT (TF)	4.5	InVigor R 4520P	(3)	110	102	92	103	99	103
GT (TF)	4.5	Hyola 410XX	(3)	104	105	104	103	103	104
GT (TF)	4	Nuseed Raptor TF	(3)	106	97	89	100	97	99
GT (TF)	5	Nuseed Condor TF	(2)	123	113	95	111	104	112
GT (RR)	5	Pioneer 45Y28 RR	(2)	114	108	97	107	102	107
GT (RR)	5	Nuseed GT-53	(5)	102	100	98	101	100	101
GT (TF)+CL	4	Hyola Garrison XC	(3)	105	97	89	99	97	99

Varieties grouped by herbicide tolerance type, then major maturity group, and listed in decreasing yield. Source: NVT Online, nvtonline.com.au

^ EARLY series NVT trials are sown in shorter season environments (see Figure 1).

Varieties with only a single successful trial are not included.

■ Shaded cells indicate variety was not present in trials, value shown is predicted yield from MET analysis.

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (information provided by seed companies).

TABLE 6. Yield of canola varieties in AGZONE 2 EARLY[^] series NVT, expressed as a percentage of site mean yield for each trial year (2016–2020), and the weighted average over the five-year period

AGZONE 2 EARLY TT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		1.96	1.77	1.64	0.97	2.09	-
		Variety	No. trials	(3)	(2)	(3)	(2)	(3)	(13)
TT	3	HyTTec Trident	(10)	117	119	123	121	119	120
TT	3	SF Spark TT	(6)	105	104	107	108	104	106
TT (OP)	3	ATR Stingray	(9)	91	89	87	89	90	89
TT	4.5	InVigor T 4510	(13)	109	111	112	110	111	111
TT	4	RGT Capacity TT	(4)	109	111	112	110	110	110
TT	4	HyTTec Trophy	(8)	107	111	110	107	110	109
TT	4.5	Hyola Blazer TT	(4)	101	110	102	97	107	103
TT (OP)	4	ATR Bonito	(13)	95	94	93	94	94	94
TT	5	SF Dynatron TT	(5)	106	112	109	106	110	109
TT+LL	4.5	InVigor LT 4530P	(3)	102	104	103	101	103	103
TT+GT (RR)	4	BASF 3000 TR	(10)	101	95	101	104	97	100
TT+CL	5	Hyola Enforcer CT	(4)	97	102	97	94	101	98
AGZONE 2 EARLY GT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		2.06	1.96	1.88	1.01	2.05	-
		Variety	No. trials	(3)	(2)	(2)	(2)	(2)	(11)
GT (TF)	3	Nuseed Emu TF	(3)	117	111	122	126	120	119
GT (RR)	3	InVigor R 3520	(11)	104	101	105	106	104	104
GT (RR)	4	Pioneer 44Y27 RR	(10)	109	110	112	111	112	111
GT (TF)	4	InVigor R 4022P	(4)	103	106	104	102	105	104
GT (TF)	4.5	Hyola 410XX	(4)	103	103	104	104	104	104
GT (TF)	4.5	InVigor R 4520P	(4)	99	103	100	97	101	100
GT (TF)	4	Nuseed Raptor TF	(4)	97	100	96	94	97	97
GT (TF)	5	Nuseed Condor TF	(2)	105	112	108	103	110	107
GT (RR)	5	Pioneer 45Y28 RR	(2)	103	107	104	101	106	104
GT (RR)	5	Nuseed GT-53	(9)	100	101	100	99	100	100
GT (TF)+CL	3.5	Hyola Battalion XC	(2)	101	100	101	102	101	101
GT (TF)+CL	4	Hyola Garrison XC	(4)	97	100	96	94	97	97

Varieties grouped by herbicide tolerance type, then major maturity group, and listed in decreasing yield. Source: NVT Online, nvtonline.com.au

[^] EARLY series NVT trials are sown in shorter season environments (see Figure 1).

Varieties with only a single successful trial are not included.

■ Shaded cells indicate variety was not present in trials, value shown is predicted yield from MET analysis.

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (information provided by seed companies).

TABLE 7. Yield of canola varieties in AGZONE 4 EARLY[^] series NVT, expressed as a percentage of site mean yield for each trial year (2016–2020), and the weighted average over the five-year period

