

# Wide row canola why bother; a summary of a series of small plot and farmer trials and farmer experiences

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## Key messages

- Canola grown in wide rows (50 to 60 cm) yielded well enough to consider this row spacing as an option.
- Canola plants were able to compensate for being sown in wide rows - biomass similar to narrow rows.
- We may be able to reduce input costs, seed and fertiliser by refining the production package in wide rows.
- Wide rows offer benefits of reduced fuel costs at seeding, easy stubble handling and safety of IBS herbicides.

## Aims

1. Test yield response to narrow vs wide row over high and low rainfall zones of the NAR.
2. Test best agronomy for wide rows; hybrid vs open pollinated, seeding rate, fertiliser and fungicide.

## Background:

Many experiments conducted in Western and Eastern Australia have shown that canola and lupin should be sown at row spacings as narrow as practicable to maximise yield (Scott et al. 2013). However, previous work in the WA NAR has shown that lupin can successfully be grown in wide rows in this environment (Harries and French 2007). Farmers in the Northern Agri Group (NAG), already growing lupin in wide rows, were keen to investigate if wide rows would work for canola in their region. Several farmer implemented demonstrations were run in 2013 with promising results, and this led to a series of 3 small plot and 3 farmer trials being run in 2014. The rationale behind relooking at wider rows than the current recommendation of approximately 24 cm varies with rainfall zone:

- High rainfall areas
  - Increasingly popular Round-up Ready (RR) hybrids are more vigorous than open pollinated triazine tolerant (TT) varieties so may be more suited to wide rows.
  - Airflow and fungicide efficacy when combating sclerotinia should increase in wide rows.
- All rainfall zones
  - utilising wide rows may allow reduced seed and fertiliser inputs.
- All rainfall zones but particularly the low rainfall zones
  - Wide rows conserve moisture until later in the growing season and can 'drought proof' canola crops; yield stability across years may be more important than maximum yield in good years but failures in drier years.

## Methods

Three farmer sown trials and 3 small plot trials were paired within 3 paddocks within the H1, M1 and L1 Agzones (Suckling high rainfall, Cripps medium and Ford low). The members of each pair had treatments in common.

*Farmer sown trials;* Trials at Cripps and Fords were fully replicated with 12 seeder runs the length of the paddock. Each seeder run was divided in half for high and low seed rate. At Suckling's 8 seeder runs, one of each treatment, were sown. This site was un-replicated because of logistics of the paddock. Row spacing was wheat seeding width (25 to 30 cm) and double wheat seeding width for all farmer trials. One hybrid and one OP variety, chosen by the farmer, was used at each site. Two different herbicide groups were used. At the higher rainfall sites Roundup Ready was used while at the lower rainfall site TT was used. This was in line with current technology used by the farmers and reflected that in the low rainfall zone OP TT varieties are still being used as a cheaper input option.

*DAFWA sown trials;* Plots were 20m long by two cone seeder runs, wide enough for plot harvest without the outside rows, to avoid edge effects. Each trial contained 16 treatments and 4 replicates. Trials at Suckling's and Cripps had identical experimental design and treatments. The design was a strip plot factorial: Strips = fungicide, sub plots = row spacing, sub-sub plots = density x fertiliser treatments. The trial at Ford's had the same experimental design, however the fungicide treatment was replaced with a comparison of OP and hybrid variety, considered more important in this environment. Row spacing used was 22 and 44 cm, narrower than farmer sown but constrained by plot seeder bar width. Two herbicide groups were used as per farmer sown. Fertiliser applied at sowing was tested to see if lower than normal rates could be used in wider rows.

The fertiliser treatment was a normal compound fertiliser N application at sowing of 9 units and half the normal rate. Fungicide, Prosaro, was applied at sites closer to the coast, to test fungicide response to sclerotinia with different row spacings. Given the trial designs comparisons between OP and hybrid could be made at farmer sown and Fords DAFWA sown trials.

## Results

### Yield

Over the five replicated trials yield was greater in wide rows at one trial, the same in three trials and less in one.

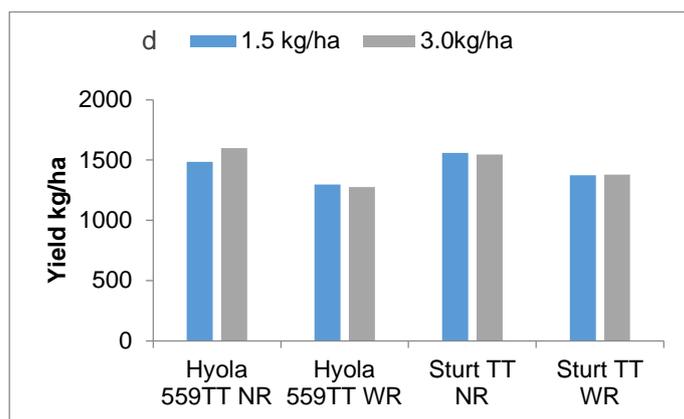
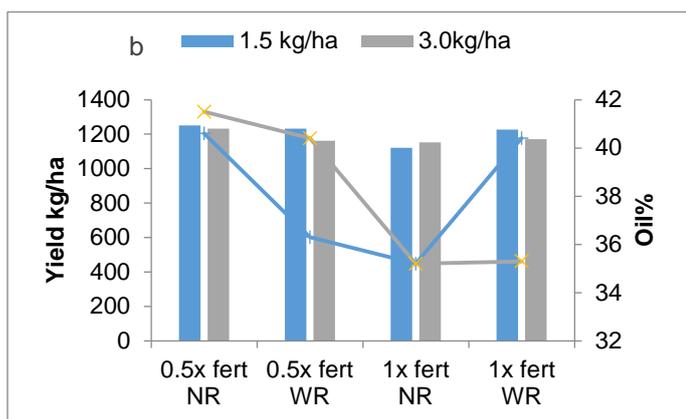
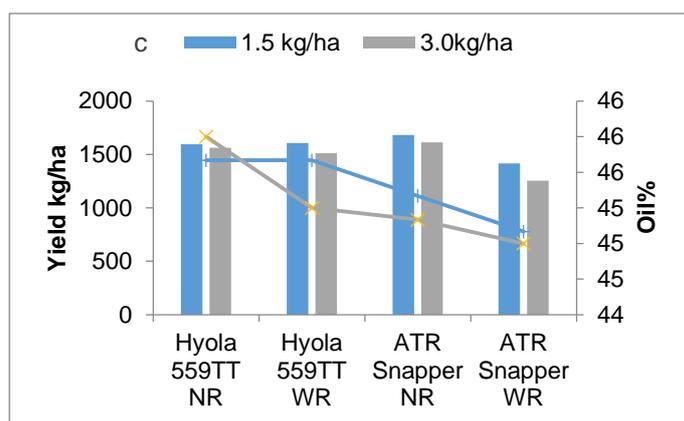
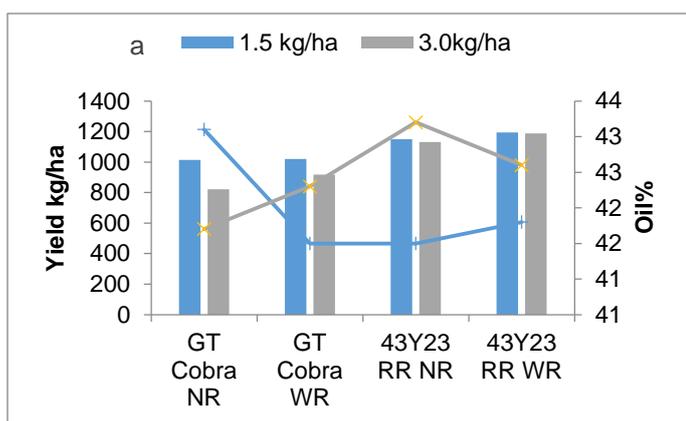
Seed rate only had a significant effect in one trial. This was Cripps farmer sown, where high seeding rate of 3 kg/ha yielded less than low seeding rate of 1.5 kg/ha - 1014 compared to 1095 kg/ha ( $P < 0.001$ ). This is typical of the response of canola and lupin where yield rarely drops dramatically with higher seeding rates. DAFWA have recently conducted a series of trials showing plant density of 20 plants per square metre for hybrids and 27 plants per square metre for open pollinated varieties achieves yield potential, and at some sites potential was achieved at lower densities (Seymour et al. 2014). However with seed cost of hybrids, a significant saving can be made by using lower seed rates.

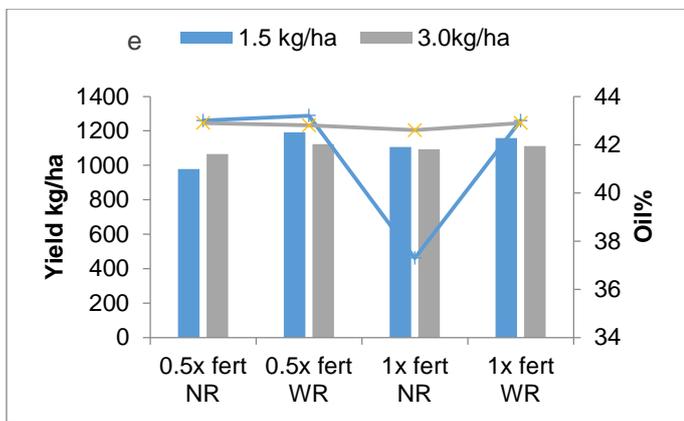
Hybrid plant type yielded more than open pollinated. Of the three replicated trials comparing hybrid to OP, the hybrid plant type yielded more than the OP. This difference was significant at Cripps' farmer sown trial, 1166 to 943 kg/ha but not significant at the other sites.

The only trial where interactions between treatments were statistically significant was Cripps' farmer sown. At this site, increasing seed rate decreased yield of the OP more than the hybrid. Also, increasing the seed rate decreased yield more in the narrow rows than the wide rows. Interestingly at 3 of the 5 replicated sites, wide row x low seed rate was the highest yielding row spacing seed rate combination.

Reducing the fertiliser at sowing to half the rate normally used by each farmer did not significantly reduce yield at any of the three DAFWA sown trials where it was tested. At Cripps' yield at normal fertiliser rate was 1168 compared to 1220 kg/ha at the half rate. At Suckling's this was 1090 to 1117 kg/ha and Ford's 1462 to 1422 kg/ha. By placing the fertiliser only in the wide rows the concentration around the seedlings is increased and there may be an opportunity to reduce fertiliser inputs at sowing. Recent work by Mark Seymour and Sally Sprigg (2013) has shown that nitrogen post sowing can be used effectively at N responsive sites, such that growers may be able to match inputs better to seasonal conditions and yield potential. It should be noted that all sites have good P fertiliser history ( $>20$  ppm, 0-10).

Fungicide did not impact yield significantly at the two sites where it was applied. At the time of spraying fungicide sclerotinia was present with apothecia found at Suckling's. However the dry period during the season meant that the disease did not progress to reduce yield





**Figure 1** Grain yield (bars) and oil content (line) of the 5 replicated trials; a Cripps farmer sown, b Cripps DAFWA, c Ford farmer sown, d Ford DAFWA, e Suckling DAFWA. NR = narrow row spacing, WR = wide row spacing

### Vegetative growth

Biomass was measured at vegetative stages from the farmer sown trials. At the high seeding rate total biomass and individual plant weight was reduced; high rates resulted in competition between the canola plants. Even at this early growth stage the wide row canola had produced a similar amount of biomass to the narrow rows (table 1). At Cripps' biomass averaged across all wide row treatments was 176 g/m<sup>2</sup> compared to 177 g/m<sup>2</sup> for narrow rows; Ford's 348 g/m<sup>2</sup> compared to 356 g/m<sup>2</sup>; Suckling's 258 g/m<sup>2</sup> compared to 274 g/m<sup>2</sup>. For OP canola, total biomass and individual plant weight decreased in 5 of 6 responses when going from narrow to wide rows. For hybrid canola the opposite occurred, at 5 sites total biomass and individual plant weight was greater in wide rows. This was a trend only, not a statistically significant interaction at any site. Results indicate plant architecture of canola is suited to wide rows.

**Table 1. Dry biomass (g/m<sup>2</sup>) and plant dry weight (g/plant) at vegetative stages (farmer sown).**

Target density	Row spacing	Plant type	Suckling biomass 4/7 (79 *DAS)	Suckling plant wt 4/7 (79 DAS)	Cripps Biomass 4/7 (72 DAS)	Cripps plant wt 4/7 (72 DAS)	Ford biomass 31/7 (99 DAS)	Ford plant wt 31/7 (99 DAS)
15	NR	HY	284.4	10.7	195	5.8	404	6.6
30	NR	HY	367.5	6.8	166	3.5	320	3.7
15	WR	HY	246.7	15.5	187	6.9	345	5.1
30	WR	HY	341.7	10.7	166	4.6	335	4.0
15	NR	OP	225.7	7.8	174	4.6	322	5.2
30	NR	OP	216.9	5.1	172	3.7	378	5.4
15	WR	OP	199.5	7.5	190	5.9	358	6.6
30	WR	OP	194.6	5.0	162	4.2	355	3.5

