Trial 3. Nitrogen Efficiency Trial – Nitrogen Rates

Project Objective: To examine the nitrogen use efficiency of canola grown under overhead irrigation when increasing rates of nitrogen fertiliser applied (Prilled Urea 46%N)

Location: Finley IRC **Cultivar:** 45Y28 RR

Sown: 30th April **Harvested:** 4th December

FAR Code: FAR IRR C21-03-1

Rotation Position: Wheat (2020), Wheat (2019), Faba Beans (2018)

Soil Management: Wheat stubble incorporated with speed disc in Autumn

Irrigation: Surface irrigation, 3 applications totalling 289mm

GSR: April-October 192mm. Total water available 481mm

Available Soil N: 110 kg/ha (0-90cm)

Key Messages:

- *Seed yield (3.90 t/ha) was maximised when 240kg N/ha was applied as a two split application and although yield increased up to 320kg N/ha the advantage in seed yield was not statistically significant.*
- *There was no significant effect on seed oil content (45.9 – 48.3%) across the different rates of nitrogen fertiliser applied.*
- *When no nitrogen was applied the test weight was significantly lower (62.4 kg/hl) than all the other nitrogen applications (63.3 – 64.1 kg/hl).*
- *There was no significant difference in harvest index (HI) although values varied from 23 -31% with the N rates applied.*
- *Seed yield showed little relationship with dry matter content of the crop at 80% flowering.*
- *No removed in the crop canopy at flowering revealed a soil N supply of approximately 70kgN/ha in the absence of fertiliser applied.*
- *At 200kg N/ha applied fertiliser and below more N was removed in dry matter at flowering with N doses of 200kg N/ha and below.*
- *When applied fertiliser was 240kg /ha N or greater less N was removed in dry matter at flowering than was applied.*

The GRDC Optimising Irrigated Grains Project is a collaborative project including the following project partners:

Table 5. Influence of applied nitrogen fertiliser rate (split 50:50) at six leaf (6L) & green bud (GB) on grain yield (t/ha SAGI predicted values), oil content (%) and test weight (kg/hL).

	Nitrogen Treatment Rate & Timing	Grain Yield and Quality					
		Total N	Yield		Oil	Test Weight	
		kg N/ha	t/ha		%	kg/hL	
1	0kg N/ha	0	2.19	a	48.3 -	62.4	c
2	40kg N/ha@6L & 40kg N/ha@GB	80	3.44	b	46.9 -	63.4	ab
3	60kg N/ha@6L & 60kg N/ha@GB	120	3.44	b	45.9 -	63.3	b
4	80kg N/ha@6L & 80kg N/ha@GB	160	3.54	b	46.9 -	63.5	ab
5	100kg N/ha@6L & 100kg N/ha@GB	200	3.74	b	47.4 -	63.5	ab
6	120kg N/ha@6L & 120kg N/ha@GB	240	3.89	b	46.3 -	63.8	ab
7	140kg N/ha@6L & 140kg N/ha@GB	280	3.54	b	48.0 -	63.5	ab
8	160kg N/ha@6L & 160kg N/ha@GB	320	4.19	b	46.3 -	64.1	a
	Mean		**3.50**		**47.0**	**63.4**	
	LSD		0.50		ns	0.79	
	P Val		<0.001		0.065	0.012	

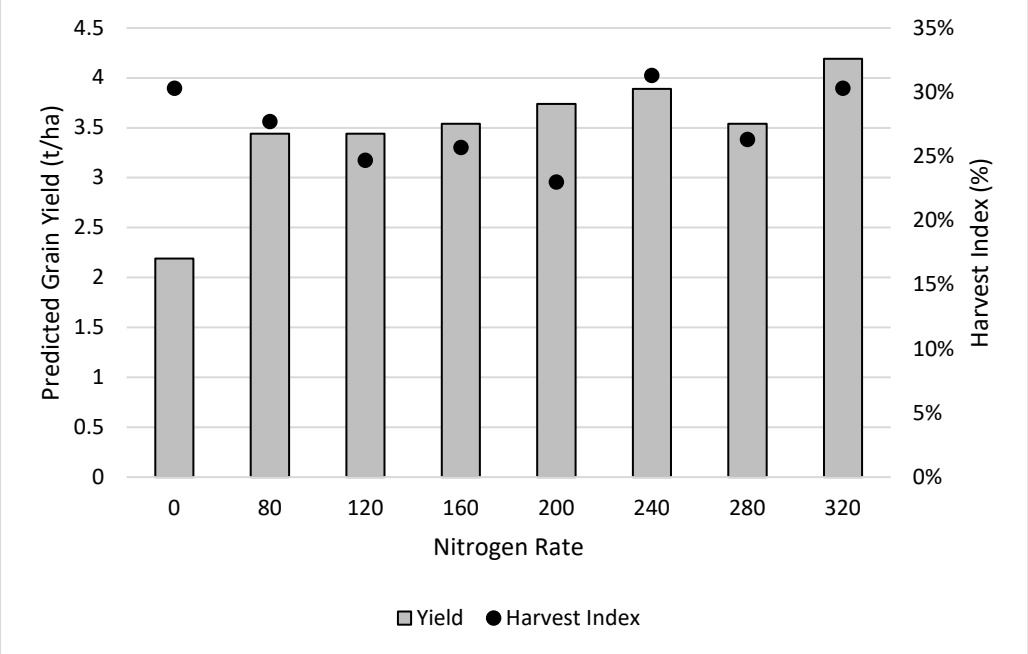

Figure 1. Influence of applied N rate on grain yield (t/ha) and harvest index (%), harvest index n.s.

Released: 27 Sept 2022

The GRDC Optimising Irrigated Grains Project is a collaborative project including the following project partners:

Table 6. Influence of applied nitrogen rate on dry matter and nitrogen removal at 80% flowering.