AGZONE 4 EARLY TT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		1.99	2.04	1.59	0.72	1.23	-
		Variety	No. trials	(1)	(1)	(2)	(2)	(3)	(9)
TT	3	HyTTec Trident	(8)	132	125	121	123	124	124
TT	3	SF Spark TT	(5)	114	106	106	102	109	107
TT (OP)	3	ATR Stingray	(7)	82	86	88	87	87	87
TT	4	RGT Capacity TT	(3)	115	114	112	114	112	113
TT	4.5	InVigor T 4510	(9)	114	114	112	114	112	113
TT	4	HyTTec Trophy	(5)	108	112	110	116	108	111
TT	4.5	Hyola Blazer TT	(3)	86	108	105	122	96	104
TT (OP)	4	ATR Bonito	(9)	91	92	93	92	93	92
TT	5	SF Dynatron TT	(5)	104	112	110	118	106	110
TT+LL	4.5	InVigor LT 4530P	(3)	100	104	103	107	101	103
TT+GT (RR)	4	BASF 3000 TR	(6)	113	97	99	88	106	100
TT+CL	5	Hyola Enforcer CT	(4)	85	100	99	109	93	98
AGZONE 4 EARLY GT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		2.23	2.32	1.97	0.84	1.38	-
		Variety	No. trials	(1)	(1)	(2)	(2)	(3)	(9)
GT (TF)	3	Nuseed Emu TF	(3)	146	118	116	104	129	121
GT (RR)	3	InVigor R 3520	(9)	112	103	103	99	107	104
GT (RR)	4	Pioneer 44Y27 RR	(9)	116	112	110	111	112	112
GT (TF)	4.5	Hyola 410XX	(5)	105	104	103	103	104	104
GT (TF)	4	InVigor R 4022P	(5)	99	106	104	110	101	104
GT (TF)	4.5	InVigor R 4520P	(5)	91	102	101	108	96	100
GT (TF)	4	Nuseed Raptor TF	(2)	87	98	98	105	93	97
GT (TF)	5	Nuseed Condor TF	(2)	97	111	108	120	102	108
GT (TF)+CL	3.5	Hyola Battalion XC	(3)	104	101	101	99	102	101
GT (TF)+CL	4	Hyola Garrison XC	(5)	87	98	98	104	93	96

Varieties grouped by herbicide tolerance type, then major maturity group, and listed in decreasing yield. Source: NVT Online, nvtonline.com.au

[^] EARLY series NVT trials are sown in shorter season environments (see Figure 1).

Varieties with only a single successful trial are not included.

■ Shaded cells indicate variety was not present in trials, value shown is predicted yield from MET analysis.

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (information provided by seed companies).

TABLE 8. Yield of canola varieties in AGZONE 5 EARLY[^] series NVT, expressed as a percentage of site mean yield for each trial year (2016–2020), and the weighted average over the five-year period

AGZONE 5 EARLY TT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		1.61	1.68	0.65	1.28	1.53	-
		Variety	No. trials	(3)	(3)	(1)	(2)	(2)	(11)
TT	3	HyTTec Trident	(4)	120	114	150	119	118	121
TT	3	SF Spark TT	(4)	106	99	115	101	106	104
TT (OP)	3	ATR Stingray	(3)	89	92	73	89	90	89
TT	4.5	InVigor T 4510	(11)	110	110	126	113	109	112
TT	4	HyTTec Trophy	(8)	108	113	122	114	107	112
TT	4.5	Hyola Blazer TT	(2)	101	122	108	120	101	111
TT	4	RGT Capacity TT	(2)	110	110	126	112	109	112
TT (OP)	4	ATR Bonito	(11)	94	95	85	93	94	93
TT	5	SF Dynatron TT	(4)	107	115	121	116	107	112
TT+LL	4.5	InVigor LT 4530P	(2)	102	106	106	106	102	104
TT+CL	5	Hyola Enforcer CT	(4)	97	110	95	108	97	102
TT+GT (RR)	4	BASF 3000 TR	(2)	102	87	100	89	101	95

Varieties grouped by herbicide tolerance type, then major maturity group, and listed in decreasing yield. Source: NVT Online, nvtonline.com.au

[^] EARLY series NVT trials are sown in shorter season environments (see Figure 1).

Varieties with only a single successful trial are not included.

■ Shaded cells indicate variety was not present in trials, value shown is predicted yield from MET analysis.

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (information provided by seed companies).

RESULTS FOR MID SERIES NVT

TT and TT combination varieties

The three TT varieties with the highest predicted yields from the Mid series all have a resistant (R) blackleg rating (bare seed). The mid maturity variety HyTTec Trifecta achieved the highest yields, followed by Hyola Blazer TT (early-mid maturity) and HyTTec Trident (early maturity), which achieved comparable yields. There was a very similar pattern across the individual Agzones 2, 3, 5 and 6 (Tables 10–13), and the combined statewide results (Table 9).

SF Dynatron TT yielded just 4% less than HyTTec Trifecta and had a relatively high oil content (Table 2). However, SF Dynatron TT has a low blackleg rating of MS and should be avoided or used with a good blackleg management package in areas with high rainfall and high blackleg risk.

Other high-yielding varieties in the Mid series trials included (in decreasing order) the early-mid maturity varieties HyTTec Trophy, RGT Capacity TT and InVigor T 4510 and the mid-late maturity InVigor T 6010. InVigor T 6010 and RGT Capacity TT have a blackleg rating of MS.

DG Murray TT was the highest yielding OP variety in the Mid series. There was an 18% yield gap between DG Murray TT and the highest yielding hybrid (HyTTec Trident), but only a 5% difference between DG Murray and the lowest yielding hybrid (Tables 9–13). OP yield differences may be slightly less on-farm, when using the best practice OP agronomy (large seed and high seeding rate). In the medium and high rainfall zones, OP varieties are likely to be restricted to lower yielding or high-risk sites, or where preferred hybrid seed is not available. DG Murray TT has a blackleg resistance rating of R-MR, compared with MS for ATR Bonito. In addition, DG Murray TT has a totally different blackleg group (H), so swapping from ATR Bonito to DG Murray TT will greatly improve blackleg resistance.

