

DAW00227

Tactical Break Crop Agronomy in Western Australia

13CH21 – Plant density in low rainfall canola

Authors

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Location of trial

Smarts Chapman Valley / Eradu

Summary (Key messages)

At Chapman Valley in 2013 canola grain yields began to plateau at approximately 20-30 plants/m². Economic optimum target densities were found to be @ 16 plants/m² for Hyola 404RR, 24 plants/m² for GT Viper, 33 plants/m² for Hyola 450TT, and 34 plants/m² for ATR Stingray.

Taking into account contingencies such as seeding errors, dry conditions at seeding and changes in seed size or viability we suggest that seed rates of RR and TT hybrids and RR OP at similar sites be around 1.9 to 2.3 kg/ha, whilst the cheaper seed of less competitive TT OP lines be sown at @ 4.0 kg/ha.

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: Smarts (Austin Rainer, Manager)
- Growing Season rainfall (GSR) = 301 mm, GSR + stored water (estimate) = 330 mm, both 5% above average (1975-2012).
- Soil type: Loamy sand (organic carbon 1.13%)
- Crop / variety: Canola
- Paddock rotation Wheat 2012, Wheat 2011, Lupin 2 t/ha 2010

Treatment detail

- 36 treatments:
 - 2 HT - Herbicide tolerant canola (TT and RR)
 - 4 Cultivar
 - TT– OP = CB Telfer TT and Hybrid = Hyola 450TT
 - RR - OP = GT Viper, Hybrid = Hyola 404 RR
 - 8 densities of 5, 10, 15, 20, 30, 40, 60, or 80 plants/m²
 - 3 replicates

Assumptions used in Gross Margins

Oil bonus +/- 1.5% per unit of oil (%) either side of 42%, with no oil ceiling, Non treatment costs \$171/ha.

RR costs – Hyola 404RR seed \$31/kg, GT Viper \$25/kg, herbicides \$28/ha and grain worth \$479/t (CBH Pool Geraldton 5/11/13).

TT costs – Hyola 450TT seed \$24/kg and ATR Stingray \$2/kg which assumes farmers purchase new seed every 3 years at \$11/kg and bulk up seed on 25% of their canola program. Herbicides \$47/ha and grain worth \$499/t (CBH Pool Geraldton 5/11/13).

Results

Despite higher seed costs for hybrid seed, overall gross margins were higher for both TT and RR hybrid varieties at Chapman valley in 2013. For RR, the hybrid variety Hyola 404RR increased gross margins over the RR OP line GT Viper by \$267/ha, due mostly to higher grain yields for Hyola 404RR. Hyola 450TT on average produced a gross margin \$232/ha higher than ATR Stingray due to both higher yields and oil.

All canola varieties responded to increasing plant density in a similar fashion with grain yield starting to plateau out at @ 20-30 plants/m². Regression analysis and optimising was conducted for all varieties, where we assumed field establishment would not have been as high as in 2013, but at a range of 50-65%. As an input such as seeding rate sets up the rest of the year in most instances growers appear to happy enough to cover the cost of seed inputs (plus interest payments). In which case the economic optimum densities ranged from 16 plants/m² for Hyola 404RR which has the largest seed and most expensive seed, to 34 plants/m² for the cheapest seed type ATR Stingray (Table 1).

If expected sowing conditions change or the value of the end product changes that might have some influence on target densities farmers aim for. Of the varieties tested in 2013 Hyola 450TT appears to be the variety which has the slowest increase to the plateau. Therefore its economic optimum density might well be expected to be the most responsive to changes. We ran a number of scenarios such as receiving hybrid seed that was 40% larger than expected and they reduced the economic optimum target density of Hyola 450TT by @ 5 plants/m² - equivalent to 0.5 kg/ha or \$12/ha.

As the grain yield responses were fairly flat at Chapman Valley in 2013 these economic scenarios are not particularly compelling, and we might therefore consider other ways of determining a safe and reliable target density. Firstly we might just want to ensure target densities are at least 10 plants/m² away from the turning point of the grain yield curves. Which would move target densities to approximately 25 for Hyola 404RR and GT Viper and 30 for Hyola 450TT and ATR Stingray. For ATR Stingray and other OP TT's the costs of seed are so minimal farmers may choose to sow at 4 kg/ha (@60 plants/m²) and cover all bases. Whilst this site did not have a ryegrass issue observations elsewhere would indicate these densities would also be adequate to compete with weeds.

