

Table 1: Harvest Traits for the Treatments

Treatment	Grain Yield (t/ha)	Test Weight (kg/hL)	Harvest DM (t/ha)	Protein (%)	Retention (%)	Screening (%)
Treatment1	8.75 ± 0.24 - a	65.91 ± 0.31 -	14.77 ± 0.93 - a	9.84 ± 0.22 - a	98.07 ± 0.12 - b	0.68 ± 0.05 -
Treatment2	9.64 ± 0.24 - b	66.76 ± 0.3 -	17.6 ± 0.93 - ab	10.93 ± 0.22 - b	96.74 ± 0.43 - ab	0.81 ± 0.09 -
Treatment3	9.59 ± 0.24 - b	67.11 ± 0.32 -	17.27 ± 0.93 - ab	11.59 ± 0.22 - bc	97.51 ± 0.18 - ab	0.69 ± 0.03 -
Treatment4	10.12 ± 0.24 - b	66.53 ± 0.3 -	18.82 ± 0.93 - ab	11.88 ± 0.22 - bc	96.41 ± 0.61 - ab	0.85 ± 0.1 -
Treatment5	9.53 ± 0.24 - b	66.51 ± 0.29 -	16.93 ± 0.93 - ab	12.38 ± 0.22 - c	97.3 ± 0.2 - ab	0.77 ± 0.07 -
Treatment6	10.04 ± 0.25 - b	65.98 ± 0.33 -	16.82 ± 0.93 - ab	12.09 ± 0.22 - c	95.51 ± 0.85 - ab	0.97 ± 0.13 -
Treatment7	9.71 ± 0.24 - b	66.44 ± 0.29 -	18.27 ± 0.93 - ab	12.32 ± 0.22 - c	96.13 ± 0.44 - ab	0.97 ± 0.16 -
Treatment8	9.95 ± 0.25 - b	66.16 ± 0.29 -	20.77 ± 0.93 - b	12.58 ± 0.22 - c	95.83 ± 0.39 - a	0.86 ± 0.08 -

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 (%)	Screening (%)
LSD	0.464	0.672	2.563	0.631	1.223	0.272
Mean	9.700	66.400	17.700	11.700	96.700	0.800
Treatment_p-value	0.001	0.063	0.009	0.000	0.029	0.408
CV	6.705	0.953	13.175	8.372	1.250	24.272

Trial 2. Nitrogen Use Efficiency Trial – Nitrogen Timing Trial

Protocol Objective:

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

Location: Finley IRC

FAR Code: FAR B21-04-1

Sown: 12th May 2021

Cultivar: RGT Planet

Harvested: 4th December 2021

Rotation position: Canola (2020), Wheat (2019), Faba Beans (2018)

Soil Management: Cultivated with speed disc in Autumn

Irrigation: Surface irrigation, 2 applications totalling 224mm

GSR: April-October 192mm. Total water available 416mm.

Available Soil N: 146 kg/ha N (0-90cm)

Key Points:

- There was no interaction between nitrogen rates and nitrogen timing in this trial.
- With moderately high soil fertility following canola (146 kg N/ha available mineral N (0-90cm)) there was no significant difference in grain yield at N rates between 80 – 240kg N/ha (identical result to Trial 1).
- Delaying nitrogen application to GS32 (second node) and GS37 (flag leaf visible) gave a significantly higher yield (9.95 t/ha) than applying nitrogen at sowing and GS30 application (9.37 t/ha)

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- Delaying the nitrogen applications to the development window GS32-GS37 increased protein slightly and although the effect was not statistically significant the risk of not achieving malt quality is increased at higher N levels.
- Grain protein increased as higher rates of N were applied, at 160 - 240 kg N/ha, protein was above the maximum 12% required to achieve malt quality irrespective of N timing.
- There was no significant differences in test weight (data not shown), although it was a factor in some treatments not achieving a malt quality grade.
- N uptake in the crop at harvest indicated that over 200kg N/ha had been taken up in the crop.