Herbicide combination varieties Hyola Enforcer CT (TT+CL) and InVigor LT 4530P (TT+LL) have yield expectations close to some single tolerance TT hybrids (Tables 9–3).

GT and GT combination varieties

In the longer season Mid series GT trials, early-mid maturity varieties InVigor R 4520P and the new variety Pioneer 44Y30 RR achieved the highest predicted yields, particularly in the high rainfall Agzones 3 and 6 (Tables 11 and 13). InVigor R 4520P has the benefits of both TruFlex® and PodGuard® traits, but it has a moderately susceptible (MS) blackleg rating (bare seed). In Agzones 3 and 6, mid maturity varieties Pioneer 45Y28 RR and Nuseed Condor TF were equal third highest yielding. Both varieties have relatively high oil content. Nuseed Condor TF also has the TruFlex® trait and a blackleg rating of R, bare seed. Both Pioneer 44Y30 RR and Pioneer 54Y28 RR have a blackleg rating of MR.

Other high yielding early-mid maturity varieties were Nuseed Raptor TF, InVigor R 4022P, Pioneer 44Y27 RR and the mid maturity variety Nuseed GT-53. Nuseed Raptor TF and Nuseed GT-53 have a R blackleg rating. Nuseed Raptor TF and InVigor R 4022P have the TruFlex® trait and InVigor R 4022P also has the PodGuard® trait.

In Agzone 2, varieties displayed a closer range of predicted yields with only 6% difference between seven varieties: early-mid maturity varieties InVigor R 4520P, Pioneer 44Y27 RR, Nuseed Raptor TF, InVigor R 4022P, mid maturity varieties Nuseed Condor TF, Pioneer 45Y28 RR and early maturity variety Nuseed Emu TF (Table 10). Nuseed Emu TF was only present in two Mid series trials, both with mean yields below 1t/ha.

CL varieties

The new mid maturity variety Pioneer 45Y95 CL achieved the highest predicted yields in the CL trials, although this variety has only been tested in the 2018 NVT. Other CL varieties with high predicted yields were the early-mid maturity variety Pioneer 44Y94 CL and the mid maturity variety Pioneer 45Y93 CL (Table 9).



TABLE 9. Yield of canola varieties in MID^ series NVT (AGZONES 2, 3, 5 and 6 combined), expressed as a percentage of site mean yield for each trial year (2016–2020), and the weighted average over the five-year period

WA MID TT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		2.51	1.90	2.10	1.90	2.64	-
		Variety	No. trials	(9)	(12)	(10)	(12)	(8)	(51)
TT	3	HyTTec Trident	(20)	120	115	123	113	117	117
TT	3	SF Spark TT	(10)	104	103	105	103	103	104
TT (OP)	3	ATR Stingray	(16)	92	94	91	95	93	93
TT	4.5	Hyola Blazer TT	(9)	119	119	114	117	116	117
TT	4	HyTTec Trophy	(36)	117	115	116	114	115	115
TT	4	RGT Capacity TT	(11)	114	113	112	112	112	113
TT	4.5	InVigor T 4510	(51)	112	110	112	110	111	111
TT (OP)	4	ATR Bonito	(45)	93	95	92	96	95	94
TT	5	HyTTec Trifecta	(25)	122	120	120	118	119	120
TT	5	SF Dynatron TT	(12)	118	117	115	115	115	116
TT	5	SF Ignite TT	(48)	110	111	104	109	107	108
TT	6	InVigor T 6010	(13)	111	113	106	112	109	110
TT (OP)	6	DG Murray TT	(9)	99	100	97	99	98	99
TT (OP)	6	ATR Wahoo	(14)	96	99	91	98	95	96
TT+CL	5	Hyola Enforcer CT	(17)	111	109	111	108	109	110
TT+GT (RR)	4	BASF 3000 TR	(10)	94	92	99	94	96	95
TT+LL	4.5	InVigor LT 4530P	(8)	108	108	107	108	108	108
WA MID GT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		2.73	2.07	2.28	2.23	2.72	-
		Variety	No. trials	(6)	(8)	(6)	(10)	(8)	(38)
GT (TF)	3	Nuseed Emu TF	(2)	102	98	108	99	103	102
GT (RR)	3	InVigor R 3520	(13)	95	93	101	95	98	96
GT (TF)	4.5	InVigor R 4520P	(18)	115	116	110	114	112	114
GT (RR)	4	Pioneer 44Y30 RR	(6)	116	114	114	112	113	114
GT (TF)	4	Nuseed Raptor TF	(19)	110	107	109	106	107	108
GT (TF)	4	InVigor R 4022P	(18)	107	108	105	107	106	107
GT (RR)	4	Pioneer 44Y27	(33)	107	104	108	104	106	106
GT (TF)	4.5	Hyola 410XX	(19)	100	98	102	99	100	100
GT (TF)	5	Nuseed Condor TF	(17)	112	111	110	109	109	110
GT (RR)	5	Pioneer 45Y28 RR	(16)	112	111	109	109	108	110
GT (RR)	5	Nuseed GT-53	(38)	106	103	106	103	104	104
GT (RR)	5.5	InVigor R 5520P	(33)	99	102	96	102	99	100
GT (TF)+CL	3.5	Hyola Battalion XC	(4)	103	100	104	100	102	102
GT (TF)+CL	4	Hyola Garrison XC	(18)	103	102	104	102	102	102
WA MID CL									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		2.97	2.00	2.32	2.42	3.24	-
		Variety	No. trials	(4)	(7)	(6)	(5)	(3)	(25)
CL	3	Pioneer 43Y92 CL	(10)	107	106	107	103	106	106
CL	4	Pioneer 44Y94 CL	(7)	118	117	115	111	114	115
CL	5	Pioneer 45Y95 CL	(5)	119	119	114	113	113	116
CL	5	Pioneer 45Y93 CL	(15)	113	116	107	113	108	112
CL	5	Hyola Equinox CL	(3)	107	105	108	102	106	106

