NORTHERN
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GRDC
GROWNOTES™

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

CANOLA

SECTION 2

PRE-PLANTING

VARIETAL PERFORMANCE AND RATINGS YIELD | VARIETIES FOR NSW | PLANTING SEED QUALITY

MORE INFORMATION

Winter crop variety sowing guide 2016

Canola: northern NSW planting guide

Pre-planting

FAQ

2.1 Varietal performance and ratings yield

The main features to consider when selecting a variety are maturity, yield, oil content, herbicide tolerance and disease resistance. Early-maturing varieties are generally more suited to drier western areas, and midseason types are suited to higher rainfall areas. [1]

Canola varieties are either hybrid or open-pollinated (OP). Within these breeding groups there are five herbicide tolerance groups; 1. Conventional; 2. Triazine-tolerant; 3. Imidazolinone-tolerant (marketed as Clearfield®); 4. Roundup Ready; 5. Dual tolerant—Triazine tolerant plus Roundup Ready. [2]

There are expected to be 58 canola varieties on the market in NSW for 2016.

There are 12 new releases for NSW:

- ATR-MakoA, Monola® 416TT and Nuseed GT-42 from Nuseed Pty Ltd
- Banker CL and Rimfire CL from Heritage Seeds
- Bayer 3000TR® from Bayer
- DG 460RR from Landmark
- DG 560TT from Landmark
- Hyola® 504RR from Pacific Seeds
- Pioneer® 45T01 (TT) from DuPont Pioneer
- SF Turbine TT from Seed Force
- Victory® V5003RR from AWB

Outclassed, but still available:

- Hyola® 50

Withdrawn:

- Pioneer 44C79 (CL), Pioneer 44Y84 (CL), Hyola® 400RR, Hyola® 500RR, Hyola® 505RR, Hyola® 971CL, Monola® 605TT [3]

2.1.1 Maturity

The relative maturity of varieties can vary depending on location and sowing time. The maturity groupings shown in Table 1 are made as a guide only and relate to physiological maturity or windrow/harvest maturity.

The winter canola types for grazing and grain recovery are not included in Table 1. Maturity of these types is generally considered late–very late. [4]

1 L Serafin, J Holland, R Bambach, D McCaffery (2005) Canola: northern NSW planting guide. NSW Department of Primary Industries, http://www.nvtonline.com.au/wp-content/uploads/2013/03/Crop-Guide-Canola-Northern-NSW-Planting-Guide.pdf

2 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/272945/winter-crop-variety-sowing-guide-2016.pdf

3 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/272945/winter-crop-variety-sowing-guide-2016.pdf

4 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/272945/winter-crop-variety-sowing-guide-2016.pdf

Table 1: *Variety maturities for canola.*

	Lower rainfall north <550 mm, centre/south <500 mm		Higher rainfall north >500 mm, centre/south >450 mm	
	Early maturing	**Early–mid maturing**	**Mid maturing**	**Mid–late maturing**
Conventional	Nuseed Diamond	Victory® V3002	AV-Garnet AV-Zircon Hyola® 50	
Triazine tolerant (TT)	ATR-Stingray Monola® 314TT Pioneer® SturtTT	ATR-Bonito ATR-Gem Hyola® 450TT Monola® 416TT Pioneer® Atomic TT DG 560TT SF Turbine TT	ATR-Mako Hyola® 559TT Monola® 515TT Pioneer® 45T01 (TT)	ATR-Wahoo Hyola® 650TT
CLEARFIELD®	Pioneer® 43C80 (CL) Pioneer® 43Y85 (CL))	Carbine Hyola® 474CL Pioneer® 44Y87 (CL) Pioneer® 44Y89 (CL)	Banker CL Hyola® 575CL Pioneer® 45Y86 (CL) Pioneer® 45Y88 (CL) Rimfire CL	Archer Hyola® 577CL
Roundup Ready®	IH30 RR Nuseed GT-41 Pioneer® 43Y23 (RR)	DG 460RR Hyola® 404RR Monola® G11 Monola® 513GT Nuseed GT-42 Pioneer® 44Y24 (RR) Pioneer® 44Y26 (RR)	DG 550RR Hyola® 504RR® Nuseed GT-50 Pioneer® 45Y25 (RR) IH51 RR IH52 RR Victory® V5002RR Victory® V5003RR	Hyola® 600RR®
Roundup Ready® plus Triazine tolerant (Dual tolerance)	Bayer 3000TR®		Hyola® 525RT®	Hyola® 725RT®

The relative maturity of varieties can vary depending on location and sowing time. The groupings are made as a guide only and relate to physiological maturity or windrow/harvest maturity.

The winter canola types for grazing and grain recovery are not included in this table. Maturity of these types is generally considered late–very late.

2.1.2 Yielding ability

Tables 2 and 3 present the relative performances of mid-maturing and early-maturing canola varieties from trials conducted in 2011–15, under the National Variety Trials (NVT) program. Note that new varieties have fewer data supporting the 5-year dataset and hence, those results should be viewed with caution, especially where there are only two trials. [5]

5 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/272945/winter-crop-variety-sowing-guide-2016.pdf

Table 2: *Comparative performance of mid-maturing varieties of canola, based on predicted yields from an analysis across all sites (2011–15 NVT trials).*

