Trial 4. Nitrogen Efficiency Trial – Nitrogen Timing Trial

Project Objective: To assess whether the optimum timing for applied N interacts with N rate

Location: Finley IRC
FAR Code: FAR IRR C21-04-1
Sown: 30th April
Cultivar: Nuseed Diamond
Harvested: 4th December
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 (0-90 cm)

Key Messages:

- *Different N timing strategies had no significant effect on yield irrespective of N rate applied (80, 160, 240 kg N/ha)*
- *Applied N fertiliser (based on urea 46% N) significantly increased yield over the unfertilised crop up to the highest rate of 240 kg N/ha.*
- *Dry matter production at 80% flowering significantly increased over the unfertilised crop when N fertiliser was applied at the early timing (Post sow pre-emergence (PSPE)/6 leaf).*
- *Nitrogen removal at 80% flowering was significantly increased compared to the unfertilised crop when N fertiliser was applied at the early timings (PSPE/6leaf), however N removal at the later timing (green bud/yellow bud) was only increased at the highest rate of N fertiliser (240 Kg N/ha).*
- *Oilseed test weight was significantly higher when Nitrogen application was delayed until 6 leaf/green bud (62.8 kg/hl) or green bud/yellow bud (63.0 kg/hl) compared to PSPE/6 leaf application (62.2 kg/hl)*
- *Grain oil content decreased as N application and yield increased.*

Table 7. The influence of N rate and timing strategy on grain yield (t/ha) of canola.

	Grain Yield (t/ha)			
	Application Timing			
Nitrogen Rate	PSPE/6 Leaf	6 Leaf/ Green bud	Green Bud/ Yellow Bud	**Mean**
0kg N/ha	3.33 -	3.00 -	2.87 -	**3.07 c**
80kg N/ha	3.48 -	3.87 -	3.54 -	**3.63 b**
160kg N/ha	3.73 -	3.87 -	3.85 -	**3.81 b**
240kg N/ha	4.16 -	4.30 -	4.30 -	**4.25 a**
Mean	**3.67 -**	**3.76 -**	**3.64 -**	

N Timing	**P val**	0.923	**LSD**	ns
N Rate	**P val**	<0.001	**LSD**	0.30
N Rate x N Timing	**P val**	0.446	**LSD**	ns

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Table 8. The influence of N rate and timing strategy on oilseed test weight (kg/hL) of canola.

	Test Weight (kg/hL)			
	Application Timing			
Nitrogen Rate	PSPE/6 Leaf	6 Leaf/ Green bud	Green Bud/ Yellow Bud	**Mean**
0kg N/ha	62.6 -	61.9 -	62.4 -	**62.3 -**
80kg N/ha	61.9 -	63.0 -	62.9 -	**62.6 -**
160kg N/ha	62.0 -	63.4 -	63.4 -	**62.9 -**
240kg N/ha	62.2 -	62.9 -	63.2 -	**62.8 -**
Mean	**62.2 b**	**62.8 a**	**63 a**	

N Timing	**P val**	0.029	**LSD**	0.56
N Rate	**P val**	0.121	**LSD**	ns
N Rate x N Timing	**P val**	0.081	**LSD**	ns

Table 9. The influence of N rate and timing strategy on grain oil (%) of canola.

	Oil (%)			
	Application Timing			
Nitrogen Rate	PSPE/6 Leaf	6 Leaf/ Green bud	Green Bud/ Yellow Bud	Mean
0kg N/ha	48.0 -	47.7 -	47.7 -	**47.8 a**
80kg N/ha	46.9 -	47.2 -	46.6 -	**46.9 b**
160kg N/ha	45.8 -	46 -	45.3 -	**45.7 c**
240kg N/ha	46.1 -	45.6 -	45.3 -	**45.7 c**
Mean	46.7 -	46.6 -	46.2 -	

N Timing	P val	0.257	LSD	ns
N Rate	P val	<0.001	LSD	0.58
N Rate x N Timing	P val	0.808	LSD	ns