50:50 splits of different N application rates were tested for the effects on barley yield and quality. The three timing treatments progressively moved N application from sowing to later in crop development timings. The effect on yield and grain protein is evident in Table 1 and 2.

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

	Nitrogen Application Rate				
	0kg N/ha	80kg N/ha	160kg N/ha	240kg N/ha	Mean
	Yield t/ha	Yield t/ha	Yield t/ha	Yield t/ha	Yield t/ha
Sowing & GS30	9.35 -	9.42 -	9.49 -	9.22 -	9.37 b
GS30 & GS32	9.16 -	9.73 -	10.06 -	9.75 -	9.68 ab
GS32 & GS37	9.57 -	10.19 -	10.08 -	9.98 -	9.95 a
Mean	9.36 b	9.78 a	9.88 a	9.65 ab	
N Timing	LSD P=0.05	0.34		P val	0.017
N Rate	LSD P=0.05	0.33		P val	0.021
N Timing x N	LSD P=0.05	ns		P val	0.459

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

	Nitrogen Application Rate				
	0kg N/ha	80kg N/ha	160kg N/ha	240kg N/ha	Mean
	Protein %	Protein %	Protein %	Protein %	Protein %
Sowing & GS30	11.5 -	12.4 -	12.5 -	12.8 -	12.3 -
GS30 & GS32	10.9 -	11.8 -	12.2 -	12.5 -	11.8 -
GS32 & GS37	11.5 -	12.0 -	13.0 -	13.7 -	12.6 -
Mean	11.3 d	12.1 c	12.6 b	13.0 a	
N Timing	LSD P=0.05	ns		P val	0.063
N Rate	LSD P=0.05	0.3		P val	<0.001
N Timing x N	LSD P=0.05	ns		P val	0.080

Mean Protein figures followed by different letters are considered to be statistically different ($p=0.05$)

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Table 3. Influence of nitrogen application rates and timing on quality specification. Note that quality was reduced by test weight.

	Nitrogen Application Rate				Mean
	0kg N/ha	80kg N/ha	160kg N/ha	240kg N/ha	
	Grade	Grade	Grade	Grade	Grade
Sowing & GS30	PL1	BAR1	BAR1	BAR1	BAR1
GS30 & GS32	PL1	BAR1*	BAR1*	BAR1	PL1
GS32 & GS37	PL1	BAR1	BAR1	BAR1*	BAR1
Mean	PL1	BAR1	BAR1	BAR1	

Bin grade calculated on the following grain specifications:

PL1 (malt): Protein min=9, max=12, Test weight min=65, Retention min=70, Screening max=7

BAR1: Protein min=no limit, max= no limit, Test weight min= 62.5, Retention min= no limit, Screening max=15

*Treatments had test weight below the minimum for malt quality of 65 kg/hl

Table 4. Influence of nitrogen application rates on dry matter production (t/ha) and Nitrogen uptake at stem elongation (GS31) and N removal at crop maturity (Harvest) kg N/ha.

Treatment		GS31				Harvest			
N Timing	N Rate	DM	N Uptake		DM	N Removal			
		t/ha	Kg N/ha		t/ha	Kg N/ha			
Sowing & GS30	0kg N/ha	2.29	-	99.5	b	18.9	-	230.8	-
Sowing & GS30	80kg N/ha	.				19.2	-	285.3	-
Sowing & GS30	160kg N/ha	2.54	-	134.8	a	18.3	-	292.8	-
Sowing & GS30	240kg N/ha	.		.		20.2	-	278.3	-
Mean		2.42		117.2		19.2		271.8	
LSD P=0.05		0.60		30.7		2.3		46.4	
P Val		0.287		0.035		0.379		0.055	

Figures followed by different letters are considered to be statistically different ($p=0.05$)

