DAW00227
Tactical Break Crop Agronomy in Western Australia

Splitting of nitrogen in medium-high rainfall canola (13CH23)

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Location of trial	Smarts Chapman Valley

Summary (Key messages)

In this 2013 trial

- Increasing nitrogen fertiliser, over 100 kg N/ha, increased canola yields.
- Nitrogen had no significant effect on oil%.
- Splitting nitrogen applications had no effect on canola yield, oil or gross margins.
- Hyola 404RR had a higher gross margin of $506/ha, compared with $436 for ATR Stingray (TT), in spite of the higher seed costs.
- To get $2 for every $1 spent on nitrogen the economic optimum rates of nitrogen at this site in 2013 were:
    - 45 kg N/ha for ATR Stingray (TT OP)
    - 70 kg N/ha for Hyola 4040RR (RR hybrid).

Background

In general, as long as nitrogen is applied within 8 weeks of sowing, there is no yield penalty.

How canola responds to nitrogen applied later than 8 weeks has not been widely researched. Similarly how new generation canola such as RoundupReady (RR) hybrids respond to nitrogen has not been widely tested, particularly in low and medium rainfall areas. This trial is one of a series of 13 timing of nitrogen experiments DAFWA conducted in 2013.

Aim

To investigate the response to changing the nitrogen rate and changing the time of application. Canola yield and oil will be measured and RR hybrids will be compared with open-pollinated TT types (OP TT).

Trial Details

- Property: Smarts (Austin Rainer, Manager)
- Agzone 1, Growing Season rainfall (GSR) = 301 mm, GSR + stored water (estimate) = 330 mm, both 5% above average (1975-2012).
- Soil type: Loamy sand (0.86% organic carbon)
- Crop / variety: Canola
- Paddock rotation Wheat 2012, Wheat 2011, Lupin 2 t/ha 2010

Trial Details

- Sowing date May 6
- Seeding rate – Target density 40 plants/m² - ATR Stingray 2.7 kg/ha, Hyola 404RR 3.9 kg/ha
- Fertiliser (kg/ha) 80 kg/h of Bigphos + Mn 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

34 treatments: 2 Cultivars (ATR Stingray [TT open-pollinated variety] and Hyola 404 RR [RR hybrid variety]) x 17 N treatments (kg N/ha) with timing spread between seeding, and up to 12 weeks after sowing;

		N kg/ha			
No.	Total N	Seeding	4WAS	8WAS	12WAS
1	0	0	0	0	0
2	25	25	0	0	0
3	50	50	0	0	0
4	75	75	0	0	0
5	150	150	0	0	0
6	25	12.5	12.5	0	0
7	50	25	25	0	0
8	75	37.5	37.5	0	0
9	150	75	75	0	0
10	25	8.3	8.3	8.3	0
11	50	16.7	16.7	16.7	0
12	75	25	25	25	0
13	150	50	50	50	0
14	25	6.3	6.3	6.3	6.3
15	50	12.5	12.5	12.5	12.5
16	75	18.8	18.8	18.8	18.8
17	150	37.5	37.5	37.5	37.5

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 – seed $31/kg, Herbicides $28/ha, Grain worth $479/t (CBH Pool Geraldton 5/11/13).

TT costs – seed $2/kg, Herbicides $47/ha, Grain worth $499/t (CBH Pool Geraldton 5/11/13).

Results

1. Splitting nitrogen applications did not increase canola yield.

Splitting nitrogen had no significant effect on grain yield, oil%, oil yield, gross returns or gross margins. The response to nitrogen was similar regardless if it was all applied at seeding or in 2, 3 or 4 way splits.

2. Increasing nitrogen fertiliser, over 100 kgN/ha, increased canola yields, but gross margins were maximised at lower rates of nitrogen

Increasing the nitrogen fertiliser, up to 150 kg N/ha, increased the yields of both Hyola 404 RR and ATR Stingray. (Fig. 1). Increasing nitrogen fertiliser also increased the gross margin, for both varieties (Fig 2). If the intention was to cover the costs of inputs and interest repayments then the economic optimum rate for Hyola 404RR was 114 kg N/ha and for ATR Stingray it was 98 kg N/ha. If the intent was to double returns on investment and cover off some risk the optimum N rate declined to 70 and 45 kg N/ha respectively. Another approach to optimising returns is to determine the rate of N applied to achieve 90% of maximum returns – which in both Hyola 404RR and ATR Stingray produced a optimum N rate of 70 kg N/ha. (see Table 1)

3. Nitrogen rates had no significant effect on the percentage of oil of either variety

We expected oil% to decrease as the rate of nitrogen increased and protein levels increased. However at Chapman Valley in 2013 we did observe this to be the case. Similarly we might have expected oil% to drop off with later nitrogen applications, but this was also not the case in 2013.

4. Hyola 404RR had a higher gross margin of $510/ha, compared with $425 for ATR Stingray (TT), in spite of the higher seed costs.

Averaged across all nitrogen rates Hyola 404RR produced greater dry matter, grain yields and oil, than ATR Stingray, although ATR Stingray had a slightly better harvest index. Hyola 404RR therefore produced greater overall gross returns ($/t x oil bonus x GY) than ATR Stingray. As a consequence despite higher seed costs, Hyola 404RR produced overall a higher gross margin of $506/ha compared to $436/ha for ATR Stingray.

5. *SYN provided a good estimate of the amount of nitrogen in the paddock and the grain yield response of canola if no nitrogen was applied.*

We used the excel tool ‘Select your Nitrogen (SYN), to estimate that the paddock would supply 67 kg N/ha. The soil organic nitrogen component was 56 kg N/ha and the residual organic nitrogen component, from the lupin residues, was 11 kg N/ha.

SYN showed that, without any nitrogen fertiliser being applied, the site could produce 1.2 t/ha of canola. This is exactly the response for the Roundup Ready Hyola 404RR but a slight overestimation for ATR Stingray, which yielded 1 t/ha, where no N fertiliser was applied. SYN tended to underestimate the oil%, which is probably understandable given the exceptional spring of 2013.

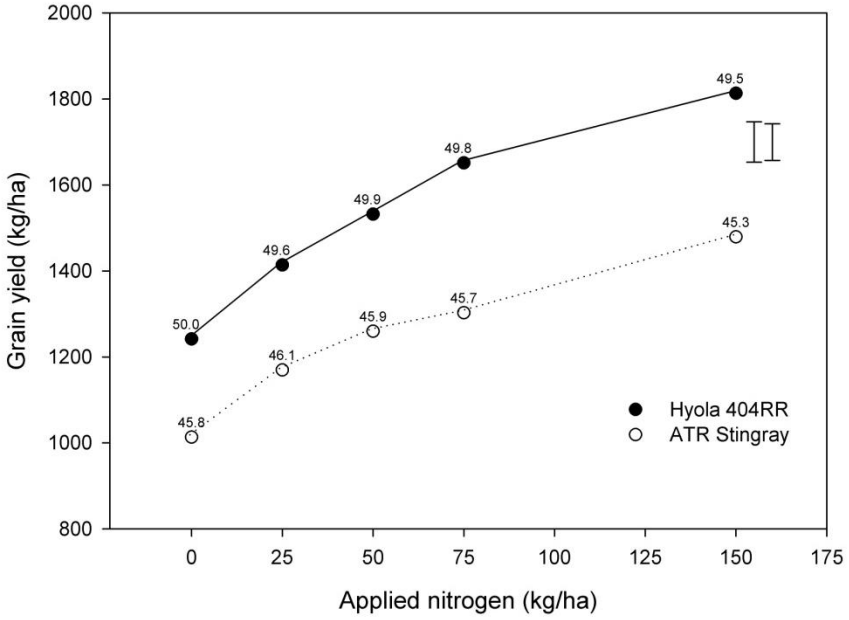

Figure 1 **Increased nitrogen fertiliser increased yields of canola at Chapman Valley in 2013. Values above symbols indicate percentage oil of grain. Data presented are averaged over timing of nitrogen application. First error bar refers to LSD (P = 0.05) for comparing between varieties, second error bar is comparing between nitrogen rates for any one variety.**