\*Days after sowing

### Biomass at Maturity

As with the earlier biomass measurements, seeding rate had a greater effect than any other treatment with a reduction in biomass at the higher seeding rates at most sites. Increasing row spacing did not cause a significant reduction in biomass at any site. The only statistically significant response was at Ford's DAFWA sown trial, with more biomass in wider rows than narrow (P < 0.01). At Suckling's farmer sown trial, the wide rows had less biomass, because the open pollinated variety had low biomass at wide rows, however statistics were not done on this trial as there was only one replication. Hybrid was compared to OP at four sites; hybrid biomass was greater than OP at Suckling's farmer sown and not at the other sites, the same as the earlier biomass measurement. For some trials there was better plant establishment with the OP compared to the hybrid which would explain this.

**Table 2. Dry matter at maturity (g/m<sup>2</sup>) by target density, row spacing and plant type**

Target density	Row spacing	Plant type	Suckling DAFWA 11/9 (148 DAS)	Suckling farmer 11/9 (146 DAS)	Cripps DAFWA 19/9 (140 DAS)	Cripps farmer 19/9 (137 DAS)	Ford DAFWA Sown 19/9 (141DAS)	Ford farmer sown 19/9 (135DAS)
15	NR	HY	550	862	387	353	874	884
30	NR	HY	507	589	316	291	900	1044
15	WR	HY	585	607	339	420	1282	1061
30	WR	HY	462	669	322	381	1365	923
15	NR	OP		617		337	906	957

30	NR	OP		614		375	835	1185
15	WR	OP		433		373	1490	910
30	WR	OP		394		374	1197	704

### Plant weight at maturity

As with the earlier biomass measurements seeding rate had a greater effect than any other treatment. At all sites final plant weight at the high seed rate was about half that of the low seed rate. Increasing row spacing did not cause a statistically significant reduction in plant weight at any site. At Ford's DAFWA sown trial and Cripps' farmer sown trial plant weight was significantly greater in wider rows  $P < 0.05$ . At Suckling's DAFWA trial plant weight was greater in the wider rows but not significantly. At the other sites there was little difference in plant weight between row spacings. Hybrid plant weight was greater than OP plant weight. Overall for the four trials with hybrid v OP comparison the hybrid plants were 127% the weight of the OP. This was also associated with difference in season length for some varieties i.e. Ford's OP variety Sturt was a shorter season variety than the most suitable TT hybrid, Hyola 559. Hyola 559 continued to grow for longer than Sturt, plant weight was 140% of Sturt at the Ford DAFWA sown trials.

**Table 3. Individual plant weight (g/plant) at maturity by target density, row spacing and plant type.**

Target density	Row spacing	Plant type	Suckling DAFWA	Suckling farmer	Cripps DAFWA	Cripps farmer	Ford DAFWA	Ford farmer
15	NR	HY	19.1	29.4	17.0	14.0	24.1	18.9
30	NR	HY	11.0	13.0	7.4	5.8	20.0	13.2
15	WR	HY	31.4	22.2	21.2	16.8	35.5	20
30	WR	HY	14.6	12.7	14.8	10.6	19.5	13.1
15	NR	OP		20.1		11.4	18.7	16.9
30	NR	OP		11.2		8.7	11.7	11.6
15	WR	OP		17.1		14.9	27.0	27.1
30	WR	OP		13.1		9.7	13.7	10.2

### Conclusions

Wide rows performed well enough to consider using them. This opens the way to refine agronomic packages for wide rows and there may be potential for reduced up front input costs. It is likely that as was found in lupin soil type and environment will affect the relative yield in wide and narrow rows. From the lupin and canola trials done so far it looks like wide rows are better suited to shallower soil types where drought during grain fill is severe if water is used in the top soil rapidly in winter. Also growing lupin in wide rows at southern, cooler, areas resulted in reductions in yield. Canola is better adapted to cooler season environments, more vigorous, so it would be good to test the new canola hybrids in southern areas. Growers involved in these trials consider aspects other than yield to be an important factor in deciding to use wide rows, reduced fuel costs at seeding (approximately 30%), better stubble handling, and improved crop safety of IBS herbicides.

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### Key words

Canola, row spacing

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