

Coonawarra SA

Irrigated trials conducted at the Coonawarra irrigated research centre 2021 were managed by SARDI

Trial 1. Nitrogen Use Efficiency Trial – Nitrogen Timing Trial

Protocol Objective:

To evaluate nitrogen use efficiency in winter barley under different rates and timings of applied N fertiliser applied as urea (46% N) grown on surface irrigation.

Location: Coonawarra, SA

FAR Code: FAR IRR B21-04-2

Sown: 18th October 2021

Cultivar: RGT Planet

Harvested: 1st February 2022

Rotation position: Forage Rape (2021), Barley (2020), Ryegrass Pasture (2019)

Soil Management: Fallowed for 2 weeks prior to sowing

Irrigation: Centre Pivot, 3.5 ML/ha

GSR: October- January 96 mm, Total available water 446 mm

Key Points:

- *Barley yields cv RGT Planet of over 6t/ha were achieved in 106 days from sowing to harvest with no applied nitrogen.*
- *Yield was maximised with no addition of nitrogen fertiliser.*
- *At the highest rate of 240 kg N/ha, there was a significant reduction in yield (6.03t/ha) compared to where no nitrogen was applied (6.24 t/ha).*
- *There was no difference in grain yield when nitrogen application timing was varied.*
- *Grain protein increased as higher rates of N were applied up to 160 kg N/ha. Between 160 and 240 kg N/ha, there was no difference in grain protein.*
- *The grain protein was too high to achieve malt quality in all application timings and rates of nitrogen in this trial.*

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Table 1. Influence of different N application timings (50:50 splits) and N rates on grain yield (t/ha).

	Nitrogen Application Rate			
	Sowing & GS23	GS23 & GS30	GS30 & GS33	Mean
	Yield t/ha	Yield t/ha	Yield t/ha	Yield t/ha
0kg N/ha	6.23 -	6.30 -	6.21 -	6.24 a
80kg N/ha	6.22 -	6.34 -	6.16 -	6.24 ab
160kg N/ha	6.28 -	6.52 -	6.50 -	6.43 a
240kg N/ha	5.95 -	6.02 -	6.13 -	6.03 b
Mean	6.17 -	6.29 -	6.25 -	
N Timing	LSD P=0.05	ns	P val	0.474
N Rate	LSD P=0.05	0.21	P val	0.006
N Timing x N Rate	LSD P=0.05	ns	P val	0.843

Table 2. Protein (%) of nitrogen application rates split equally at three different application timings.

	Nitrogen Application Rate			
	Sowing & GS23	GS23 & GS30	GS30 & GS33	Mean
	Protein %	Protein %	Protein %	Protein %
0kg N/ha	13.4 -	13.3 -	13.3 -	13.4 c
80kg N/ha	13.7 -	13.7 -	13.9 -	13.8 b
160kg N/ha	14.1 -	14.0 -	14.2 -	14.1 a
240kg N/ha	14.0 -	14.3 -	14.2 -	14.2 a
Mean	13.8 -	13.8 -	13.9 -	
N Timing	LSD P=0.05	ns	P val	0.207
N Rate	LSD P=0.05	0.17	P val	<0.001
N Timing x N Rate	LSD P=0.05	ns	P val	0.356

Protein levels in this trial were all too high (>12%) to meet Malt spec, as a result all treatments went BAR1 grade.

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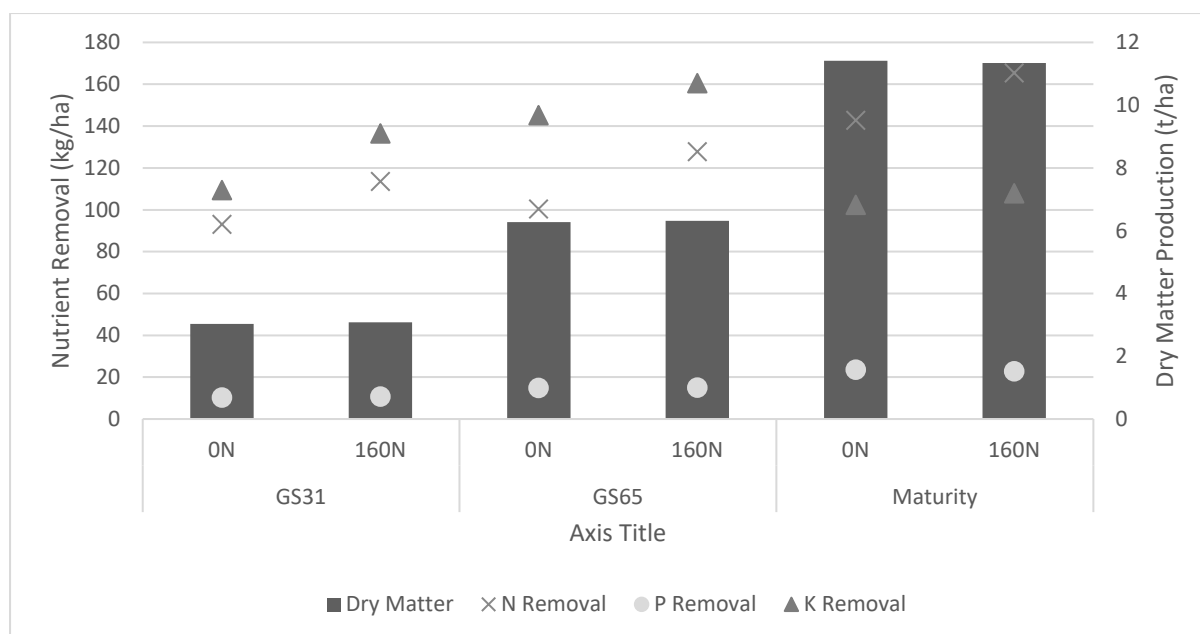


Figure 1. The influence of nitrogen rate on dry matter production (t/ha) and nutrient (N, P, and K) removal (kg/ha) at different crop development stages (stem elongation, mid flowering and maturity).