Varieties grouped by herbicide tolerance type, then major maturity group, and listed in decreasing yield. Source: NVT Online, nvt.grdc.com.au

^ MID series NVT trials are sown in longer season environments (see Figure 1).

Varieties with only a single successful trial are not included.

Shaded cells indicate variety was not present in trials, value shown is predicted yield from MET analysis.

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (information provided by seed companies).

TABLE 10. Yield of canola varieties in AGZONE 2 MID[^] series NVT, expressed as a percentage of site mean yield for each trial year (2016–2020), and the weighted average over the five-year period

AGZONE 2 MID Triazine tolerant (TT) and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		2.61	2.01	2.09	1.46	1.87	-
		Variety	No. trials	(5)	(4)	(4)	(5)	(1)	(19)
TT	3	HyTtec Trident	(11)	119	115	122	119	112	118
TT	3	SF Spark TT	(6)	104	103	105	104	103	104
TT (OP)	3	ATR Stingray	(12)	92	94	91	93	96	93
TT	4	HyTtec Trophy	(14)	115	113	114	114	110	114
TT	4	RGT Capacity TT	(3)	112	111	109	111	111	111
TT	4.5	InVigor T 4510	(19)	111	110	109	111	113	110
TT (OP)	4	ATR Bonito	(14)	93	95	92	95	99	94
TT (OP)	4	ATR Mako	(11)	93	93	94	93	92	93
TT	5	HyTtec Trifecta	(8)	120	117	116	116	110	117
TT	5	SF Dynatron TT	(6)	116	113	111	113	109	113
TT	5	SF Ignite TT	(17)	108	107	102	102	96	104
TT (OP)	6	DG Murray TT	(2)	99	99	98	96	91	98
TT+CL	5	Hyola Enforcer CT	(4)	110	108	110	109	106	109
TT+GT (RR)	4	BASF 3000 TR	(10)	95	96	100	100	107	98
AGZONE 2 MID Glyphosate tolerant GT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		2.75	1.87	2.08	1.66	0.86	-
		Variety	No. trials	(4)	(3)	(3)	(4)	(1)	(15)
GT (TF)	3	Nuseed Emu TF	(2)	103	104	109	110	140	109
GT (RR)	3	InVigor R 3520	(11)	97	99	102	103	130	102
GT (TF)	4.5	InVigor R 4520P	(5)	115	116	106	112	98	111
GT (RR)	4	Pioneer 44Y27 RR	(15)	107	106	108	107	116	108
GT (TF)	4	Nuseed Raptor TF	(5)	108	106	110	106	104	107
GT (TF)	4	InVigor R 4022P	(5)	107	109	101	108	104	106
GT (TF)	4.5	Hyola 410XX	(5)	100	99	103	100	107	101
GT (TF)	5	Nuseed Condor TF	(5)	111	110	108	108	101	109
GT (RR)	5	Pioneer 45Y28 RR	(5)	110	108	107	106	95	107
GT (RR)	5	Nuseed GT-53	(15)	105	102	107	103	103	104
GT (RR)	5.5	InVigor R 5520P	(10)	100	102	93	99	89	98
GT (TF)+CL	4	Hyola Garrison XC	(5)	103	101	104	102	102	102

Varieties grouped by herbicide tolerance type, then major maturity group, and listed in decreasing yield. Source: NVT Online, nvt.grdc.com.au

[^] MID series NVT trials are sown in longer season environments (see Figure 1).

Varieties with only a single successful trial are not included.

■ Shaded cells indicate variety was not present in trials, value shown is predicted yield from MET analysis.

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (information provided by seed companies).

TABLE 11. Yield of canola varieties in AGZONE 3 MID^ series NVT, expressed as a percentage of site mean yield for each trial year (2016–2020), and the weighted average over the five-year period