		Total N	Dry Matter	N removal
		kg N/ha	t/ha	kg/ha
1	0kg N/ha	0	3.68 -	67.1 b
2	40kg N/ha@6L & 40kg N/ha@GB	80	6.31 -	134.5 ab
3	60kg N/ha@6L & 60kg N/ha@GB	120	5.18 -	138.2 ab
4	80kg N/ha@6L & 80kg N/ha@GB	160	5.79 -	144.4 a
5	100kg N/ha@6L & 100kg N/ha@GB	200	5.24 -	141.3 a
6	120kg N/ha@6L & 120kg N/ha@GB	240	5.49 -	206.9 a
7	140kg N/ha@6L & 140kg N/ha@GB	280	5.51 -	168.1 a
8	160kg N/ha@6L & 160kg N/ha@GB	320	6.33 -	206.5 a
	Mean		**5.44**	**150.9**
	LSD		ns	73.4
	P Val		0.075	0.023

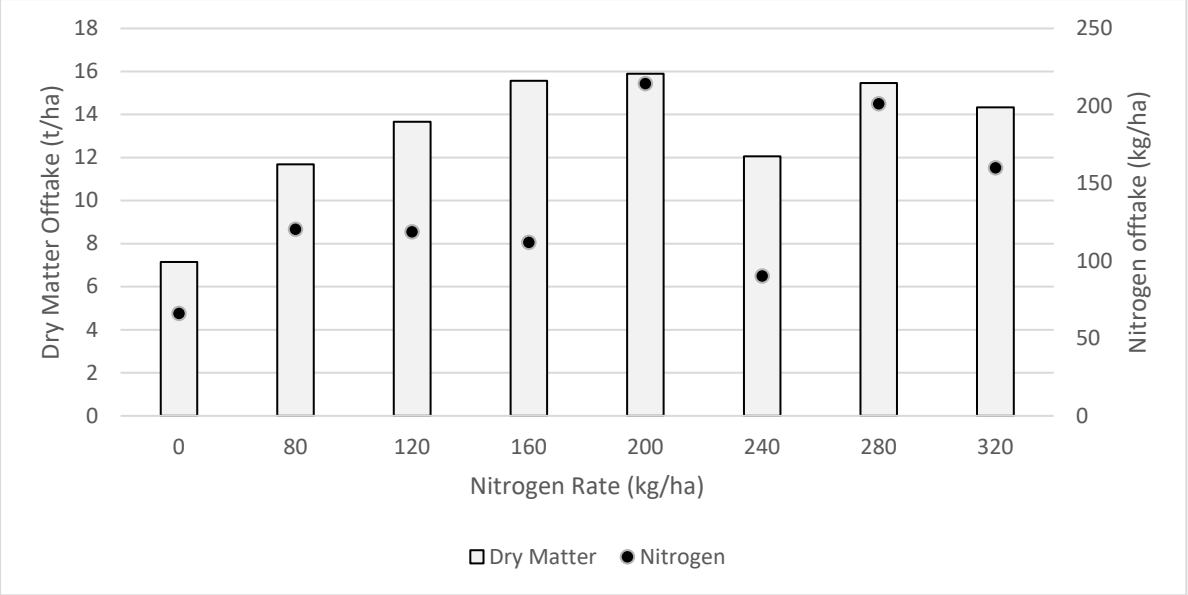

Figure 2. Influence of applied nitrogen rate on dry matter and nitrogen removal at harvest.

SAGI statistical analysis (Predicted values for Yield, Harvest dry matter, test weight and oil content)

The following statistical analysis of key harvest assessments has been carried out by SAGI. This analysis uses spatial statistical analysis to refine predicted values for key assessment values.

The GRDC Optimising Irrigated Grains Project is a collaborative project including the following project partners:

Table 1: Harvest Traits for the Treatments

Treatment	Grain Yield (t/ha)	Test Weight (kg/hL)	Harvest DM (t/ha)	Oil (%)
0	2.19 ± 0.27 - a	62.37 ± 0.25 - a	6.94 ± 1.02 -	42.06 ± 0.49 - bc
80	3.44 ± 0.27 - b	63.41 ± 0.25 - ab	11.03 ± 1.68 -	42.53 ± 0.47 - bc
120	3.44 ± 0.27 - b	63.29 ± 0.25 - ab	12.55 ± 2.22 -	43.18 ± 0.48 - c
160	3.54 ± 0.27 - b	63.54 ± 0.24 - b	14.36 ± 2.14 -	40.89 ± 0.46 - ab
200	3.74 ± 0.27 - b	63.47 ± 0.25 - ab	14.81 ± 2.18 -	41.32 ± 0.48 - abc
240	3.89 ± 0.27 - b	63.76 ± 0.25 - b	12.16 ± 1.88 -	40.69 ± 0.48 - ab
280	3.51 ± 0.27 - b	63.4 ± 0.25 - ab	15.86 ± 2.36 -	39.28 ± 0.47 - a
320	4.19 ± 0.27 - b	64.19 ± 0.25 - b	15.41 ± 2.3 -	40.88 ± 0.47 - abc

Note: values expressed as mean ± standard error of prediction
- no subscripts relevant for this response

A summary of the experiment statistics is below:

Table 2: Key statistics for each response analysed

Statistic	Grain Yield (t/ha)	Test Weight (kg/hL)	Harvest DM (t/ha)	Oil (%)
LSD	0.501	0.728	0.358	1.295
Mean	3.500	63.400	12.500	41.400
Treatment_p-value	0.000	0.004	0.103	0.002
CV	21.011	1.022	33.580	3.784

The GRDC Optimising Irrigated Grains Project is a collaborative project including the following project partners: