Department of Agriculture and Food
GOVERNMENT OF WESTERN AUSTRALIA

GRDC Grains Research & Development Corporation

DAW00227
Tactical Break Crop Agronomy in Western Australia

14ED10 – Plant density in low rainfall canola

Authors	Mark Seymour
Location of trial	Tim Osborne's Salmon Gums

Summary (Key messages)

- RR hybrid canola maximised gross margins
- OP TT variety Sturt produced similar gross margins to the hybrid TT variety Hyola 450 TT
- Gross margins were optimised at:
  - ~ 50 plants/m² for Sturt TT
  - 5 to 25 plants/m² for Hyola 450TT
  - ~ 13 plants/m² for Pioneer 43Y23 RR

Background

Canola is now being grown in low rainfall areas. Primarily farmers choose open pollinated TT varieties. However breeding companies are favouring the development of hybrids in order to pay for breeding services. Hybrids provide growers with more vigorous seedlings, comparatively better plant establishment and generally higher yields. However growers have to purchase new seed of hybrid varieties every year in order to get these potential yield benefits. Seed for hybrid canola is 25 times more expensive than the seed of open pollinated canola. Inevitably if farmers are forced into hybrids they will wish to minimise seed costs by sowing at low densities.

Aim

To investigate the plant density response to yield and oil content of TT and RR hybrid canola in comparison with open-pollinated canola

Trial Details

- Property: Tim, Dave and Fiona Osborne's, Eldred Road Salmon Gums
- Agzone 5, Growing Season rainfall (GSR, April to Oct) = 175 mm, GSR + stored water (estimate) = 198 mm
- Soil type: sandy loam (0.7% organic carbon), estimated to be 58 kg N/ha available in paddock from soil and plant residues
- Paddock rotation Barley 2013, Wheat 2012, Wheat 2011, Field pea 2010
- Sowing date May 6
- Fertiliser 400 kg/ha of gypsum (17% Ca, 14% S) top-dressed over whole site before sowing (kg/ha),107 kg/ha of Impact treated Agras No.1 at seeding, 100 L UAN/ha on 19th June, 1 L Mantrac/ha on 9th July and 120 kg/ha of Muriate of Potash top-dressed over whole site July 10

Treatment detail

- 28 treatments: 4 varieties x 8 target densities
  - 2 HT - Herbicide tolerant canola (TT and RR)
  - TT– OP = Sturt TT and Hybrid = Hyola 450TT
  - RR - OP = GT Viper (data not shown due to low field establishment), Hybrid = Pioneer 43Y23 RR
  - 8 target densities of 5, 10, 15, 20, 30, 40, 60, or 80 plants/m². Seed rates were adjusted for germination, seed size and estimated field establishment- which varied with target density and seed type.
  - 3 replicates

Assumptions used in Gross Margins

Oil bonus +/- 1.5% per unit of oil (%) either side of 42%, with no oil ceiling.

Additional costs such as seeding, harvest, insecticides assumed to be $100/ha.

Nitrogen costs $1/kg, application costs $8/ha

RR costs – OP seed $25/kg, hybrid seed $33/kg, Herbicides $28/ha, Grain worth $513/t (Decile 5 price).

TT costs – OP seed $3/kg, hybrid seed $24/ha, Herbicides $46/ha, Grain worth $535

Results

The OP TT variety Sturt responded to plant densities above 50 plants/m², Hyola 450TT seed yield responded up to 25 plants/m² while gross margins were similar at 5 to 25 plants/m². Pioneer 43Y23 RR had ~ 20% higher establishment than we anticipated, and its yield and gross margin plateaued at ~ 13 plants/m².

RR hybrid canola maximised gross margins, whilst there was no difference between OP or hybrid TT canola.

Table 1. Target and actual plant density, seed yield (GY, kg/ha) and gross margin (GM, $/ha) of 3 canola varieties at Salmon Gums in 2014. Values followed by same letter in column labelled f are not significantly different.

Variety and target density	Established plants per m²	f	GY	f	GM	f
Sturt TT 5	3	a	446	ab	-70	a
Sturt TT 10	7	abc	552	bc	-14	abc
Sturt TT 15	8	abcd	744	efg	89	efgh
Sturt TT 20	14	bcde	765	efg	103	fghij
Sturt TT 30	19	efg	794	efghi	115	ghij
Sturt TT 40	38	ij	802	efghi	114	ghij
Sturt TT 60	46	jk	818	efghij	126	hij
Sturt TT 80	64	l	911	ijkl	165	jkl
Hyola 450TT 5	5	ab	772	efgh	114	ghij
Hyola 450TT 10	9	abcd	780	efgh	111	ghij

Hyola 450TT 15	16	cdef	813	efghij	120	hij
Hyola 450TT 20	25	fgh	895	hijkl	158	ijkl
Hyola 450TT 30	30	hi	797	efghi	87	efgh
Hyola 450TT 40	49	k	972	kl	141	hijk
Hyola 450TT 60	72	l	819	efghij	14	bcd
Hyola 450TT 80	84	m	864	ghijk	-8	abc
Pioneer 43Y23 RR 5	7	abc	735	ef	121	hij
Pioneer 43Y23 RR 10	13	abcde	898	hijkl	200	kl
Pioneer 43Y23 RR 15	16	cdefg	949	kl	218	l
Pioneer 43Y23 RR 20	26	gh	981	kl	222	l
Pioneer 43Y23 RR 30	36	ij	958	kl	194	kl
Pioneer 43Y23 RR 40	67	l	976	kl	137	hijk
Pioneer 43Y23 RR 60	93	m	931	jkl	48	cdefg
Pioneer 43Y23 RR 80	123	n	1003	l	21	bcde
	P	l.s.d.	P	l.s.d.	P	l.s.d.
Cultivar	<.001	4	<.001	45	<.001	24
Density	<.001	5	<.001	64	<.001	34
Cultivar.Density	<.001	10	<.001	128	<.001	68

Conclusion

The results from this trial confirmed the results from previous years, with OP TT canola responding to higher plant densities than other canola due to a combination of the biological response and the low cost of increasing OP TT density. Similarly RR hybrid canola showed a flat response to plant density and consequently a relatively low plant density maximised returns. Hybrid canola responded somewhere in-between, with yields responding to higher densities than RR hybrid canola. Hybrid TT did not produce higher gross margins than OP TT, therefore the low risk option in low rainfall areas remains OP TT, with RR hybrids being the best option if weeds develop resistance to triazine herbicides.

Acknowledgements

This trial is one of a series conducted throughout WA as part of the GRDC/DAFWA co-funded project "Tactical Break Crop Agronomy in Western Australia". Thanks to the Osborne family for hosting the trial and to the Esperance RSU for trial management. Pam Burgess (DAFWA. Esperance) provided technical assistance to ensure all treatments and measurements occurred in a timely and accurate fashion.

Links

For other reports related to this trial see https://www.agric.wa.gov.au/canola/canola-plant-density-trials-list

For more information contact

Mark Seymour, Senior Research Officer, Esperance on 90831 143.

Email: mark.seymour@agric.wa.gov.au