AGZONE 3 MID Triazine tolerant (TT) and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		3.13	2.06	2.47	2.45	3.09	-
		Variety	No. trials	(2)	(3)	(3)	(3)	(3)	(14)
TT	3	HyTtec Trident	(3)	124	118	123	111	118	118
TT	3	SF Spark TT	(3)	105	103	105	102	104	104
TT (OP)	3	ATR Stingray	(2)	91	93	91	96	93	93
TT	4.5	Hyola Blazer TT	(3)	126	128	118	122	113	121
TT	4	HyTtec Trophy	(10)	122	120	117	115	114	117
TT	4	RGT Capacity TT	(5)	119	119	113	114	111	115
TT	4.5	InVigor T 4510	(14)	116	115	112	111	111	113
TT (OP)	4	ATR Bonito	(13)	92	95	92	97	94	94
TT (OP)	4	ATR Mako	(8)	89	89	92	92	93	91
TT	5	HyTtec Trifecta	(9)	129	128	122	121	117	123
TT	5	SF Dynatron TT	(4)	124	124	117	119	113	119
TT	5	SF Ignite TT	(14)	114	117	107	115	104	111
TT	6	InVigor T 6010	(6)	117	120	109	117	106	114
TT (OP)	6	DG Murray TT	(4)	98	99	98	100	97	98
TT (OP)	6	ATR Wahoo	(7)	96	100	94	103	93	97
TT+CL	5	Hyola Enforcer CT	(6)	113	111	111	108	109	110
TT+LL	4.5	InVigor LT 4530P	(3)	112	112	107	109	107	109
AGZONE 3 MID Glyphosate tolerant GT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		3.38	2.33	2.45	2.63	3.37	-
		Variety	No. trials	(1)	(2)	(2)	(3)	(3)	(11)
GT (TF)	4.5	InVigor R 4520P	(6)	118	119	112	116	111	115
GT (RR)	4	Pioneer 44Y30 RR	(3)	119	117	115	112	113	114
GT (TF)	4	Nuseed Raptor TF	(7)	113	110	110	107	106	108
GT (TF)	4	InVigor R 4022P	(6)	107	109	106	107	107	107
GT (RR)	4	Pioneer 44Y27 RR	(10)	108	106	108	102	106	105
GT (TF)	4.5	Hyola 410XX	(7)	100	99	101	98	100	99
GT (TF)	5	Nuseed Condor TF	(6)	115	114	111	111	108	111
GT (RR)	5	Pioneer 45Y28 RR	(6)	116	114	110	111	107	111
GT (RR)	5	Nuseed GT-53	(11)	108	105	106	103	103	104
GT (RR)	5.5	InVigor R 5520P	(11)	98	101	97	103	99	100
GT (TF)+CL	4	Hyola Garrison XC	(6)	105	103	104	102	102	103

Varieties grouped by herbicide tolerance type, then major maturity group, and listed in decreasing yield. Source: NVT Online, nvt.grdc.com.au

^ MID series NVT trials are sown in longer season environments (see Figure 1).

Varieties with only a single successful trial are not included.

■ Shaded cells indicate variety was not present in trials, value shown is predicted yield from MET analysis.

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (information provided by seed companies).

TABLE 12. Yield of canola varieties in AGZONE 5 MID[^] series NVT, expressed as a percentage of site mean yield for each trial year (2016–2020), and the weighted average over the five-year period

AGZONE 3 MID Triazine tolerant (TT) and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		1.49	1.32	1.31	0.80	2.22	-
		Variety	No. trials	(1)	(1)	(1)	(1)	(1)	(5)
TT	3	HyTTec Trident	(3)	108	120	120	125	124	119
TT (OP)	3	ATR Stingray	(2)	97	91	92	90	90	92
TT	4	HyTTec Trophy	(4)	108	112	114	117	118	114
TT	4.5	Hyola Blazer TT	(2)	106	112	108	114	118	112
TT	4.5	InVigor T 4510	(5)	109	106	112	113	112	110
TT (OP)	4	ATR Bonito	(5)	99	91	94	92	91	93
TT	5	SF Dynatron TT	(2)	108	110	111	115	117	112
TT	5	SF Ignite TT	(4)	100	105	98	103	107	103
TT+CL	5	Hyola Enforcer CT	(2)	104	109	109	112	112	109

TABLE 13. Yield of canola varieties in AGZONE 6 MID[^] series NVT, expressed as a percentage of site mean yield for each trial year (2016–2020), and the weighted average over the five-year period

AGZONE 6 MID Triazine tolerant (TT) and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		1.81	1.82	1.94	2.45	2.58	-
		Variety	No. trials	(1)	(4)	(2)	(3)	(3)	(13)
TT	3	HyTTec Trident	(3)	125	112	125	110	115	115
TT	4.5	Hyola Blazer TT	(3)	121	117	117	117	122	118
TT	4	HyTTec Trophy	(8)	119	113	120	112	116	115
TT	4	RGT Capacity TT	(2)	114	111	117	111	114	113
TT	4.5	InVigor T 4510	(13)	112	108	117	109	111	111
TT (OP)	4	ATR Bonito	(13)	91	96	93	97	95	95
TT (OP)	4	ATR Mako	(6)	92	94	89	93	92	92
TT	5	HyTTec Trifecta	(8)	125	118	124	117	122	120
TT	5	SF Ignite TT	(13)	110	111	104	111	114	111
TT	6	InVigor T 6010	(6)	111	112	109	113	115	112
TT (OP)	6	DG Murray TT	(3)	100	101	94	100	101	100
TT (OP)	6	ATR Wahoo	(6)	96	101	88	101	101	99
TT+CL	5	Hyola Enforcer CT	(5)	112	107	112	106	109	108
TT+LL	4.5	InVigor LT 4530P	(3)	107	106	112	107	108	108

