Department of Agriculture and Food
GOVERNMENT OF WESTERN AUSTRALIA

GRDC Grains Research & Development Corporation

DAW00227
Tactical Break Crop Agronomy in Western Australia

Plant density response in medium rainfall canola Wongan Hills (13WH11)

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Location of trial	Wongan Hills Research Station

Summary (Key messages)

In this 2013 trial

- Canola yield responded to increasing plant density to 65 plants/m² but there was very little response at densities greater than 20 to 30 plants/m²
- The response was variable within this trial site, which means that is very likely to be quite variable across different years and locations.
- Roundup Ready canola enabled much better weed control than triazine tolerant canola on this site.

Background

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 lower densities.

Aim

To compare the plant density response of yield and oil content between hybrid and OP canola in TT and RR herbicide tolerance groups

Trial Details

- Property: DAFWA Wongan Hills Research Station
- Agzone 2, Growing Season rainfall (GSR) = 249 mm, GSR + stored water (estimate) = 286 mm
- Soil type: Loamy sand (1.01% organic carbon), total mineral N at seeding 52 kg/ha to 50 cm
- Paddock rotation Wheat 2012, Pasture 2009-2011
- 3 replicates
- Sowing date May 13
- Fertiliser (kg/ha) 100 kg/ha of Whitgro Extra at seeding, 120 kg/ha of Muriate of Potash and 400 kg/ha of gypsum (17% Ca, 14% S) topdressed over whole site 4 weeks after seeding

Treatment detail

- 32 treatments: 2 Herbicide tolerance types (RR and TT) × a hybrid and an open-pollinated cultivars within each type (GT Viper and ATR Stingray, OP for RR and TT respectively; and Hyola 404 RR and Hyola 450 TT, hybrid for RR and TT respectively) × 8 target densities (5, 10 ,15, 20, 30, 40, 60, and 80 plants/m^2)

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.

Herbicide costs $28/ha for RR, $47/ha for TT

RR grain worth $482/t (CBH Pool Kwinana 5/11/13).

TT grain worth $495/t (CBH Pool Kwinana 5/11/13).

Results

1. Increasing seed rate increased established density.

The established densities were on average 86% of the target density. In calculating our seed rates we assumed that 75% of viable seed of TT varieties and OP RR varieties would establish, and 85% of Hybrid RR varieties would establish. The overall establishment efficiencies were 95% for the TT varieties, 90% for Hyola 404 RR, and 64% for GT Viper.

2. Yield responded to increasing density

All varieties responded to increasing density but the response was very flat at more than 40 plants/m². There was some evidence of declining yield at high density (the maximum observed in this trial was 86 plants/m²) but it was very slight. The response flattened out at lower densities in hybrids than open-pollinated varieties.

3. Roundup Ready varieties had much less ryegrass than TT varieties

There was much less ryegrass in Roundup Ready plots than in triazine tolerant plots, especially at low densities. Ryegrass numbers decreased rapidly as crop density increased: TT plots at 30 plants/m² had twice as many ryegrass heads as at 50 plants/m². At low densities below 20 plants/m² the hybrid Hyola 450 TT has less ryegrass than the open-pollinated ATR Stingray.