Variety	North west	North east	South west	South east	Oil %	Blackleg rating spring 2015	Blackleg group spring 2015
	2011–15	2011–15	2011–15	2011–15	2015	2015	2015
Mid maturing conventional trials – mean seed yield expressed as a % of AV-Garnet							
AV-Garnet	100 (5)	100 (3)	100 (4)	100 (5)	42.2 (4)	MR–MS	A
AV-Zircon	99 (5)	94 (3)	100 (4)	97 (5)	42.2 (4)	MR	A
Nuseed Diamond	120 (4)	117 (2)	118 (3)	105 (4)	42.6 (4)	R–MR	ABF
Victory® V3002	106 (5)	106 (3)	106 (4)	102 (3)	42.0 (4)	R–MR	ABF
AV-Garnet t/ha	1.92	1.65	2.24	2.82			
Mid maturing Triazine Tolerant (TT) trials – mean seed yield expressed as a % of ATR-Gem							
ATR-Bonito	104 (7)	104 (7)	102 (7)	102 (22)	43.0 (11)	MR	A
ATR-Gem	100 (8)	100 (7)	100 (8)	100 (26)	42.6 (11)	MR	A
ATR-Mako	104 (4)	105 (2)	104 (3)	103 (10)	40.7 (11)	MR	A
ATR-Stingray	99 (9)	100 (7)	97 (8)	97 (24)	42.0 (11)	MR	C
ATR-Wahoo	99 (6)	99 (5)	101 (3)	102 (22)	43.0 (9)	MR	A
DG 560TT	108 (2)	109 (2)	106 (2)	103 (6)	40.6 (11)	n.d.	n.d.
Hyola® 450TT	103 (6)	103 (6)	102 (6)	98 (9)	41.5 (7)	R	ABD
Hyola® 525RT	102 (3)	n.d.	99 (6)	97 (11)	43.1 (7)	R–MR	ABD
Hyola® 559TT	109 (7)	110 (7)	108 (7)	105 (23)	42.3 (11)	R–MR	ABD
Hyola® 650TT	104 (4)	107 (6)	109 (4)	107 (16)	41.8 (11)	R	ABE
Hyola® 725RT	n.d.	n.d.	n.d.	n.d.	44.0 (5)	R–MR	ABD
Monola®416TT	98 (3)	n.d.	95 (4)	95 (7)	42.1 (9)	MR	n.d.
Monola® 515TT	88 (4)	87 (2)	90 (4)	89 (10)	41.8 (9)	R–MR	Not identified
Pioneer 45T01 (TT)	105 (5)	104 (6)	102 (5)	99 (12)	42.3 (10)	MR–MS	AB
Pioneer® Atomic TT	105 (6)	103 (5)	101 (7)	99 (13)	39.3 (4)	MS	AB
SF Turbine TT	109 (2)	111 (2)	109 (2)	106 (6)	40.6 (11)	n.d.	n.d.
ATR-Gem t/ha	1.97	1.97	1.92	2.41			
Mid maturing CLEARFIELD® trials – mean seed yield expressed as a % of Hyola® 575CL							
Archer	103 (6)	101 (7)	102 (6)	101 (24)	42.0 (11)	MR–MS	n.d.
Banker CL	113 (4)	113 (2)	110 (2)	112 (9)	42.4 (11)	MR	A
Hyola® 474CL	100 (9)	100 (8)	99 (9)	99 (23)	42.5 (11)	R	BF
Hyola® 575CL	100 (9)	100 (8)	100 (9)	100 (27)	42.8 (11)	R	BF
Hyola® 577CL	100 (6)	100 (6)	101 (5)	102 (17)	43.0 (11)	R	Not identified
Pioneer® 44Y87 (CL)	104 (5)	102 (5)	99 (4)	99 (15)	41.2 (8)	MR	A
Pioneer® 44Y89 (CL)	109 (4)	107 (4)	102 (5)	101 (9)	41.2 (8)	R–MR	BC
Pioneer® 45Y86 (CL)	106 (9)	103 (8)	100 (7)	99 (27)	42.6 (9)	MR–MS	AB
Pioneer® 45Y88 (CL)	105 (6)	105 (6)	104 (5)	105 (22)	40.6 (7)	MR	A
Rimfire CL	104 (5)	102 (4)	100 (6)	99 (13)	41.6 (11)	R–MR	AB
Hyola® 575CL t/ha	2.01	2.07	2.04	2.48			
Mid maturing Roundup Ready trials – mean seed yield expressed as a % of Nuseed GT-50							
DG 460RR	n.d.	n.d.	97 (2)	97 (4)	43.8 (7)	n.d.	A
DG 550RR	90 (3)	n.d.	94 (5)	91 (10)	42.5 (7)	R–MR	AB

Variety	North west	North east	South west	South east	Oil %	Blackleg rating spring 2015	Blackleg group spring 2015
	2011–15	2011–15	2011–15	2011–15	2015	2015	2015
Hyola® 404RR	95 (4)	n.d.	95 (9)	93 (19)	44.3 (7)	R–MR	ABD
Hyola® 504RR	n.d.	n.d.	98 (2)	95 (8)	42.5 (7)	n.d.	n.d.
Hyola® 600RR	n.d.	n.d.	n.d.	95 (8)	45.3 (6)	R	ABD
IH51 RR	91 (2)	n.d.	90 (4)	88 (8)	41.7 (7)	R–MR	A
IH52 RR	93 (3)	n.d.	95 (5)	94 (10)	42.0 (7)	R–MR	AB
Monola® 513GT	n.d.	n.d.	86 (6)	87 (10)	46.2 (4)	MR	A
Monola® G11	94 (3)	n.d.	92 (5)	88 (8)	44.0 (6)	MR	ABS
Nuseed GT-41	91 (3)	n.d.	90 (7)	91 (7)	41.9 (4)	R–MR	ABF
Nuseed GT-42	n.d.	n.d.	99 (2)	95 (2)	41.6 (4)	n.d.	n.d.
Nuseed GT-50	100 (3)	n.d.	100 (8)	100 (18)	42.7 (7)	R–MR	ABF
Pioneer® 43Y23 (RR)	100 (3)	n.d.	101 (7)	97 (10)	39.5 (4)	R–MR	B
Pioneer® 44Y24 (RR)	99 (4)	n.d.	100 (9)	99 (19)	41.3 (7)	R–MR	C
Pioneer® 44Y26 (RR)	n.d.	n.d.	95 (4)	94 (7)	45.0 (5)	R–MR	ABS
Pioneer® 45Y25 (RR)	102 (3)	n.d.	105 (5)	104 (14)	43.5 (6)	R–MR	BC
Victory V5002RR	93 (4)	n.d.	95 (9)	94 (17)	43.1 (7)	MR	AB
Victory V5003RR	94 (3)	n.d.	94 (5)	95 (10)	43.1 (7)	n.d.	n.d.
Nuseed GT-50 t/ha	2.47	n.d.	2.21	2.92			

Number of trials in parentheses. Oil content, adjusted to 6% moisture content, is expressed as a region-wide average for the maturity trial grouping and is for 2015 only. Blackleg ratings are the published ratings for spring 2015.

n.d. No data.