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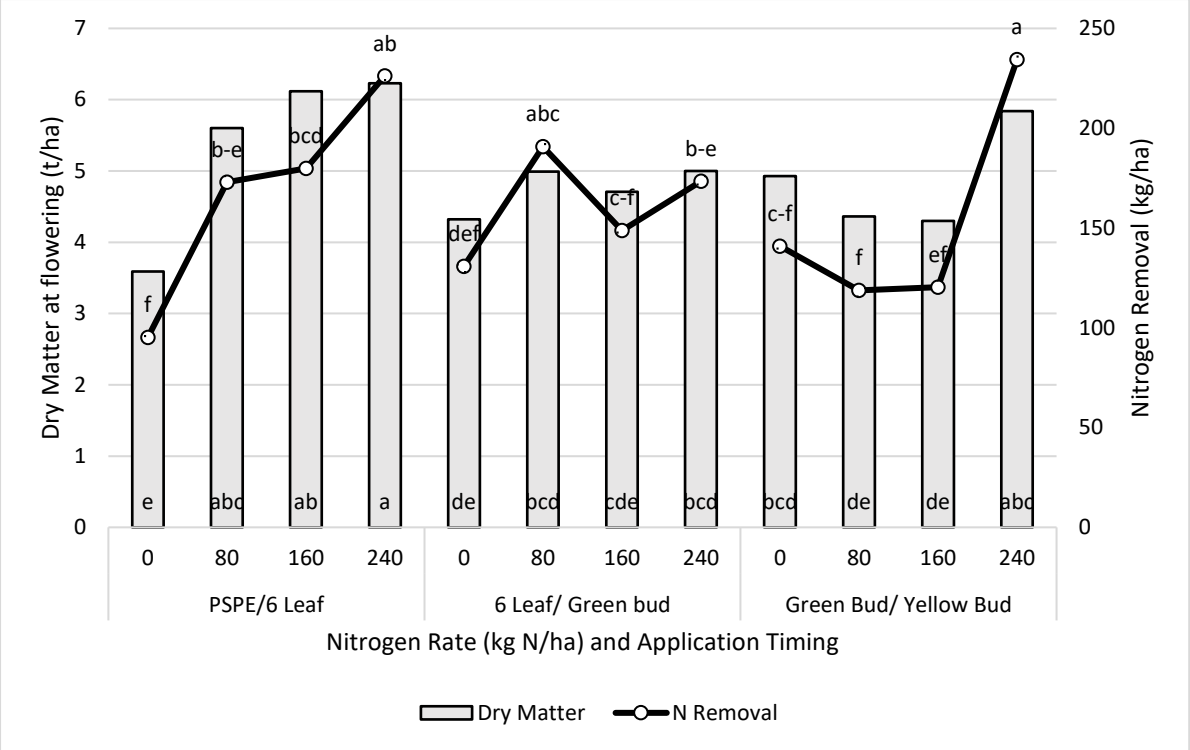

Figure 1. The influence of N rate and timing strategy on dry matter production and nitrogen removal at 80% flowering. Point on the graph with different lettering show statistical difference, dry matter production letters of significance at the bottom of the graph. DM p=0.020, N removal p=0.012.