Table 3. Nutrient removal (kg/ha) of final dry matter cuts at harvest.

	Nutrient Removal		
	Nitrogen	Phosphorus	Potassium
	Kg/ha	Kg/ha	Kg/ha
0kg N/ha	142.81 b	23.65 a	102.41 b
80kg N/ha	156.09 a	24.19 a	105.09 b
160kg N/ha	165.38 a	22.77 a	107.83 b
240kg N/ha	160.11 a	20.00 b	129.65 a
Mean	156.10	22.65	11.25
P val	0.008	<0.001	<0.001
LSD	12.68	1.85	13.34

SAGI statistical analysis (Predicted values for Yield, Harvest dry matter, test weight, retentions, screenings and grain protein) 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.

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Table 1: Harvest Traits for the Treatments

NTiming	NRate	Grain Yield (t/ha)	Test Weight (kg/hL)	Harvest DM (t/ha)	Protein (%)	Retention (%)	Screenings (%)	TSW (g)
GS00GS23	0	6.24 ± 0.17 -	66.46 ± 0.2 -	11.71 ± 0.44 -	13.4 ± 0.09 -	95.61 ± 0.61 -	0.45 ± 0.04 -	54.73 ± 0.54 -
GS23GS30	0	6.4 ± 0.18 -	66.38 ± 0.22 -	11.54 ± 0.45 -	13.32 ± 0.09 -	94.81 ± 0.61 -	0.59 ± 0.05 -	53.83 ± 0.55 -
GS30GS33	0	6.16 ± 0.17 -	66.79 ± 0.21 -	11.23 ± 0.44 -	13.33 ± 0.09 -	95.87 ± 0.61 -	0.38 ± 0.03 -	55.02 ± 0.54 -
GS00GS23	80	6.25 ± 0.17 -	65.98 ± 0.2 -	11.12 ± 0.44 -	13.68 ± 0.09 -	94.59 ± 0.61 -	0.55 ± 0.05 -	52.59 ± 0.54 -
GS23GS30	80	6.35 ± 0.17 -	65.91 ± 0.22 -	11.96 ± 0.45 -	13.68 ± 0.09 -	94.34 ± 0.61 -	0.59 ± 0.05 -	52.97 ± 0.54 -
GS30GS33	80	6.12 ± 0.17 -	66.3 ± 0.2 -	11.84 ± 0.44 -	13.9 ± 0.09 -	94.73 ± 0.61 -	0.6 ± 0.05 -	52.91 ± 0.54 -
GS00GS23	160	6.26 ± 0.17 -	66.02 ± 0.2 -	10.74 ± 0.45 -	14.13 ± 0.09 -	94.09 ± 0.61 -	0.84 ± 0.07 -	52.79 ± 0.54 -
GS23GS30	160	6.49 ± 0.17 -	65.93 ± 0.21 -	11.26 ± 0.45 -	13.97 ± 0.09 -	93.54 ± 0.61 -	0.73 ± 0.06 -	52.32 ± 0.54 -
GS30GS33	160	6.48 ± 0.17 -	66.55 ± 0.2 -	11.78 ± 0.44 -	14.15 ± 0.09 -	94.86 ± 0.61 -	0.55 ± 0.05 -	52.56 ± 0.54 -
GS00GS23	240	5.9 ± 0.17 -	65.7 ± 0.2 -	11.47 ± 0.44 -	14 ± 0.09 -	92.97 ± 0.61 -	0.73 ± 0.06 -	51.12 ± 0.54 -
GS23GS30	240	6.02 ± 0.18 -	65.31 ± 0.22 -	11.82 ± 0.45 -	14.25 ± 0.09 -	92.07 ± 0.61 -	0.72 ± 0.06 -	51 ± 0.54 -
GS30GS33	240	6.1 ± 0.17 -	65.77 ± 0.2 -	11.09 ± 0.44 -	14.2 ± 0.09 -	95 ± 0.61 -	0.53 ± 0.05 -	52.41 ± 0.54 -

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)	Protein (%)	Retention (%)	Screenings (%)	TSW (g)
LSD	0.300	0.500	1.200	0.300	1.700	0.200	1.500
Mean	6.200	66.100	11.500	13.800	94.400	0.600	52.900
NTiming_p-value	0.298	0.072	0.314	0.317	0.039	0.451	0.323
NRate_p-value	0.001	0.000	0.833	0.000	0.002	0.129	0.000
Interaction_p-value	0.560	0.825	0.462	0.281	0.401	0.825	0.584
CV	5.712	0.867	7.643	2.675	1.656	43.930	2.944

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