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)	Protein (%)	Retention (%)	Screenings (%)
GS00GS23	0	9.35 ± 0.2 -	65.05 ± 0.42 -	11.52 ± 0.28 -	97.08 ± 0.63 -	0.86 ± 0.11 -
GS23GS30	0	9.16 ± 0.2 -	65.4 ± 0.42 -	10.9 ± 0.28 -	97.77 ± 0.63 -	0.62 ± 0.11 -
GS30GS33	0	9.57 ± 0.2 -	65.1 ± 0.42 -	11.48 ± 0.28 -	96.9 ± 0.63 -	0.75 ± 0.11 -
GS00GS23	80	9.42 ± 0.2 -	65.66 ± 0.42 -	12.37 ± 0.28 -	96.3 ± 0.63 -	0.77 ± 0.11 -
GS23GS30	80	9.73 ± 0.2 -	65.01 ± 0.42 -	11.8 ± 0.28 -	96.43 ± 0.63 -	0.95 ± 0.11 -
GS30GS33	80	10.19 ± 0.2 -	65.8 ± 0.42 -	12.03 ± 0.28 -	96.46 ± 0.63 -	0.76 ± 0.11 -
GS00GS23	160	9.49 ± 0.23 -	65.13 ± 0.48 -	12.48 ± 0.31 -	96.65 ± 0.69 -	0.8 ± 0.12 -
GS23GS30	160	10.06 ± 0.2 -	64.77 ± 0.42 -	12.15 ± 0.28 -	95.79 ± 0.63 -	1.07 ± 0.11 -
GS30GS33	160	10.08 ± 0.2 -	65.3 ± 0.42 -	13.03 ± 0.28 -	95.14 ± 0.63 -	0.94 ± 0.11 -
GS00GS23	240	9.23 ± 0.23 -	65.15 ± 0.48 -	12.97 ± 0.31 -	95.85 ± 0.69 -	0.8 ± 0.12 -
GS23GS30	240	9.75 ± 0.2 -	65.19 ± 0.42 -	12.5 ± 0.28 -	95.54 ± 0.63 -	1.06 ± 0.11 -
GS30GS33	240	9.98 ± 0.2 -	64.77 ± 0.42 -	13.72 ± 0.28 -	94.68 ± 0.63 -	1.06 ± 0.11 -

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)	Protein (%)	Retention (%)	Screenings (%)
LSD	0.600	1.200	0.700	1.400	0.300
Mean	9.700	65.200	12.200	96.200	0.900
NTiming_p-value	0.012	0.876	0.088	0.173	0.266
NRate_p-value	0.020	0.391	0.000	0.000	0.012
Interaction_p-value	0.475	0.640	0.105	0.530	0.095
CV	4.968	1.238	7.327	1.433	27.797

Trial 3. Lodging Control in Irrigated Crops – Winter and Spring Barley

Protocol Objective:

To compare and contrast plant growth regulation strategies in winter and spring barley germplasm.

Location: Finley IRC

FAR Code: FAR B21-09-1

Sown: 29th April 2021

Cultivar: RGT Planet & Cassiopee

Harvested: 4th December 2021

Rotation position: Canola (2020), Wheat (2019), Faba Beans (2018)

Soil Management: Cultivated with speed disc in Autumn

Irrigation: Surface irrigation, 2 applications totalling 224mm

GSR: April-October 192mm. Total water available 416mm.

Key Points:

- Under overhead irrigation in a relatively fertile rotation position (first barley after canola) the spring barley RGT Planet significantly out yielded the winter cultivar Cassiopee (10.07 vs. 8.98t/ha).
- Applying Moddus Evo at 400 ml/ha either as a single application (GS31) or split (GS31 & GS33) led to a significant increase in grain yield (9.87 – 9.92 t/ha) compared to the grazed or untreated plots (8.97 & 9.35 t/ha), averaged across both varieties.
- There was no interaction between variety and PGR application or grazing on plant height, lodging or yield indicating that both the spring and winter cultivar responded similarly.
- Cassiopee grew taller and was subject to significantly more lodging than RGT Planet.

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