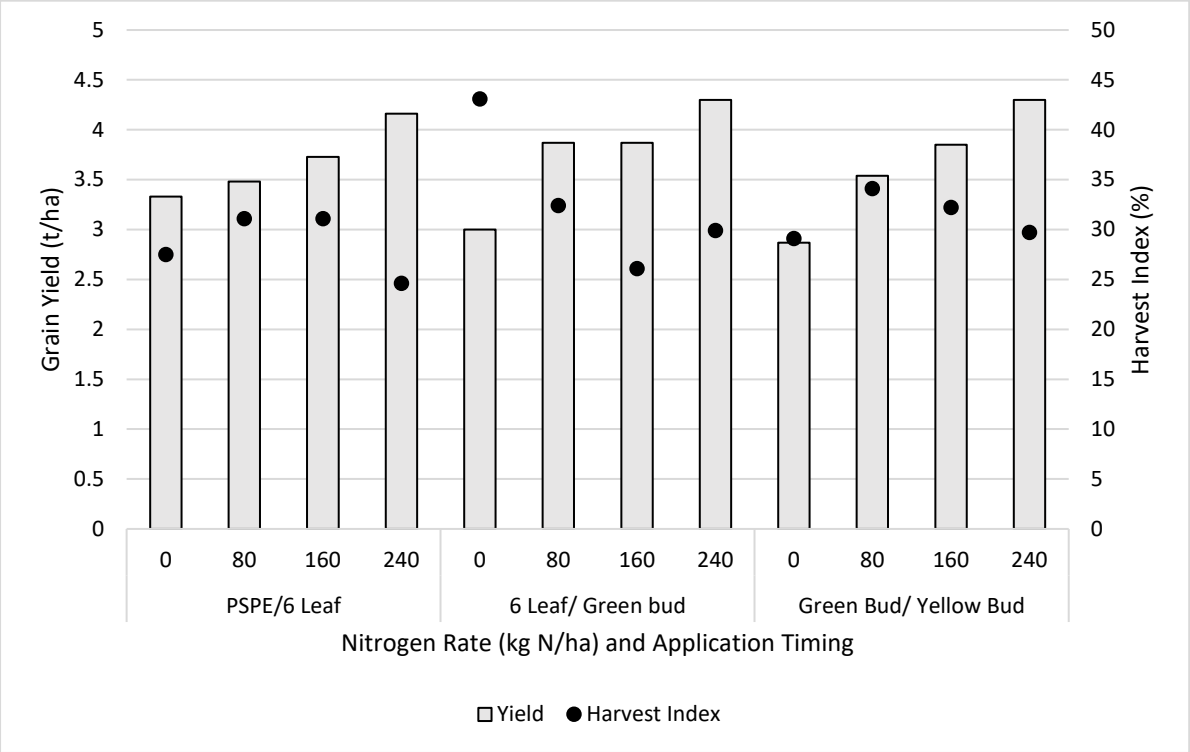

Figure 2. The influence of N rate and timing strategy on grain yield (t/ha) and harvest index (%).

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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.

Table 1: Harvest Traits for the Treatments

NTiming	NRate	Grain Yield (t/ha)	Test Weight (kg/hL)	Harvest DM (t/ha)	Oil (%)
6LeafGbud	0	3.01 ± 0.29 -	61.94 ± 0.32 -	9.51 ± 1.88 -	42.54 ± 0.55 -
GbudYbud	0	2.87 ± 0.29 -	62.41 ± 0.32 -	9.31 ± 1.88 -	42.81 ± 0.55 -
PSPE	0	3.28 ± 0.28 -	62.6 ± 0.32 -	12.11 ± 1.87 -	43.04 ± 0.55 -
6LeafGbud	80	3.78 ± 0.28 -	62.97 ± 0.32 -	9.49 ± 1.86 -	42.06 ± 0.55 -
GbudYbud	80	3.52 ± 0.3 -	63.02 ± 0.32 -	9.38 ± 1.89 -	41.2 ± 0.55 -
PSPE	80	3.49 ± 0.29 -	61.87 ± 0.32 -	14.11 ± 1.87 -	41.47 ± 0.55 -
6LeafGbud	160	3.87 ± 0.28 -	63.31 ± 0.32 -	13.02 ± 1.87 -	40.27 ± 0.55 -
GbudYbud	160	4.01 ± 0.29 -	63.22 ± 0.32 -	14.72 ± 1.88 -	39.16 ± 0.55 -
PSPE	160	3.74 ± 0.29 -	62.06 ± 0.32 -	13.27 ± 1.88 -	40.01 ± 0.55 -
6LeafGbud	240	4.17 ± 0.28 -	62.94 ± 0.32 -	12.43 ± 1.87 -	39.65 ± 0.55 -
GbudYbud	240	4.26 ± 0.28 -	63.21 ± 0.32 -	13.68 ± 1.86 -	39.32 ± 0.55 -
PSPE	240	4.23 ± 0.28 -	62.24 ± 0.32 -	11.92 ± 1.87 -	40.39 ± 0.55 -

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	0.600	0.900	5.000	1.500
Mean	3.700	62.700	11.900	41.000
NTiming_p-value	0.993	0.040	0.286	0.299
NRate_p-value	0.000	0.175	0.110	0.000
Interaction_p-value	0.379	0.074	0.502	0.759
CV	18.450	1.235	32.358	4.032

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