Table 3: *Comparative performance of early-maturing varieties of canola, based on predicted yields from an analysis across all sites (2011–15 NVT trials).*

Variety	North west	North east	South west	South east	Oil %	Blackleg rating spring 2015	Blackleg group spring 2015
	2011–15	2011–15	2011–15	2011–15	2015	2015	
Early maturing conventional trials – mean seed yield expressed as a % of AV-Garnet							
AV-Garnet	100 (7)	100 (4)	100 (3)	n.d.	41.3 (3)	MR–MS	A
Nuseed Diamond	120 (4)	129 (2)	n.d.	n.d.	43.4 (3)	R–MR	ABF
Victory V3002	108 (6)	107 (3)	103 (2)	n.d.	42.0 (3)	R–MR	ABF
AV-Garnet t/ha	2.41	1.46	1.46				
Early maturing Triazine tolerant (TT) trials – mean seed yield expressed as a % of ATR-Stingray							
ATR-Bonito	101 (5)	98 (4)	102 (2)	n.d.	42.7 (3)	MR	A
ATR-Gem	98 (5)	94 (2)	100 (2)	n.d.	43.0 (2)	MR	A
ATR-Stingray	100 (7)	100 (4)	100 (3)	n.d.	43.8 (3)	MR	A
Bayer 3000TR	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
DG 560TT	112 (2)	n.d	n.d.	n.d.	39.4 (3)	n.d.	n.d.
Hyola® 450TT	110 (3)	104 (3)	n.d.	n.d.	44.3 (1)	R	ABD
Hyola® 559TT	112 (5)	107 (3)	n.d.	n.d.	42.3 (3)	R–MR	ABD
Monola® 314TT	97 (2)	n.d.	n.d.	n.d.	44.4 (1)	MR	Not identified
Monola® 416TT	96 (2)	n.d	n.d.	n.d.	42.6 (1)	n.d.	n.d.
Pioneer® Atomic TT	108 (4)	95 (2)	n.d.	n.d.	41.2 (3)	MS	AB
SF Turbine TT	109 (2)	n.d	n.d.	n.d.	40.7 (3)	n.d.	n.d.

Variety	North west	North east	South west	South east	Oil %	Blackleg rating spring 2015	Blackleg group spring 2015
	2011–15	2011–15	2011–15	2011–15	2015	2015	
ATR-Stingray t/ha	1.91	1.47	n.d.				
Early maturing Clearfield trials – mean seed yield expressed as a % of Hyola® 474CL							
Hyola® 474CL	100 (7)	100 (4)	100 (3)	n.d.	43.2 (3)	R	BF
Hyola® 575CL	100 (7)	101 (4)	100 (3)	n.d.	43.0 (3)	R	BF
Pioneer® 44Y87(CL)	101 (5)	92 (4)	98 (2)	n.d.	40.8 (3)	MR	A
Pioneer® 44Y89(CL)	106 (3)	105 (3)	n.d.	n.d.	42.0 (3)	R–MR	BC
Rimfire CL	91 (3)	82 (3)	n.d.	n.d.	41.8 (3)	R–MR	AB
Hyola® 474CL t/ha	n.d.	n.d.	n.d.				
Early maturing Roundup Ready trials – mean seed yield expressed as a % of Hyola® 404RR							
Hyola® 404RR	100 (4)	n.d.	100 (3)	n.d.	43.9 (1)	R–MR	ABD
IH30 RR	99 (3)	n.d.	95 (2)	n.d.	47.0 (1)	MR	AB
Nuseed GT-41	98 (3)	n.d.	95 (2)	n.d.	42.8 (1)	R–MR	ABF
Pioneer® 43Y23(RR)	100 (4)	n.d.	99 (3)	n.d.	42.9 (1)	R–MR	B
Pioneer® 44Y24(RR)	99 (3)	n.d.	99 (2)	n.d.	43.8 (1)	R–MR	C
Hyola® 404RR t/ha	2.35	n.d.	1.63				

Number of trials in parentheses. The more trials, the greater the reliability. Oil content, adjusted to 6% moisture content, is expressed as a region-wide average for the maturity trial grouping and is for 2015 only. Blackleg ratings are the published ratings for spring 2015.

n.d. No data. New varieties have less trial data supporting the 5-year dataset and hence should be viewed with some caution, especially where there are only 2 trial results.

Blackleg rating disclaimer. The blackleg ratings above, published by NSW Department of Primary Industries, are based on best information available at the time of publication. However, nursery and grower experience has shown that disease severity may vary between locations and years, depending on seasonal conditions and possible changes in the fungus for reasons not currently understood. Therefore, growers may sometimes experience significant variation from the averages shown in these ratings.

MORE INFORMATION

GRDC Update paper: Australian canola oil quality

Variety and agronomy trials

2.1.3 Oil

Canola was developed from rapeseed to produce an oilseed crop with improved nutritional composition. The aim was to produce a crop that had low levels of glucosinolates in the meal and low levels of erucic acid in the oil. [6]

Oil is extracted by mechanically crushing the seed. The oil is then processed by using heat and/or chemicals. Approximately 73% of canola in Australia is processed by addition of solvents, 25% by expeller treatment and 2% by cold-pressing.

The seed typically has an oil content of 35–45%. The oil content is generally expressed as a percentage of the whole seed at 8% moisture content. The oil contains:

- 10–12% linolenic acid (omega-3)
- <0.1% erucic acid
- 59–62% oleic acid
- 12–22% linoleic acid

Canola oil is high in unsaturated fats (93%) and has no cholesterol or trans-fats. It has the lowest saturated fat content (7%) of any common edible oil. [7]

6 R Mailer (2009) Grain quality. In Canola best practice management guide for eastern Australia. (EdsD McCaffrey, T Potter, S Marcroft, F Pritchard)) GRDC, http://www.grdc.com.au/uploads/documents/GRDC_Canola_Guide_All_1308091.pdf

7 J Edwards, K Hertel (2011) Canola growth and development. PROCROP Series. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/516181/Procrop-canola-growth-and-development.pdf

2.1.4 Seed meal

The seed meal is what is left over after the oil is removed. It contains proteins, carbohydrates, minerals and fibre. The exact composition of seed meal depends on the oil extraction method. The protein content varies each season and increases as the oil content decreases. Typically, seed meal consists of 36–39% protein, 1.5–2.0% fat, 11–13% fibre and <10 µmolglucosinolate/g.

The minimum protein content of seed meal, as determined by the AOF (Australian Oilseeds Federation) is 36%, measured at 12% moisture. [8]

MORE INFORMATION

Pacific Seeds Hyola hybrid agronomy

2.2 Varieties for NSW

2.2.1 Conventional varieties

AV-Garnet: a mid-maturing to mid–early-maturing variety. Medium height. Moderate–high oil content. Widely adapted. Blackleg resistance rating 2014, MR; resistance group A. Tested in NVT trials 2006–14. Bred by Department of Environment and Primary Industries (DEPI) Victoria. Marketed by Nuseed Pty Ltd.