AGZONE 6 MID Glyphosate tolerant GT and combinations									
Herbicide tolerance	Harvest maturity	Year		2016	2017	2018	2019	2020	2016–2020
		Site mean yield (t/ha)		2.00	2.10	2.52	2.57	2.74	-
		Variety	No. trials	(1)	(3)	(1)	(3)	(3)	(11)
GT (TF)	4.5	InVigor R 4520P	(6)	112	114	118	113	115	114
GT (RR)	4	Pioneer 44Y30 RR	(3)	113	111	119	111	113	112
GT (TF)	4	Nuseed Raptor TF	(6)	112	106	108	105	109	107
GT (TF)	4	InVigor R 4022P	(6)	104	106	111	106	106	106
GT (RR)	4	Pioneer 44Y27 RR	(7)	106	102	109	102	104	104
GT (TF)	4.5	Hyola 410XX	(6)	101	98	100	98	99	99
GT (RR)	5	Pioneer 45Y28 RR	(5)	112	110	110	109	112	110
GT (TF)	5	Nuseed Condor TF	(6)	112	109	112	108	111	110
GT (RR)	5	Nuseed GT-53	(11)	108	103	104	102	105	104
GT (RR)	5.5	InVigor R 5520P	(11)	96	103	100	103	101	102
GT (TF)+CL	3.5	Hyola Battalion XC	(2)	105	99	101	99	101	100
GT (TF)+CL	4	Hyola Garrison XC	(6)	105	102	102	101	103	102

Varieties grouped by herbicide tolerance type, then major maturity group, and listed in decreasing yield. Source: NVT Online, nvt.grdc.com.au

[^] MID series NVT trials are sown in longer season environments (see Figure 1).

Varieties with only a single successful trial are not included.

■ Shaded cells indicate variety was not present in trials, value shown is predicted yield from MET analysis.

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (information provided by seed companies).

WA canola varieties grown in 2016–2021

The proportion of open pollinated (OP) TT canola has decreased in WA being replaced in part by GT varieties, which increased to a high of 37% of the total canola area in the 2021 season. Hybrid TT varieties have also increased in area, from 2% in 2017 to 23% in the 2021 growing season, at the expense of OP TT varieties. The area sown to Clearfield remains low at 3% and the area of various dual herbicide combinations (TT+GT, TT+CL, GT+CL) remains minor, at a total of 4% in 2021 (Table 14).

TABLE 14. Proportion (% area planned for sowing) of canola herbicide systems in WA (2016–2021)

Herbicide tolerance	2016	2017	2018	2019	2020	2021
TT OP	72	78	67	53	46	33
TT Hy	2	2	5	10	17	23
GT	23	18	26	34	32	37
CL	2	1	1	2	3	3
Combinations	2	1	1	1	3	4

Source: CBH Group

Different proportions of herbicide tolerant canola varieties are planted across WA port zones (Figure 2). The highest proportion of GT use is in the Geraldton port zone, which increased to 82% in the 2021 growing season. Contributing factors to this increase are the long history of wheat-lupin rotation in Geraldton port zone, leading to some triazine resistant weeds, the historically high proportion of cropping with higher reliance on grass selective sprays, and increased group A resistance, compared with southern mixed farming systems. Conversely, the proportion of TT crops increases from northern to southern port zones, with a low of 11% at Geraldton to a high of 86% at Esperance. Further, the use of hybrid TT varieties has increased in the higher rainfall zones of Albany and Esperance, with significant increases since 2017. For example, in the Esperance zone, 50% of the canola area was sown to hybrid TT varieties in the 2021 growing season.