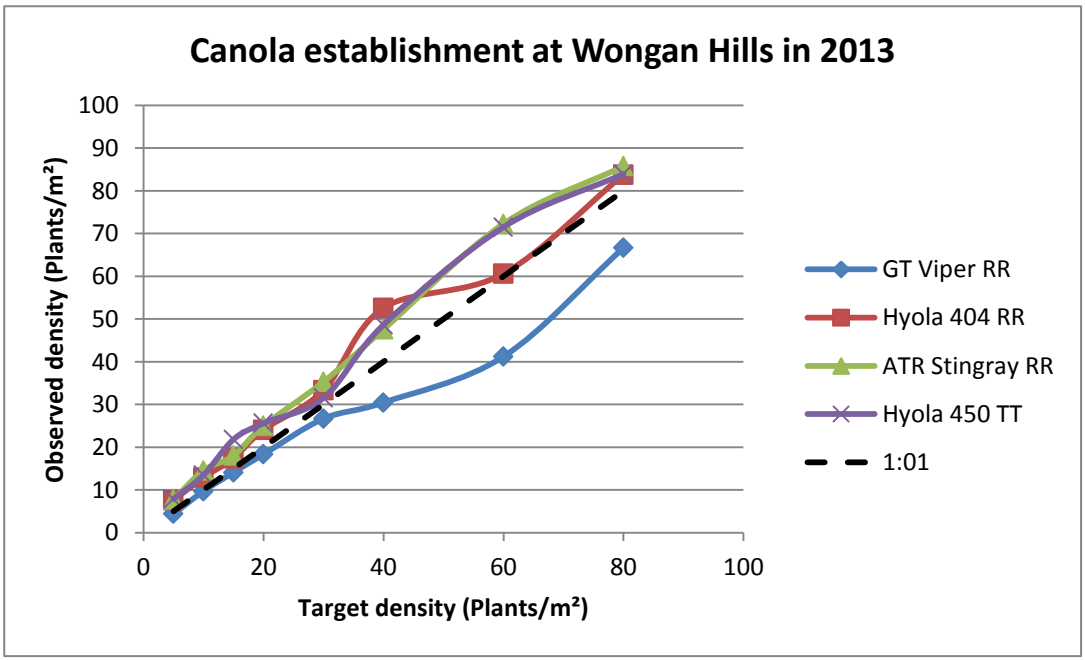

Figure 1. Observed canola crop density as a function of target plant density at Wongan Hills in 2013. The dotted line shows the 1: line between target and observed densities.