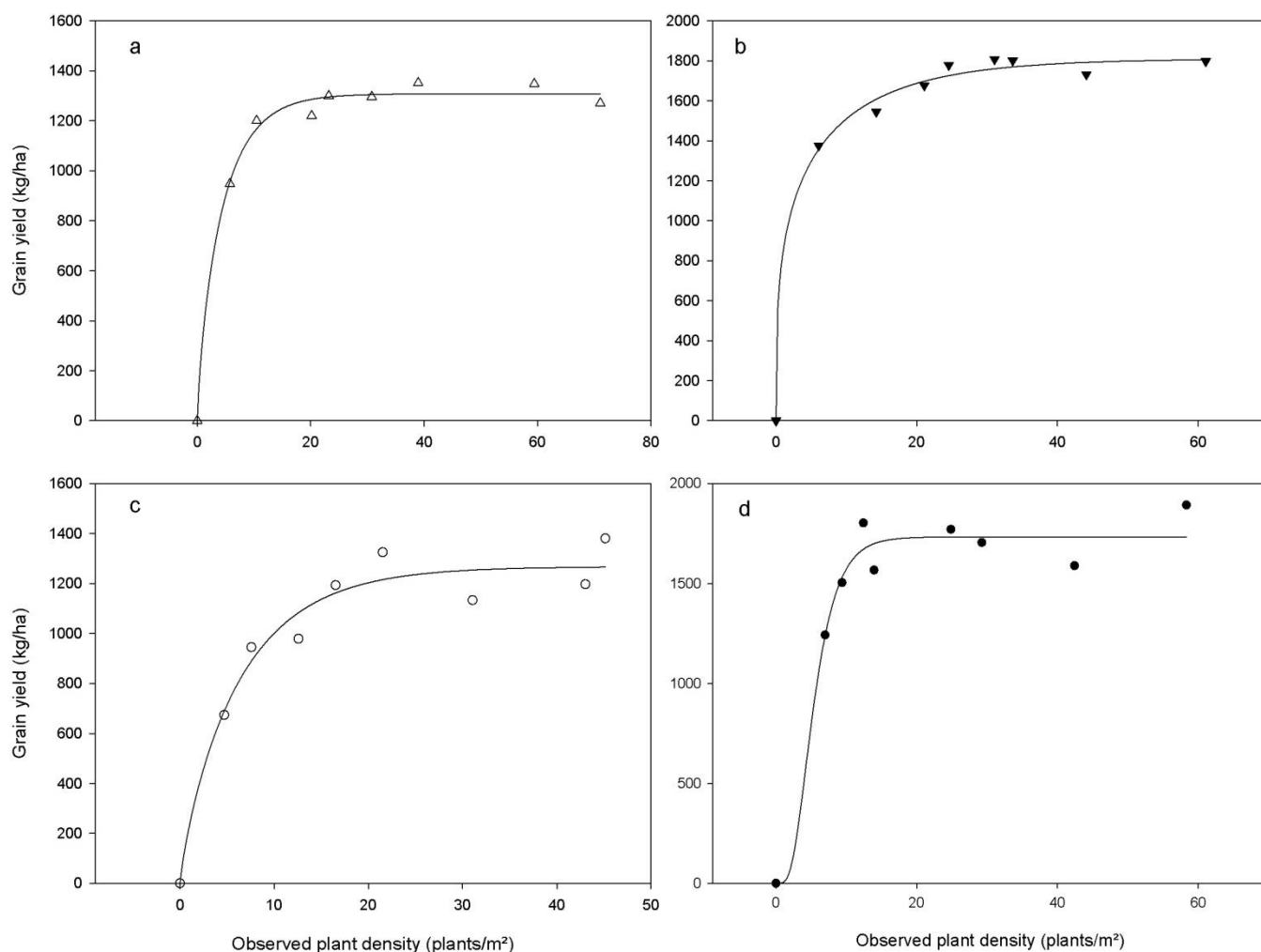


Figure 1 Relationship between plant density (observed, plants/m²) and the grain yield of (a) ATR Stingray, (b) Hyola 450TT, (c) GT Viper and (d) Hyola 404RR at Smart's, Chapman Valley in 2013 (13CH21)

Table 1 Summary of optimum target plant densities

	Hyola 404RR	GT Viper	Hyola 450TT	ATR Stingray
Money back plus 10% interest	16	24	33	34
1.5 times money invested	15	22	30	32
Double your money	15	20	26	31
GYmax	35	45	61	37
95%GYmax	11	20	23	14
90%GYmax	10	15	15	11
@ 10 plants above inflection point	25	25	30	30
Suggested target	25	25	30	60
Target seed rate, example	2.3	2.3	1.9	4.0
Safe bet \$/ha seed rate costs, example	70	57	45	8

Conclusion

Canola is a very plastic crop which can compensate if crop densities are low in medium rainfall regions. At Chapman Valley in 2013 economic optimum target densities were less than 40 plants/m² for all varieties and below 30 for RR varieties. To cover for contingencies such as seeding errors, dry conditions at seeding and changes in seed size or viability we suggest that seed rates of RR and TT hybrids and RR OP be around 1.9 to 2.3 kg/ha, whilst the cheaper seed of less competitive TT OP lines be sown at 4.0 kg/ha.

Acknowledgements

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