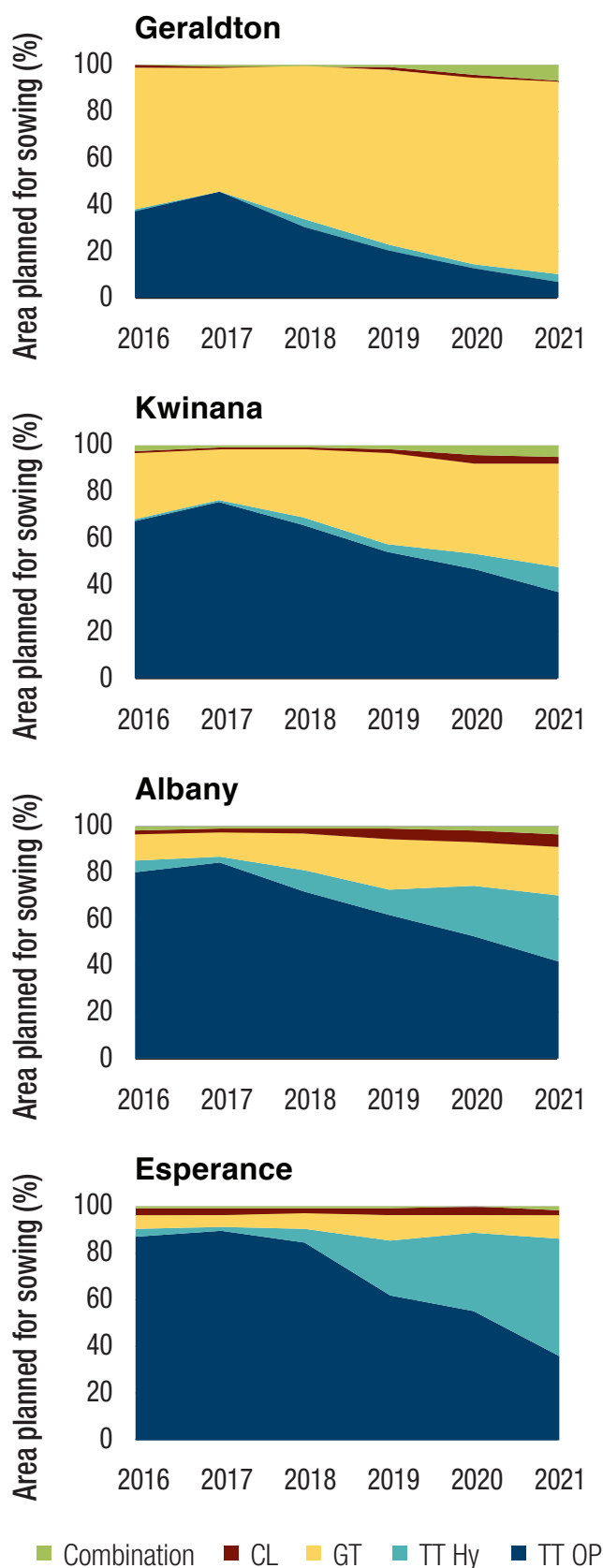


FIGURE 2. Proportion (% area) of canola herbicide systems in CBH port zones: Geraldton, Kwinana, Albany and Esperance

Source: CBH Group

Despite the reduction in area sown to OP canola, ATR Bonito remained the most widely grown canola variety in WA during 2021 at 26% of the total canola area. HyTTec Trident was the second most popular variety and increased in area quickly after its release in 2019 to reach 11% in 2021.

There has been a relatively quick adoption of the TruFlex® trait with five varieties sown over 0.5% of the total canola area, including the GT+CL combination varieties, Hyola 540XC and Hyola 530XC (Table 15).

The 28 canola varieties shown in Table 15 represent more than 94% of the total canola area. A further 49 canola varieties were grown in 2021 over the remaining 6% canola area.

TABLE 15. Proportion (% area) of canola varieties planned to be sown in WA (2016-2021)

Variety	Tolerance	2017	2018	2019	2020	2021
ATR Bonito	TT OP	54.5	53.0	39.1	34.6	26.4
HyTTec Trident	TT hybrid	-	-	-	5.2	11.3
Pioneer 44Y27 RR	GT (RR)	-	1.7	6.8	5.5	7.1
HyTTec Trophy	TT hybrid	-	0.0	2.3	5.9	5.6
Nuseed GT-53	GT (RR)	1.4	3.7	3.6	3.5	4.4
Pioneer 43Y29 RR	GT (RR)	-	-	3.1	3.4	3.6
ATR Stingray	TT OP	12.7	6.7	6.1	5.5	3.5
Pioneer 43Y23 RR	GT (RR)	5.4	7.9	7.4	4.8	3.2
Nuseed Raptor TF	GT (TF)	-	-	-	1.0	3.1
Hyola 404RR	GT (RR)	4.8	8.4	5.4	3.6	2.8
InVigor R 4022P	GT (TF)	-	-	-	0.8	2.7
Hyola 410XX	GT (TF)	-	-	1.0	2.5	2.6
Pioneer 45Y28 RR	GT (RR)	-	-	-	1.2	2.5
InVigor T 4510	TT hybrid	0.1	1.9	3.5	3.1	2.5
InVigor R 3520	GT (RR)	-	0.0	0.5	0.5	1.8
Hyola 540XC	GT+CL	-	-	-	1.0	1.7
DG 408RR	GT (RR)	-	0.3	2.8	2.8	1.3
HyTTec Trifecta	TT hybrid	-	-	-	0.3	1.2
ATR Mako	TT OP	2.5	2.7	3.5	2.1	1.1
Pioneer 44Y94 CL	CL	-	-	-	-	0.9
InVigor R 5520P	GT (RR)	0.1	0.6	1.0	0.9	0.8
AFP Cutubury	TT OP	-	0.0	0.2	0.5	0.7
Hyola 580CT	TT+CL	-	-	0.3	1.1	0.7
Hyola Enforcer CT	TT+CL	-	-	-	-	0.7
Pioneer 44Y90 CL	CL	0.1	0.8	1.2	0.9	0.6
Hyola 530XT	TT+GT	-	-	-	0.1	0.6
Pioneer 45Y93 CL	CL	-	-	0.1	0.9	0.6
Pioneer 43Y92 CL	CL	-	0.0	0.4	1.3	0.6

Varieties over 0.05% planned area sown in 2021 shown. Source: CBH Group

Canola seeding and establishment

Calculating canola seeding rate requires:

- Seed size, in seeds/kg (available from seed supplier)
- Germination % (available from seed supplier)
- Target density (see Table 16)
- An estimate of field establishment (FE) (see Table 17)

Seeding rate formula:

$$\text{Seed rate (kg/ha)} = \frac{\text{target density (plants/m}^2\text{) x 10,000}}{\text{FE (\%)} \times \text{seeds per kg} \times \text{germination (\%)}}$$

(Use the decimal format for FE and germination in manual calculations, for example 0.75) or use the online DPIRD seeding rate calculator at agric.wa.gov.au/n/4319

Target density

Optimum canola density varies with rainfall zone and canola type. In the medium rainfall zone the optimum density is 25–40 plants/m² for hybrid seed and 40–50 plants/m² for OP varieties. (Table 16). The optimum canola density is lower for hybrid seed than OP seed, largely due to the higher cost of hybrid seed.

