

Hybrid versus open-pollinated TT canola: which one wins where?

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Key messages

- Growers could consider changing from open pollinated TT varieties to TT hybrid varieties where yields are expected between 1.1 and 1.9t/ha, depending on their approach to risk.
- Growers should continue to choose RR hybrids primarily for the weed control opportunities.

Background

Most canola grown in Western Australia is from open pollinated (OP) triazine tolerant (TT) varieties (78% in 2017). Growers also have access to hybrid TT, Roundup Ready (RR) and Clearfield (CL) hybrid varieties. Hybrids grow more vigorously (Figure 1), some have high disease tolerance and can produce higher yields than open pollinated TT varieties. However, hybrid canola has a considerably higher seed cost, compared with OP canola meaning that the risk is borne at the start of the season when the potential yield is unknown. As canola expands into the low rainfall zone and the OP cultivar choice becomes more restricted with fewer variety releases, it becomes important to understand gross margin trade-offs among the range of canola options.



Method

The latest WA National Variety Trial (NVT) data (2013-2017) was used to compare the yield of different hybrid canola types with open pollinated TT varieties. There were 85 TT trials, providing the best data comparison. RR and CL hybrids were compared with open pollinated TT varieties at 55 co-located RR trials and 35 co-located CL trials, providing an estimate of difference between the types. The yields were calculated using the average yield of all varieties of each type, for each location.

The gross margin for TT, RR and CL hybrids were compared with open pollinated TT canola based on yield differences only, not including weed control benefits. The gross margin analysis was conducted based on a farm gate grain price of \$550/t and \$510/t for GM varieties, \$5 end point royalty for OP TT varieties, seed costs of \$2/kg for TT OP, \$26/kg for TT and CL hybrids and \$35/kg for RR hybrids, seeding rates of 4kg/ha for TT OP varieties 2.5kg/ha for hybrids, and variable cost for nitrogen fertiliser. The same (\$60/ha) herbicide cost was used for all herbicide types.

We define the breakeven threshold (1:1 return) as the yield at which the extra input costs from hybrid seed are covered by the extra yield from hybrids. At this threshold, hybrids deliver the same profit as open pollinated TTs. However, at this threshold the growers face extra financial



Figure 1 Open-pollinated canola (left) and hybrid canola (right) and showing vigour difference at vegetative growth stage

risk from the upfront seed cost and extra production risk from using lower seed rates. Growers may want to have a higher return on their investment in seed costs to mitigate these risks. We considered the yield at which each extra \$1 invested in seed returned \$2 profit, the 1:2 return threshold.

Yield results

Overall, hybrids out yielded open pollinated TT varieties and the differences were greater at the highest yielding sites (Table 1). Where OP TT had yields of 2t/ha, yields for TT, RR and CL hybrids were 2.2, 2.3 and 2.3t/ha, respectively.

Table 1 Comparison of TT OP yield (t/ha) with TT, RR and CL hybrids, in WA NVT 2013-2017

TT OP	TT Hybrid	RR Hybrid	CL hybrid
0.5	0.5	0.6	0.6
1	1.1	1.2	1.2
2	2.2	2.3	2.3
3	3.4	3.5	3.4

Gross margin analysis

The cost of growing hybrid canola is \$65-87/ha more expensive than OP, due to greater seed costs. Gross margins were strongly linked to yield potential and hybrid canola was only more profitable when the gains from higher yield outweighed the greater cost of production (Figure 2).

The gross margins accounted for yield differences but did not account for rotation or system benefits from better control of problem weeds.

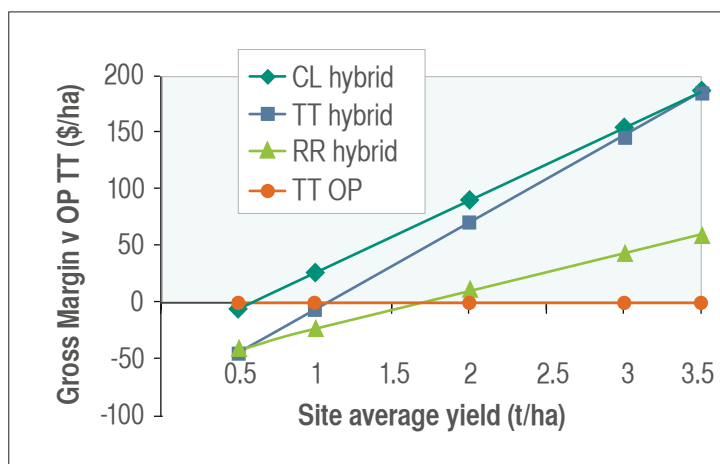


Figure 2 Difference in gross margin for TT, RR and CL hybrids, compared with OP TT canola. The intercept on x-axis indicates the profit break-even yield threshold, compared to OP TT canola