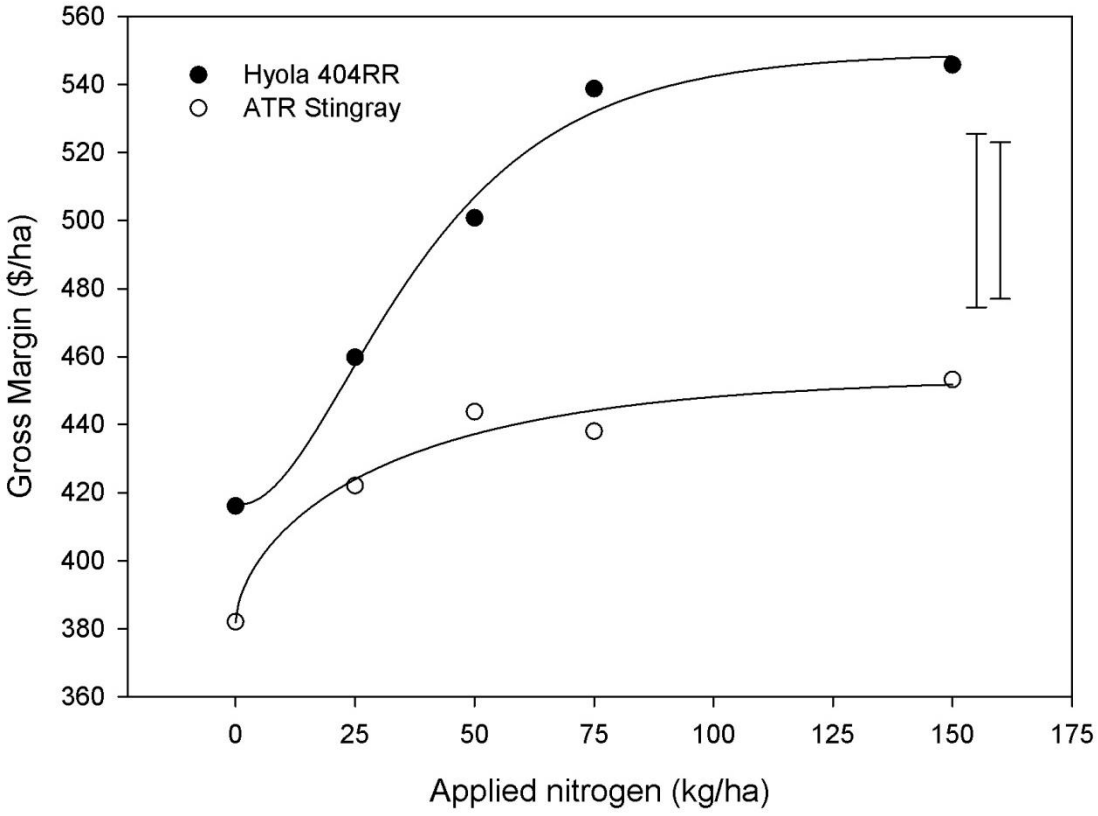

Figure 2 **Increased nitrogen fertiliser increased gross margin of canola at Chapman Valley in 2013. Data presented are averaged over timing of nitrogen application. First error bar refers to LSD (P = 0.05) for comparing between varieties, second error bar is comparing between nitrogen rates for any one variety.**

Table 1: **Nitrogen rate to apply in order to achieve a range of rates of return on investment in RR hybrid and open-pollinated TT canola in the Chapman Valley in 2013 (DAFWA trial 13CH23**).

Expected rate of return from N inputs	ATR Stingray kg N/ha	Hyola 404RR kg N/ha
1.0 (i.e. your money back)	105	121
1.1 (covers interest and application costs)	98	114
2.0 (double your money)	45	70
3.0	1	33
90% of maximum returns	70	70

Conclusion

In a year with a kind spring canola grain yield responded to high nitrogen inputs. If farmers intention was to get $2 for every $1 they spend on nitrogen then the economic optimum rates of nitrogen at this site in 2013 were 45 kg of applied N/ha for TT OP and 70 kg N/ha for the RR hybrid variety.

Canola did not respond to splitting of nitrogen application. If this result is found at other sites and years it provides farmers with potential flexibility in making decisions on nitrogen inputs later in the season.

We found RR produced the highest yields, oil and financial returns despite higher up-front costs.

Acknowledgements

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