AV-Zircon: a mid-maturing variety. Medium height. Moderate oil content. Blackleg resistance rating 2014, MR; resistance group currently unknown. Tested in NVT trials 2011–14. Bred by DEPI Victoria and Nuseed Pty Ltd. Marketed by Nuseed Pty Ltd.

Hyola® 50: mid-maturing to mid–early-maturing hybrid. High oil content. Widely adapted. Blackleg resistance rating 2014, R; resistance group AD. Tested in NVT trials 2005–14. Bred by Canola Breeders International. Marketed by Pacific Seeds.

Nuseed® Diamond: new release (coded NCH1203C). Early-maturing hybrid. Medium height. High oil content. Suited to low–medium rainfall zones. Blackleg resistance rating 2014, R–MR; resistance group ABF. Tested in NVT trials 2012–14. Bred and marketed by Nuseed Pty Ltd.

SF Brazzil™: late-maturing, winter, dual-purpose, open-pollinated variety. Suited to early sowing and winter grazing in very high-rainfall zones. Blackleg resistance rating 2014, R–MR; resistance group BC. Not tested in NVT trials. Marketed by Seed Force.

SF Sensation™: very late-maturing, winter, dual-purpose hybrid. Suited to early sowing and winter grazing in very high-rainfall zones. Blackleg resistance rating 2014, R–MR; resistance group currently unknown. Not tested in NVT trials. Marketed by Seed Force.

Victory® V3002: early–mid-maturing conventional specialty (high stability oil) hybrid, slightly later than Victory V3001. Moderate–high oil content. Blackleg resistance rating 2014, R–MR; resistance group ABF. Tested in NVT trials 2011–14. Bred by Cargill and DEPI Victoria. Marketed by AWB Ltd in a closed-loop program. [9]

2.2.2 Triazine-tolerant varieties

Triazine-tolerant (TT) varieties can have lower yield and oil content than some Roundup Ready varieties. However, they can give good yields in weedy paddocks, when sprayed with atrazine and/or simazine herbicides.

ATR-Bonito: an early-maturing to early–mid-maturing variety. High–very high oil content. Plant height slightly shorter than ATR-Gem. Blackleg resistance rating 2014, MR; resistance group A. Tested in NVT trials 2012–14. Bred by Nuseed Pty Ltd and DEPI Victoria. Marketed by Nuseed Pty Ltd. An EPR (end-point royalty) applies.

ATR-Gem: a mid–early-maturing variety. High–very high oil content. Slightly shorter plant height than Tawriffic TT. Blackleg resistance rating 2014, MR; resistance group A.

8 J Edwards, K Hertel (2011) Canola growth and development. PROCROP Series. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/516181/Procrop-canola-growth-and-development.pdf

9 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/272945/winter-crop-variety-sowing-guide-2016.pdf

Tested in NVT trials 2011–14. Bred by Nuseed Pty Ltd and DEPI Victoria. Marketed by Nuseed Pty Ltd.

ATR-Mako: new release (coded NT0252). Mid-early maturing OP variety. Suited to medium–high rainfall zones. Slightly taller plant height than ATR-Gem. Blackleg rating spring 2015 MR and resistance group A. Tested in NVT trials 2014 and 2015. Bred and marketed by Nuseed Pty Ltd. An EPR applies.

ATR-Stingray: an early-maturing variety. High oil content. Short plant height. Blackleg resistance rating 2014, MR; resistance group C. Tested in NVT trials 2010–14. Bred by Nuseed Pty Ltd and DEPI Victoria. Marketed by Nuseed Pty Ltd.

ATR-Wahoo: a mid-maturing variety, similar to ATR-Marlin. High–very high oil content. Plant height similar to ATR-Gem. Blackleg resistance rating 2014, MR; resistance group A. Tested in NVT trials 2012–14. Bred by Nuseed Pty Ltd and DEPI Victoria. Marketed by Nuseed Pty Ltd. An EPR applies.

DG 560TT: new release (coded SFR65-009TT). Early-mid maturing hybrid. Moderate height. Suited to medium rainfall zones. No published GRDC blackleg rating or resistance group 2015. Tested in NVT trials for the first time in 2015. Marketed by Landmark.

Hyola® 450TT: early-maturing to mid–early-maturing hybrid. High–very high oil content. Medium plant height. Suited to low-rainfall to medium–high-rainfall areas. Blackleg resistance rating 2014, R; resistance group ABD. Tested in NVT trials 2013 and 2014. Bred and marketed by Pacific Seeds.

Hyola® 559TT: mid-maturing to mid–early-maturing hybrid. High oil content. Medium plant height. Suited to medium–very high-rainfall areas. Blackleg resistance rating 2014, R; resistance group ABD. Tested in NVT trials 2012–14. Bred and marketed by Pacific Seeds.

Hyola® 650TT: mid-maturing to mid–late-maturing hybrid. High oil content. Medium–tall plant height. Suited to medium–high-rainfall areas. Blackleg resistance rating 2014, R; resistance group ABE. Tested in NVT trials 2013 and 2014. Bred and marketed by Pacific Seeds

Monola® 314TT: early–mid-maturing, open-pollinated, specialty oil variety. Moderate oil content. Medium plant height. Blackleg resistance rating 2014 and resistance group. Tested in NVT trials 2013 and 2014. Bred and marketed by Nuseed Pty Ltd.

Monola® 416 TT: new release (coded NL0852). Early–mid maturing OP specialty oil variety. Suited to medium–low rainfall zones. Short-medium plant height. No published GRDC blackleg rating or resistance group 2015. Tested in NVT trials in 2014 and 2015. Bred and marketed by Nuseed Pty Ltd.

Monola® 515TT: new release (coded NL805). Mid-maturing, open-pollinated specialty oil variety. Moderate–high oil content. No published GRDC blackleg resistance rating or resistance group for 2014. Tested in NVT trials for the first time in 2014. Bred and marketed by Nuseed Pty Ltd.

Pioneer® 45T01 (TT): new release. Mid maturing hybrid. Medium plant height with strong, early vigour. Suited to medium–high rainfall zones. Blackleg rating spring 2015 MR–MS and resistance group AB. Tested in NVT trials 2013–15. Marketed by DuPont Pioneer.