Hybrid TT canola

For hybrid TT canola the breakeven profit threshold compared with open pollinated TT is 1.1t/ha, and the 1:2 return rate threshold is 1.9t/ha (Table 2). Growers could consider using TT hybrids, rather than OP TT varieties, somewhere between these thresholds. The middle rate of return (1:1.5) has a yield threshold of 1.5t/ha.

NVT is an excellent system to compare varieties under standardised management. However on farm, growers usually reduce hybrid seeding rates and grade OP seed for a bigger seed size. Both of these management tactics are likely to reduce the yield gap between hybrids and OP.

Table 2 Breakeven yields (t/ha) for changing from OP TT canola, or 1:1, 1:1.5 and 1:2 return rates

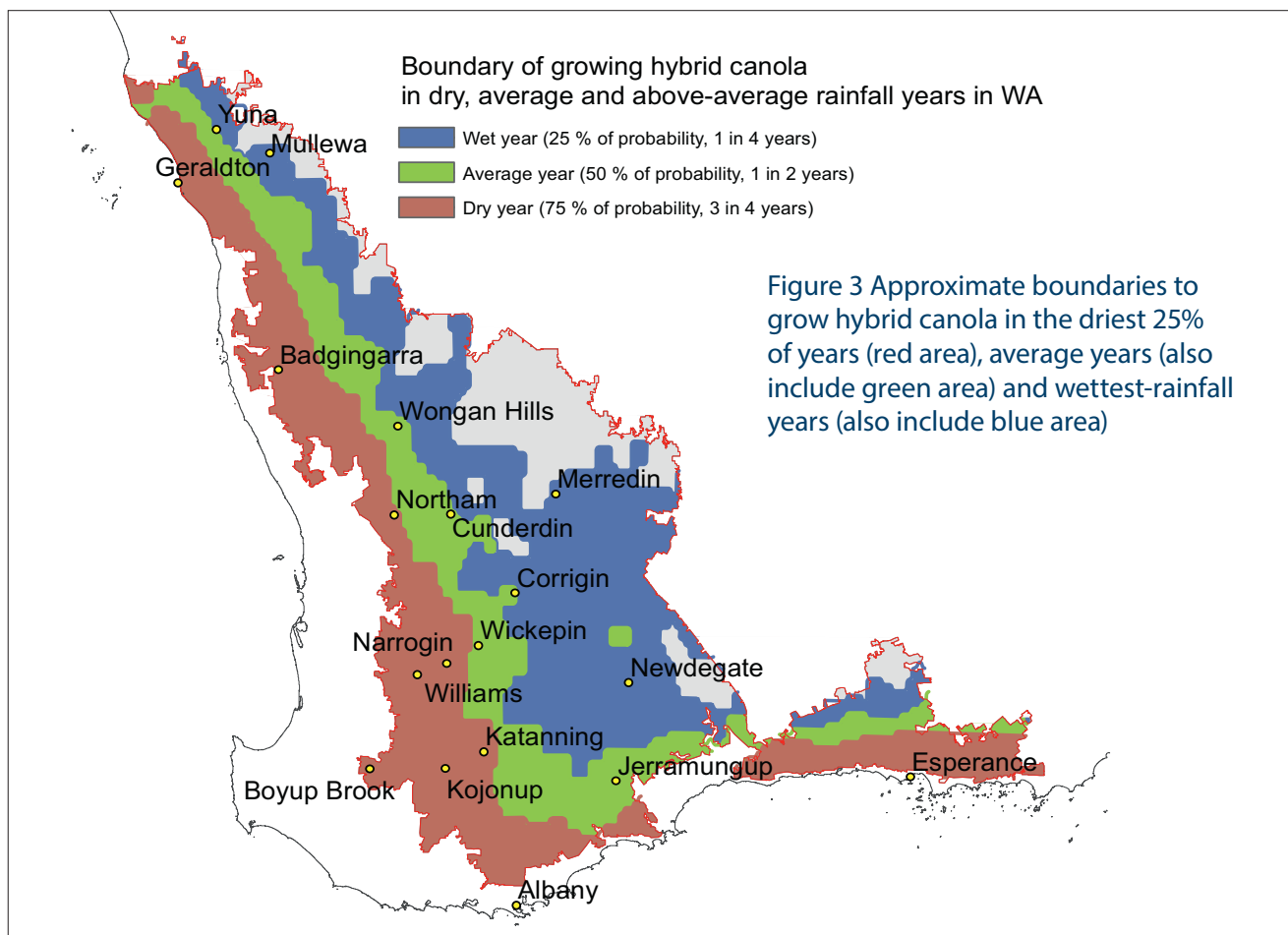
	TT Hybrid	RR Hybrid	CL hybrid
Grain price	\$550	\$510	\$530
1:1 return	1.1	1.8	0.6
1:1.5 return	1.5	3.1	1.1
1:2 return	1.9	4.4	1.6