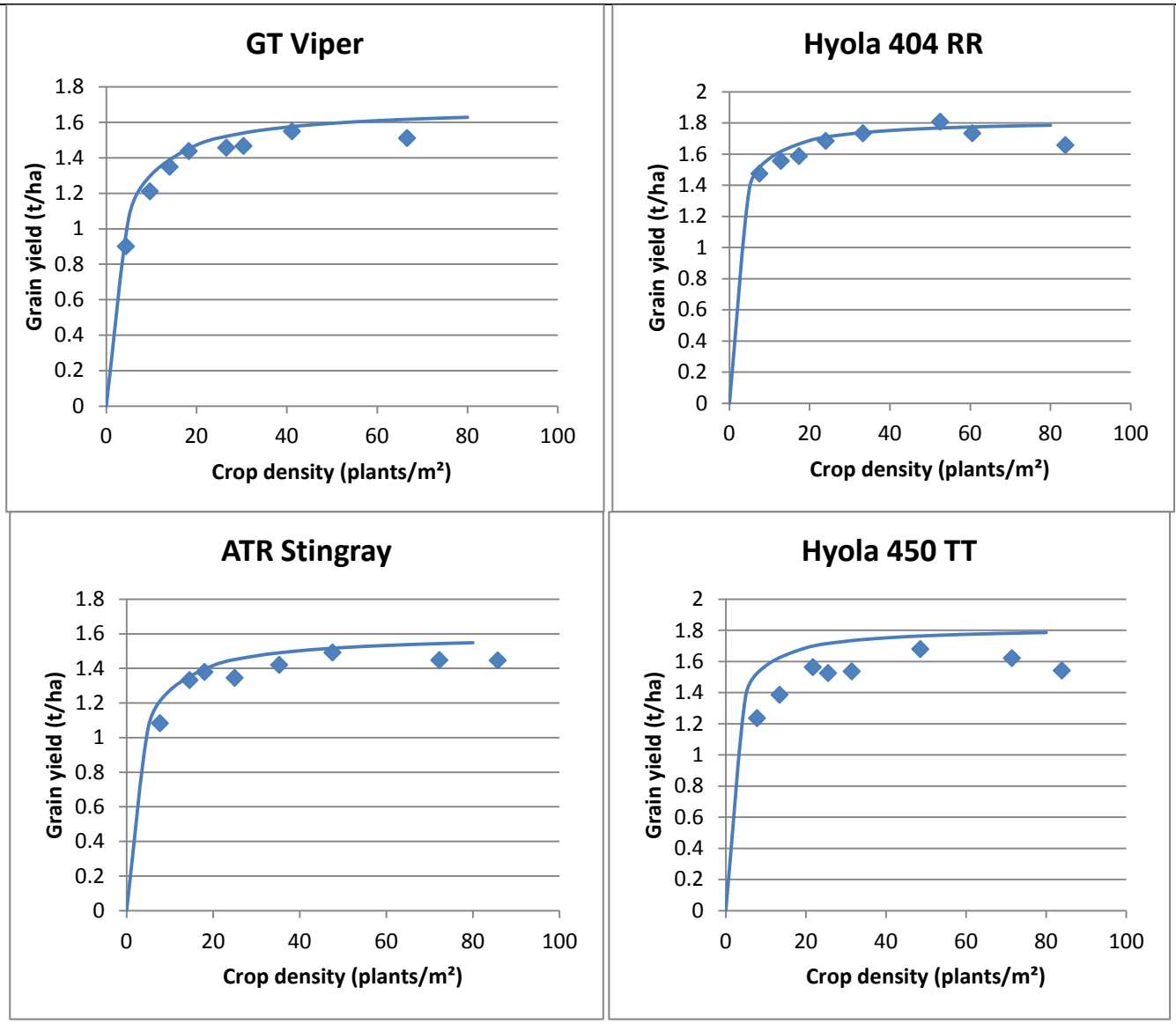

Figure 2. **Grain yields of open-pollinated and hybrid canola varieties from Roundup Ready and Triazine Tolerant herbicide resistance groups at different crop densities at Wongan Hills in 2013. Symbols are actual treatment means for grain yield and density, lines are fitted response curves.**

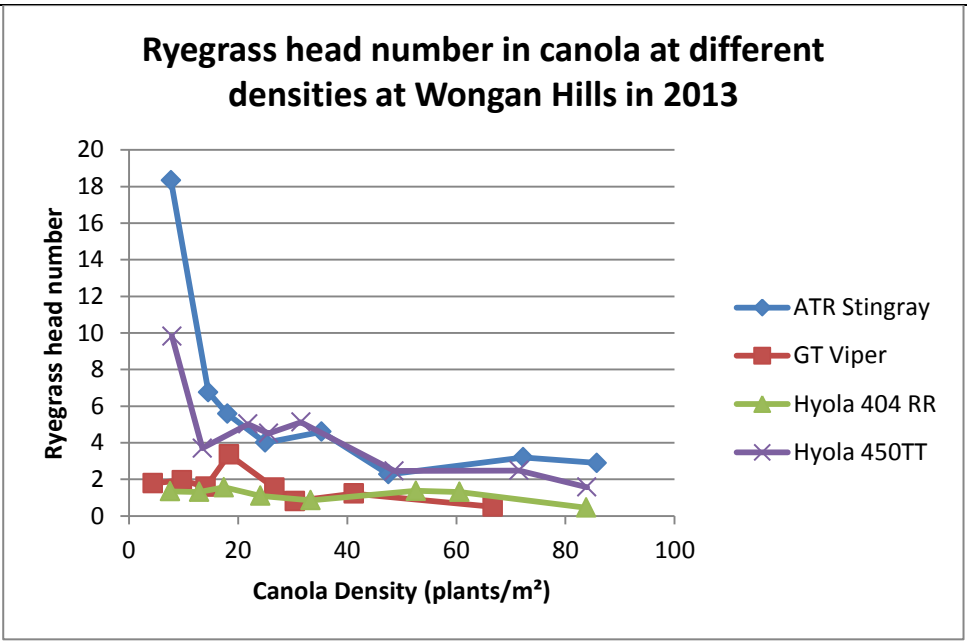

Figure 3. **Ryegrass head number in open-pollinated and hybrid canola varieties of Roundup Ready and Triazine tolerant herbicide groups as a function of crop density.**

Conclusion

The density response of open-pollinated canola varieties flattens out at densities above about 40 plants/m² while that of hybrid varieties flattens out at about 30. The density response curve is quite difficult to predict, as is also the establishment efficiency. The establishment efficiency observed in this trial was considerably higher than at some other sites in 2013 using the same seed which underlines the uncertainties involved in choosing canola seed rates. This means that there is always a danger that the target density will not be achieved, and the flatter response of the hybrid varieties can help minimise the adverse consequences of this if it happens. Data from this trial have been used as part of a larger data set to develop some guidelines for choosing canola densities in Western Australia, these overall results are discussed in the Agribusiness Crop Updates for 2014. As well as yield density can also have profound consequences for weeds. There is a danger of weed blowouts at very low densities, especially if TT varieties are used and there is some herbicide resistance present. Roundup Ready canola proved to be very effective for ryegrass management.

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 Shari Dougall and Bruce Thorpe of the Wongan Hills RSU for trial management. Laurie Maiolo (DAFWA. Merredin) 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 NVTplus

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