

DAW00227

Tactical Break Crop Agronomy in Western Australia

15ED22 Splitting of nitrogen in medium-high rainfall canola

Authors

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Location of trial

Esperance Downs Research Station (EDRS), Gibson

Summary (Key messages)

In this 2015 trial

1. *Economic response plateaued at 75 kg N/ha – lower than grain yield (125 kg N/ha)*
2. *Nitrogen applications at 12 and 14 weeks produced similar canola responses to N applied earlier in the year – but no added benefit.*
3. *OP TT and hybrid RR varieties had a similar response to nitrogen timing and rate.*

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.

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: EDRS (DAFWA, Owner)
- Agzone 6, Growing Season rainfall (GSR, May to October) = 320 mm, GSR + stored water (estimate) = 387 mm, Dry October of 17mm compared to LTA of 43mm
- Soil type: Gravelly sand (1.43% organic carbon), SYN = 76 kg N/ha
- Paddock rotation Cereal 2014, Canola 2013, Sub-clover Pasture 2011 and Sub-clover Pasture 2010
- 28 treatments: 2 Cultivars (ATR Wahoo [TT open-pollinated variety] and Hyola 600 RR [RR hybrid variety]) x 14 N treatments (kg N/ha) with timing spread between seeding, and up to 14 weeks after sowing –see Table 1;
- 3 replicates
- Sowing date April 28

Trial Details

- Seeding rate – Target density 30 plants/m² - ATR Wahoo 2.7 kg/ha, Hyola 600RR 1.9 kg/ha
- Fertiliser 400 kg/ha of gypsum (17% Ca, 14% S) top-dressed over whole paddock in late March. 100 kg/ha of Superphos at seeding, 200 kg/ha of Muriate of Potash top-dressed over whole site 4 June, 4 kg MnSO₄/ha sprayed on 29th July, and 1 kg ZnSO₄ sprayed on 4th August.

Treatment detail

Treatment no	Name	Seeding	0 to 8 weeks	12 WAS	14 WAS
1	Seeding	0	0	0	0
2	2-way split	15	35	0	0
3	2-way split	15	60	0	0
4	2-way split	15	85	0	0
5	2-way split	15	110	0	0
6	3-way split	15	10	25	0
7	3-way split	15	35	25	0
8	3-way split	15	35	50	0
9	3-way split	15	60	25	0
10	3-way split	15	60	0	25
11	4-way split	15	35	25	25
12	3-way split	15	85	25	0
13	3-way split	15	85	0	25
14	4-way split	15	35	50	25

Seeding N applied as Urea, Top-ups applied as liquid N.

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 solid and \$1.53/kg for foliar, application costs \$8/ha

RR costs – seed \$61/ha, Herbicides \$45/ha, Grain worth \$498/t (Decile 5 pricing).

TT costs – seed \$5/ha, Herbicides \$60/ha, Grain worth \$518/t

Results

Table 1 Grain yield (GY, kg/ha), oil concentration in seed (%), oil yield (kg/ha) and gross margin (GM, \$/ha) of canola in response to applied N at Gibson in 2015. *Values followed by the same letters are not significantly different.*

N	GY	Oil	Oil yield	GM
0	2.08a	48.4c	1009a	894a
50	2.42b	48.2bc	1169b	1000b
75	2.63c	48.3c	1269c	1068c
100	2.71d	48.0ab	1298d	1076c
125	2.81e	47.8a	1342e	1082c
N	< 0.001	0.004	< 0.001	< 0.001

Table 2 Grain yield (GY, kg/ha), oil concentration in seed (%), oil yield (OY, kg/ha) and gross margin (GM, \$/ha) of canola in response to split applications of N at Gibson in 2015. *Values followed by the same letters are not significantly different.*

Timing	N Treatment	Total N	GY	Oil	OY	GM
Seeding	0N	0	2.08 a	48.4 c	1009 a	894 a
2-way split	15N 35N	50	2.44 b	48.4 c	1179 b	1013 bc
2-way split	15N 60N	75	2.62 c	48.5 c	1269 c	1077 de
2-way split	15N 85N	100	2.72 defg	48.1 abc	1309 cd	1089 de
2-way split	15N 110N	125	2.83 hi	47.8 ab	1352 de	1104 e
3-way split	15N 10N 25N	50	2.41 b	48.1 abc	1160 b	986 b
3-way split	15N 35N 25N	75	2.64 cd	48.2 bc	1270 c	1074 de
3-way split	15N 35N 50N	100	2.74 fgh	47.9 ab	1313 cde	1088 de
3-way split	15N 60N 25N	100	2.65 cde	48.1 abc	1273 c	1040 cd
3-way split	15N 60N 0N 25N	100	2.73 efg	47.9 ab	1309 cd	1078 de
4-way split	15N 35N 25N 25N	100	2.69 cdef	48 abc	1289 c	1047 cd
3-way split	15N 85N 25N	125	2.83 i	47.9 ab	1357 e	1101 e
3-way split	15N 85N 0N 25N	125	2.8 ghi	48 abc	1346 de	1081 de
4-way split	15N 35N 50N 25N	125	2.76 fghi	47.6 a	1314 cde	1041 cd
P	Ntreat		<.001	0.049	<.001	<.001
P	Var. x Ntreat		0.239	0.198	0.371	0.305
I.s.d.	Ntreat		0.089	0.5	45.8	51

Table 3 Grain yield (GY, kg/ha), oil concentration in seed (%), oil yield (kg/ha), gross margin (\$/ha), total dry matter at maturity (TDM, kg/ha), harvest index (HI,%) and protein in seed (%) of two canola varieties at Gibson in 2015

Variety	GY	Oil	Oil yield	GM	TDM	HI	Protein
ATR Wahoo	2.59	47.5	1232	1065	11473	23	20
Hyola 600RR	2.68	48.6	1303	1037	11733	23	19.5
P	0.099	0.006	0.036	0.228	0.596	0.661	0.056
I.s.d.	0.129	0.37	59	69	1795	3	0.5

Conclusion

At Gibson in 2015, we observed a positive grain yield and oil yield response up to 125 kg N/ha. Once we took into account the cost of N we observed positive gross margin response up to 75 kg N/ha, where the rate of return for investment in N would have been ~ \$3.

For 50N and 75N split application at seeding/8 weeks produced the same yield, oil, oil yield and gross margin as split at seeding/8WAS/12WAS. For 100N and 125N split applications had similar responses.

Considering a scenario where a grower may have put on 75N within first 8 weeks – and would they have observed a response to an extra 25N at 12 or 14 weeks, we observed no extra yield if you apply 25N at 12 weeks, but extra yield if applied at 14 weeks, less oil% if you apply 25N at 14 weeks, but no difference yield if applied at 12 weeks and no response to N applied at 12 or 14 weeks for oil yield or gross margins. It appears our late application treatments are being imposed upon too high a background of applied N and we probably need to conduct our late N treatments at lower rates of N. i.e Apply 50N within 8 weeks and compare extra 25N at 8, 10 12, 14 to 20 weeks.

With the exception of higher oil from Hyola 600RR, we found very little difference between varieties and no variety x N treatment interactions.

Acknowledgements

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Links

For other reports related to this trial see <https://www.agric.wa.gov.au/canola/canola-nitrogen-trials>

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