TABLE 16. Optimum canola density (plants/m²) for WA rainfall zones

	Low rainfall	Medium rainfall	High rainfall
Hybrid	25-35	25-40	40-60
OP	30-40	40-50	50-70

Source: B French, M Seymour and R Malik (DPIRD)

Estimating field establishment

Field establishment (FE) relates to the proportion of viable seeds that emerge after sowing and varies with conditions at seeding and canola type. Hybrids generally have better establishment than open pollinated varieties. Under reasonable seeding conditions hybrid seed can be expected to achieve 65% field emergence while OP seed will likely achieve 50% field establishment (Table 17). DPIRD research has shown that seed size explains part of this difference as hybrid seed is often larger than OP seed. Seeding rates may need to be increased if seeding conditions are poor.

TABLE 17. Expected field establishment (%) for hybrid and open pollinated (OP) seed

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

Seed size and seeding rates

Canola seed size varies with variety and season. Generally, hybrids have larger seed than OP varieties. The common range of canola seed sizes is shown in Table 18, along with example seeding rates for reasonable seeding conditions in the medium rainfall zone.

It is recommended that harvested OP seed be graded over a 2mm sieve to select large seed for seeding, even though large quantities of seed (>100t) may need to be graded. Note the increase in seeding rate with increasing seed size, which means OP seeding rates should be a minimum of 4.6kg/ha when seed is graded over a 2mm sieve.

TABLE 18. Hybrid and OP canola seeding rates for a range of seed sizes in the medium rainfall zone of WA

Seed size	Seeds/kg	Seeds/10cm	Seed size (mg)*	Seed diameter (mm)	Hybrid seeding rate** (kg/ha)	OP seeding rate*** (kg/ha)
Very 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
Very large	150,000	46	6.7	2.2	3.2	6.2

*Seed size (mg) = one thousand seed weight (g).

**Hybrid seed target density 30 plants/m² and field establishment of 65%.

***Open pollinated (OP) target density 45 plants/m² and field establishment of 50%.

NOTE: a germination rate of 98% was used for both seed types.

Measure seed size in retained OP seed

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

Check field establishment

Check field establishment by counting all plants in a single one-metre row length. Do at least 10 counts at random over the paddock and calculate the average. Use the appropriate multiplication factor from Table 19 to convert from plants/m row to plants/m². For example, at 12-inch row spacing the multiplication factor is 3.3. If the average number of plants per metre of row is nine, then there are 30 plants/m² (3.3 x 9).

TABLE 19. Multiplication factors required to convert canola plants/m row to plants/m² for a range of row spacings

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



COMMERCIAL CANOLA SEED COMPANIES

Pacific Seeds

hyola.com.au

Steve Lamb +61 (0)429 619 103
 Dan McGrath +61 (0) 448 014 892
 Justin Kudnig +61 (0)408 408 616

Agronomy for Profit

Peter Norris +61 (0)428 850 850

BASF

myseed.com.au/canola

Michael Allingame +61 (0)437 454 283

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

Nutrien Ag solutions/Dynagro Seed (formerly commercialised by Seednet)

Seednet.com.au/products/dyna-gro-canola

David Clegg +61 (0)408 630 641

Seed Force

seedforce.com

David Leah +61 (0)447 565 457

REGISTERED TRADEMARKS

- Roundup Ready® and TruFlex® are registered trademarks of Monsanto Technology LLC, Monsanto Australia Pty Ltd.
- Hyola® is registered trademark of Pacific Seeds Pty Limited.
- Clearfield®, InVigor® and Podguard® are registered trademarks of BASF Agricultural Solutions Seed US LLC.
- HyTTec® is a published trademark of Nuseed Pty Ltd.

Canola varieties with the registered trademarks of Hyola®, HyTTec® and InVigor® are presented in Table 2. Thereafter the trademark symbol has been omitted.

ABBREVIATIONS

CC	Conventional Canola
CL	Clearfield®
GT	Glyphosate Tolerance
EPR	End Point Royalties
LL	LibertyLink
MET	Multi-Environment Trials
NVT	National Variety Trials
OP	Open Pollinated
RR	Roundup Ready®
TF	TruFlex®
TT	Triazine Tolerant

ACKNOWLEDGEMENTS AND INFORMATION SOURCES

The information contained in this guide is based on the work conducted by many research scientists, technical officers and service providers. The author would like to thank the following groups and staff:

- Yield and oil data was generated from the GRDC National Variety Trials (NVT) scheme and accessed from NVT Online and from Neale Sutton at NVT.
- Growers who host the NVT trials and GRDC NVT service providers, Living Farm and Kalyx.
- The canola NVT oil data analysis was done by Andrew van Burgel, DPIRD.
- Blackleg information was reproduced from the GRDC Fact Sheet, 2020 Spring Blackleg Management Guide. Acknowledgement to the team at Marcroft Grains Pathology.
- Variety harvest maturity was provided from company fact sheets/technical notes or directly from company representatives. Company representatives were also cooperative in checking the document.