Pioneer® Sturt TT: early-maturing to early–mid-maturing, open-pollinated variety. Moderate oil content. Short–medium plant height. Adapted to low–medium-rainfall zones. Blackleg resistance rating 2014, MS. Tested in NVT trials 2011–14. Bred by NPZ Australia Pty Ltd. Marketed by DuPont Pioneer. An EPR applies.

Pioneer® Atomic TT: mid-maturing hybrid. Medium height. Moderate oil content. Suited to medium-rainfall zones. Blackleg resistance rating 2014, MS; resistance

group AB. Tested in NVT trials 2012–14. Bred by NPZ Australia Pty Ltd. Marketed by DuPont Pioneer. [10]

SF Turbine TT: new release (coded SFR65-008TT). Early-mid maturing hybrid. Moderate height. Suited to medium rainfall zones. No published GRDC blackleg rating or resistance group 2015. Tested in NVT trials for the first time in 2015. Bred by NPZ Australia. Marketed by Seed Force.

2.2.3 Clearfield® (imidazolinone-tolerant) varieties

These varieties are tolerant to Intervix® imidazolinone herbicide and are part of the Clearfield® Production System.

Archer: mid–late-maturing hybrid. High oil content. Medium–tall plant height. Blackleg resistance rating 2014, MR–MS. Tested in NVT trials 2011–14. Marketed by Heritage Seeds.

Banker CL: new release (coded HSHC 134 (CL), 2015 and PHI-1401 in 2014). Mid maturing hybrid. Medium plant height. Blackleg rating spring 2015 MR and resistance group A. Tested in NVT trials in 2014 and 2015. Marketed by Heritage Seeds.

Carbine: early–mid-maturing hybrid. Moderate–high oil content. Medium plant height. Blackleg resistance rating 2014, MR–MS. Tested in NVT trials 2011–13. Marketed by Heritage Seeds.

Hyola® 474CL: mid-maturing to mid–early-maturing hybrid. High oil content. Medium–tall plant height. Suited to medium–low-rainfall to high-rainfall areas. Blackleg resistance rating 2014, R; resistance group BF. Tested in NVT trials 2011–14. Bred and marketed by Pacific Seeds.

Hyola® 575CL: mid-maturing hybrid. High–very high oil content. Medium plant height. Suited to medium–very high-rainfall areas. Blackleg resistance rating 2013, R; resistance group BF. Tested in NVT trials 2010–14. Bred and marketed by Pacific Seeds.

Hyola® 577CL: mid-maturing hybrid. High–very high oil content. Medium–tall plant height. Suited to medium–high-rainfall areas. Blackleg resistance rating 2014, R. Tested in NVT trials 2013 and 2014. Bred and marketed by Pacific Seeds.

Hyola® 970CL: late-maturing, winter graze and grain hybrid. Pacific Seeds indicate high–very high biomass, good grain yield and oil content. Early–mid autumn and spring sowing, graze and grain option for very high-rainfall zones. No published GRDC blackleg resistance rating or resistance group for 2014. Released 2014. Not tested in NVT trials. Bred and marketed by Pacific Seeds.

Pioneer® 43C80(CL): an early-maturing variety. Adapted to low-rainfall areas. Medium plant height. Blackleg resistance rating in 2013, MR–MS. Tested in NVT trials 2008–09 and 2011–12. Bred and marketed by DuPont Pioneer.

Pioneer® 43Y85(CL): early-maturing hybrid. Short–medium plant height. Moderate oil content. Suited to medium–low-rainfall areas. Blackleg resistance rating 2014, MR; resistance group A. Tested in NVT trials 2011–14. Bred and marketed by DuPont Pioneer.

Pioneer® 44Y87(CL): early–mid-maturing hybrid. Moderate–high oil content. Medium plant height. Suited to medium-rainfall areas. Blackleg resistance rating 2014, MR; resistance group A. Tested in NVT trials 2012–14. Bred and marketed by DuPont Pioneer.

Pioneer® 44Y89(CL): new release (coded PHI-1305). Early–mid-maturing hybrid. High oil content. Short–medium plant height. Suited to low–medium-rainfall areas. Blackleg resistance rating 2014, R–MR; resistance group BC. Tested in NVT trials 2013 and 2014. Bred and marketed by DuPont Pioneer.

10 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/272945/winter-crop-variety-sowing-guide-2016.pdf

Pioneer® 45Y86(CL): mid-maturing hybrid. High–very high oil content. Medium–tall plant height. Suited for dual-purpose (graze and grain) option in full-season environments. Blackleg resistance rating 2014, MR– MS; resistance group AB. Tested in NVT trials 2010–2014. Bred and marketed by DuPont Pioneer.

Pioneer® 45Y88(CL): mid-maturing hybrid. Moderate–high oil content. Medium plant height. Suited to high-rainfall areas. Blackleg resistance rating 2014, R–MR; resistance group A. Tested in NVT trials 2012–14. Bred and marketed by DuPont Pioneer.

Rimfire CL: new release (coded HSHC 133 (CL) in 2014). Mid to mid–early maturing hybrid. Medium plant height. Blackleg rating spring 2015 R–MR and resistance group AB. Tested in NVT trials 2013–15. Marketed by Heritage Seeds.

SF Edimax CL: new release. Late-maturing, dual-purpose winter hybrid. Undergoing BASF Clearfield registration. Suited to early sowing and spring sowing in high rainfall areas. Blackleg resistance rating 2014, R–MR; resistance group C. Not tested in NVT trials. Marketed by AGF Seeds.

2.2.4 Roundup Ready® varieties

DG 460RR: new release (coded SN-ACL 12–1586). Early–mid maturing hybrid. Short plant height. Blackleg rating spring 2015 R–MR and resistance group A. Tested in NVT trials for the first time in 2015. Bred by Seednet and marketed by Landmark.

DG 550RR: new release (coded VT-WZ-11–2685). Mid maturing hybrid. High oil content. Blackleg resistance rating 2014, R–MR; resistance group AB. Tested in NVT trials 2013 and 2014. Bred and marketed by Seednet.

Hyola® 404RR: early-maturing to mid–early maturing hybrid. Very high oil content. Medium plant height. Suited to low–high-rainfall areas. Blackleg resistance rating 2014, R–MR; resistance group ABD. Tested in NVT trials 2010–14. Bred and marketed by Pacific Seeds.