Roundup ready canola

Hybrid Roundup ready varieties have the highest advantage over OP TT yield (Table 1). However the gross margin is disadvantaged and complicated by the variable GM discount, which is typically \$20-40 less than the non GM price. This causes large variability in the gross margin; and the breakeven threshold varies between 1.1-1.8t/ha, and 2.7-4.4t/ha at a 1:2 return rate (Table 2). The higher costs and lower income of RR canola, compared with TT canola, caused the very high thresholds at the 1:2 return rate.

If we change the herbicide costs to RR- \$45/ha and TT-\$75/ha, by sowing the RR dry and adding propyzamide to the TT, then the profit breakeven threshold drops to 0.5-0.9t/ha, and the 1:2 return rate threshold drops to 2.2-3.5t/ha, for GM discounts of \$20-40/t, respectively.

Although RR varieties out yield OP TT varieties on average, RR gross margins are variable and it would be difficult to reliably meet the high 1:2 return rate thresholds for RR canola. The real benefit of RR canola is weed control options for growers, to realise the break crop rotational benefit to wheat, assessed as 0.4t/ha in WA. Growers should continue to use RR varieties for weed control options.



Clearfield canola

On average, Clearfield hybrid varieties have a yield advantage over open pollinated TT. The profit breakeven threshold to change from OP TT to Clearfield hybrid, based on increased canola yield, is 0.6t/ha and 1.6t/ha for 1:2 return rate. Results are considerably lower than for NVT 2012-2016 (1.2/2.2t/ha), so should be treated with caution.

The possibility of Clearfield herbicide residues affecting following crops is a serious risk factor for CL canola, especially in low rainfall areas.

The results show that there is opportunity to change from OP TT varieties to Clearfield hybrids, based on the yield advantage. However risks are higher than for other hybrid types.

Growing season rainfall and choice between open pollinated TT and hybrids

Having determined the break-even yield for changing from OP TT to hybrid varieties, we related the break-even yield to the growing season rainfall. Based on the relationships

between yield and growing season rainfall, it was estimated that the growing season rainfall of around 240-265mm is enough to achieve 1.1-1.2 t/ha for south-western Australia. We conservatively take 265mm as the critical value above which hybrids become more profitable than OP canola. Based on the long term growing season rainfall from April to October, we developed a map showing the potential areas of growing hybrid canola profitably in the dry, average and wet rainfall year in WA (Figure 3).

In the 25% driest years, hybrid canola is best limited to the high rainfall zone (red area of Figure 3). In average rainfall years (25 to 75th percentiles), the use of hybrids could extend to include the green shaded area, and in the very wettest years (top 25%) can be further extended to include some traditional low rainfall areas shaded in blue on Figure 3.

When considering the 1:2 return rate, growers in the high rainfall (>330mm growing season rainfall) area are more likely to meet the 1:2 return threshold of 1.9t/ha and therefore can switch from OPs to hybrids to take advantage of high rainfall and longer growing season in order to lift their current canola yield.