Hyola® 504RR: new release (coded M26120 in 2014). Mid maturing hybrid. Medium plant height. Suited to medium–high rainfall areas. No published GRDC blackleg rating or resistance group 2015. Tested in NVT trials 2014 and 2015. Bred by Pacific Seeds and marketed by Advanta Seeds.

Hyola® 600RR: new release. Mid maturing to mid–late-maturing hybrid. Very high oil content. Medium–tall plant height. Suited to medium–high-rainfall to very high-rainfall areas. No published GRDC blackleg resistance rating or resistance group 2014. Tested in NVT trials for the first time in 2014. Bred and marketed by Pacific Seeds

IH30RR: early maturing hybrid. High oil content. Suited to low–medium-rainfall areas. Blackleg resistance rating R–MR; resistance group AB. Tested in NVT trials 2012–14. Bred and marketed by Bayer.

IH51RR: new release (coded AN13R9003). Mid-maturing hybrid with Bayer's new pod shatter reduction trait. High oil content. Suited to later windrow timings or direct harvesting in medium–high-rainfall areas. No published GRDC blackleg resistance rating or resistance group for 2014. Tested in NVT trials for the first time in 2014. Bred and marketed by Bayer.

IH52RR: new release (coded AN11R5201). Mid-maturing hybrid. High oil content. Suited to medium–high-rainfall areas. Blackleg resistance rating 2014, R–MR; resistance group AB. Tested in NVT trials 2013 and 2014. Bred and marketed by Bayer.

Monola® 513GT: early–mid-maturing, open-pollinated, specialty oil variety. Very high oil content. Medium plant height. Blackleg resistance rating 2014, MR. Tested in NVT trials 2012–14. Bred and marketed by Nuseed Pty Ltd.

Monola® G11: new release (coded NMH13G011). Early–mid-maturing, specialty oil hybrid. Very high oil content. Medium plant height. Blackleg resistance rating 2014, R–MR; resistance group ABS. Tested in NVT trials 2013 and 2014. Bred and marketed by Nuseed Pty Ltd.

Nuseed® GT-41: early maturing hybrid. High oil content. Medium plant height. Blackleg resistance rating 2012, R–MR; resistance group ABF. Tested in NVT trials 2012–14. Bred and marketed by Nuseed Pty Ltd.

Nuseed GT-42: new release (coded NCH14G055). Early to early-mid maturing hybrid. Suited to medium–low rainfall zones. Medium plant height. Blackleg rating spring 2015 R, resistance group not known. Tested in NVT trials 2014 (1 trial) and 2015. Bred and marketed by Nuseed Pty Ltd.

Nuseed® GT-50: mid maturing hybrid. High–very high oil content. Medium–tall plant height. Blackleg resistance rating 2014, R–MR; resistance group ABF. Tested in NVT trials 2012–14. Bred and marketed by Nuseed Pty Ltd.

Pioneer® 43Y23(RR): early maturing hybrid. Moderate–high oil content. Blackleg resistance rating 2014. R–MR; resistance group B. Tested in NVT trials 2011–14. Bred and marketed by DuPont Pioneer.

Pioneer® 44Y24(RR): early–mid-maturing hybrid. High oil content. Medium plant height. Suited to medium–high-rainfall areas. Blackleg resistance rating 2014, MR; resistance group C. Tested in NVT trials 2011–14. Bred and marketed by DuPont Pioneer.

Pioneer® 44Y26(RR): new release (coded PHI-1311). Early–mid-maturing hybrid. High–very high oil content. Medium–tall plant height. Suited to medium–high-rainfall areas. Blackleg resistance rating 2014, R–MR; resistance group ABS. Tested in NVT trials 2013 and 2014. Bred and marketed by DuPont Pioneer.

Pioneer® 45Y25(RR): new release (coded PHI-1306). Mid-maturing hybrid. High–very high oil content. Medium plant height. Suited to medium–high-rainfall areas. Blackleg resistance rating 2014, R–MR; resistance group BC. Tested in NVT trials 2012–14. Bred and marketed by DuPont Pioneer. [11]

Victory® V5002RR: Mid maturing RR specialty (high oleic, low linolenic oil) hybrid. Blackleg rating spring 2015 MR and resistance group AB. Tested in NVT trials 2011–15. Bred by Cargill and DPI Victoria. Marketed by AWB under contract.

Victory® V5003RR: new release. Mid maturing RR specialty (high oleic, low linolenic oil) hybrid. Blackleg rating R–MR and resistance group B. Tested in NVT trials 2013–15. Bred by Cargill. Marketed by AWB under contract.

2.2.5 Roundup Ready®–triazine-tolerant varieties

New varieties are being developed that combine two herbicide tolerance traits, allowing improved weed control in paddocks where weeds have developed resistance to other herbicide chemistries.

Bayer 3000 TR®: new release (coded PJTT1). Early maturing dual herbicide tolerant hybrid. Short–medium plant height. Suited to low to low–medium rainfall zones. No published GRDC blackleg rating or resistance group 2015. Tested in NVT trials for the first time in 2015. Bred by NPZ Australia. Marketed by Bayer.

Hyola® 525RT®: mid maturing, RT® dual-herbicide-tolerant hybrid. High–very high oil content. Medium plant height. Suited to medium–high-rainfall areas. Blackleg resistance rating 2014, R–MR; resistance group ABD. Tested in NVT trials 2013 and 2014. Bred and marketed by Pacific Seeds.

Hyola® 725RT®: new release. Mid–late-maturing, RT® dual-herbicide-tolerant hybrid. High–very high oil content. Medium–tall plant height. Suited to medium–high-rainfall to very high-rainfall areas. No published GRDC blackleg resistance rating or resistance group for 2014. Tested in NVT trials for the first time in 2014. Bred and marketed by Pacific Seeds.

11 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/272945/winter-crop-variety-sowing-guide-2016.pdf

MORE INFORMATION

What is Roundup Ready canola?

Queensland hope for short season canola

Crop Guide- Canola: Juncea Canola in low rainfall SW NSW

2.2.6 Juncea canola (*Brassica juncea*)

Juncea canola is adapted to low-rainfall areas (300–400 mm) and dry conditions. It has oil quality similar to canola, but still requires segregation and has designated delivery sites.

XCEED™ VT Oasis CL: first herbicide-tolerant Clearfield® juncea canola in Australia. Early–mid-maturing, open-pollinated variety. High oil content. Suitable for direct harvesting. Blackleg resistance rating R and resistance group G. Tested in NVT trials 2008–13. Bred by DEPI Victoria/Viterra. Marketed by Seednet. An EPR applies. [12]

2.3 Planting seed quality

2.3.1 Seed size

Canola seeds weigh only approximately 3 mg each, with the 1000-seed weight of canola typically 3–6 g. Seed size varies according to the growing conditions. There are also varietal differences. Generally, hybrid varieties have larger seeds (Figure 1).

Seed size plays an important role in crop establishment. Larger seeds produce seedlings that are more vigorous and give improved crop establishment (Table 4). There is also an interaction with sowing depth. Larger seeds establish more plants, particularly if sown at depth of ≥3 cm. [13]

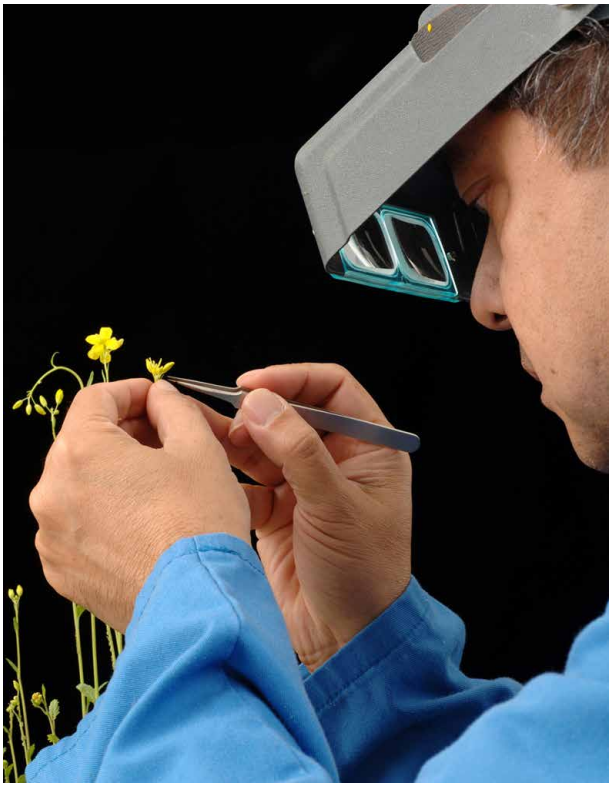

Figure 1: *Dr Abed Chaudhury cross-pollinating canola flowers. Following their discovery of two genes that control the size of plant seeds, CSIRO Plant Industry researchers are investigating how that knowledge can be used to produce larger seeds across a wide range of crops.*

Photo: Carl Davies

12 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/272945/winter-crop-variety-sowing-guide-2016.pdf

13 J Edwards, K Hertel (2011) Canola growth and development. PROCROP Series. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/516181/Procrop-canola-growth-and-development.pdf

Table 4: *Plant establishment, days to emergence and 100 plant weights (15 days after emergence) for three hybrids (Pioneer 44Y84 (CL), Hyola 50 and Hyola 555TT) and three open pollinated (Pioneer 43C80 (CL), AV-Garnet and ATR-Gem) canola varieties segregated into large and small seed sown at three planting depths.* [14]

	Hybrid		Open-pollinated	
Planting depth	**Large seed**	**Small seed**	**Large seed**	**Small seed**
Establishment				
2.5 cm	19.4a	19.8a	19.4a	16.3b
5.0 cm	18.8ab	12.8c	17.4b	8.8d
7.5 cm	15.9b	3.8e	8.7d	1.0f
Days to emergence				
2.5 cm	5.0a	5.1a	5.1a	5.2a
5.0 cm	5.9ab	6.7b	6.8b	7.2b
7.5 cm	7.4b	11.3e	8.7c	10.0d
100 Plant weight 15 days after emergence				
2.5 cm	56.9a	31.5d	45.7c	29.7d
5.0 cm	51.8b	24.5e	44.9c	23.5e
7.5 cm	49.5b	10.3 g	45.8c	13.0f

**Numbers within each section (e.g. Establishment) designated with a different letter are significantly (P=0.05) different.

Sowing depth trials were conducted at Coonamble, Nyngan and Trangie in 2012 and at Nyngan and Trangie in 2013. Each trial used six common varieties with a range of seed sizes (Table 5). Target seeding depths were 2.5, 5 and 7.5 cm.

Table 5: *Seed size (1000-seed weight, g) and number of seeds sown in three canola variety–sowing depth trials in 2012.*

Variety	Seed weight		No. of seeds sown per m
	2012	2013	
AV-Garnet	3.78	3.27	60
ATR-Stingray	3.06	2.97	60
Pioneer® 43C80(CL)	3.68	4.11	60
Pioneer® 43Y85(CL)	5.03	4.77	60
Pioneer® 44Y84(CL)	5.34	5.20	60
Hyola® 555TT	4.26	4.00	60

MORE INFORMATION

Canola establishment; does size matter?

Sowing large seed (> 5 g/1000 seeds) increases the likelihood of achieving an adequate establishment. For growers who wish to purchase seed, hybrid seed is generally larger than open-pollinated seed. For growers who retain open-pollinated seed on farm for their own use, aim to clean seed with a 2-mm screen. [15]

For full results, see GrowNotes Canola. Section 3. Planting

2.3.2 Seed germination and vigour

Seed quality is important for good establishment. Canola seed should have a germination percentage >85%. Planting high-quality seed is essential for rapid, even crop establishment.

14 R Brill, L Jenkins, M Gardner (2014) Canola establishment; does size matter. GRDC Update Papers, 5 February 2014, http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2014/02/Canola-establishment-does-size-matter

15 R Brill, L Jenkins, M Gardner (2014) Canola establishment; does size matter. GRDC Update Papers, 5 February 2014, http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2014/02/Canola-establishment-does-size-matter

Early seedling growth relies on stored energy reserves in the seed. Good seedling establishment is more likely if the seed is undamaged, stored correctly, and from a plant that has had adequate nutrition.

Seed moisture content, age of seed, seed size and germination percentage all contribute to seed quality. There can be substantial differences in the performance of commercial certified seed lots from different sources, and these differences can be as great as differences among varieties.

Several factors can greatly affect germination, including seed size, seed handling and harvest timing. [16]

The larger the seed, the larger the cotyledon and the lipid reserves. Although seed size does not affect germination, larger seeds have earlier and faster emergence than medium-sized and small seeds. This is because larger seeds germinate more rapidly and produce longer roots than smaller seeds.

Seed size is usually measured by weighing 1000 grains; this is known as the 1000-seed weight. The 1000-seed weight differs among varieties and from season to season. As a result, sowing rates should be altered according to seed weight to achieve the desired plant population. [17]

Harvest timing

The timing of windrowing can also affect germination. If the crop is not windrowed at the correct time, seed development can stop, resulting in unripe seeds with reduced germination ability.

Seed chlorophyll

High levels of seed chlorophyll can reduce seedling vigour and increase seedling mortality. Chlorophyll levels <35 mg/kg are desirable. Canola seed harvested from plants suffering frost or severe moisture stress during seed-filling may have elevated chlorophyll levels.

Seed handling

Germination can also be affected by seed-handling procedures. Care needs to be taken when harvesting canola seed to ensure that it is not cracked. Cracking can reduce germination. [18]

2.3.3 Seed storage

The aims of storage are to preserve the viability of the seed for future sowing and to maintain its quality for market. Canola is more difficult to store than cereals because of its oil content. The oil content makes canola more prone to deterioration in storage. For this reason, canola should not be stored on-farm for more than one summer.

The rate at which canola deteriorates in storage depends on:

- aeration
- storage temperature
- seed moisture content
- seed oil content
- relative humidity
- storage time
- percentage of green or immature seeds in the sample
- amount of weathering after physiological maturity.

16 J Edwards, K Hertel (2011) Canola growth and development. PROCROP Series. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/516181/Procrop-canola-growth-and-development.pdf

17 J Edwards, K Hertel (2011) Canola growth and development. PROCROP Series. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/516181/Procrop-canola-growth-and-development.pdf

18 J Edwards, K Hertel (2011) Canola growth and development. PROCROP Series. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/516181/Procrop-canola-growth-and-development.pdf

Monitoring of seed moisture of canola is necessary during storage, because a moisture content of 6.0–8.5% can be unsafe, depending on the seed oil content (Figure 2).

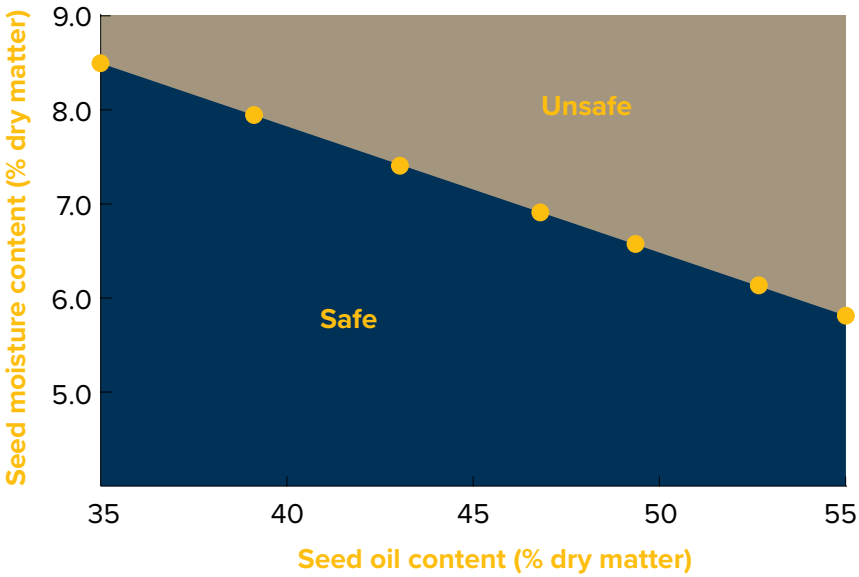

Figure 2: *Potential unsafe storage limits for Australian canola varieties at 60% equilibrium relative humidity and 25°C.*

Source: http://www.australianoilseeds.com/__data/assets/pdf_file/0006/4110/Oilseeds_Flyer.pdf

High temperatures or moisture levels can cause a number of reactions in the seed, resulting in:

- increased levels of free fatty acids, causing off-flavours in the oil
- oxidation and browning reactions, which taint the oil
- changes to the oil profile of the seed, due to reactions involving chlorophylls, carotenoid pigments, flavonoids and phenols.

Canola should be stored at ≤8% moisture and at temperatures <25°C (but preferably <20°C).

Safe storage limits are determined by the oil and moisture content of the seed. Canola falling into the potentially unsafe area above the line in Figure 2 should not be stored for any length of time unless appropriate action is taken, such as lowering the moisture content and seed temperature. [19]

MORE INFORMATION

GRDC Fact sheet: Fertiliser toxicity

2.3.4 Safe rates of fertiliser sown with the seed

Nitrogen (N) and starter (N and phosphorus, P) fertilisers can affect germination and reduce establishment if sown in contact with canola seed. Seed can be affected in a number of ways:

- toxic chemical effects from ammonium vapour, most likely from urea and ammonium phosphates (e.g.mono- and di-ammonium phosphate, MAP and DAP)
- osmotic or salt effect due to high concentrations of salts produced from soluble fertiliser dissolving in water (both N and P)
- seed desiccation from direct moisture absorption by fertiliser in very dry soil.

Fertiliser at high rates is best separated from the seed at sowing, by banding. The risk of seed damage from fertiliser increases:

- with narrow sowing tines or discs, particularly at wider row spacing, where fertiliser becomes more concentrated close to the seed (Table 6)

19 J Edwards, K Hertel (2011) Canola growth and development. PROCROP Series. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/516181/Procrop-canola-growth-and-development.pdf

MORE INFORMATION

Canola best practice management guide for south-eastern Australia

Canola irrigated: GM—SQ

- in more sandy soils
- in dry soils

Table 6: *Amounts of nitrogen (kg N/ha) that can be sown with canola seed, as determined by calculations of seedbed utilisation.*[20]

	25-mm seed spread (e.g. discs, knife-point)			50-mm seed spread		
Row spacing (cm)	**15**	**22.5**	**30**	**15**	**22.5**	**30**
Seedbed utilisation (%)	**17**	**11**	**8**	**33**	**22**	**17**
Light (sandy loam)	10	5	0	20	15	10
Medium–heavy (loam–clay)	15	10	5	30	20	15

20 J Laycock (1997) Incitec Pivot, adapted from 'Fertiliser management in direct seeding systems'. Better Crops 81(2)