

Nitrogen Trial

2018

Trial Overview

Best management practices that optimise N fertiliser use efficiency under relative high and low yielding potentials is still an area of great debate. On many occasions if the season warrants, top up applications of N provides a further yield benefit compared to basal applications. The most appropriate timing of N application post emergence can vary with the climatic year and yield potentials as well as the product of N used. Within the literature there is a lack of N product comparisons in terms of efficiencies in increasing grain yields. Hi-Tech Ag have two N Products in BLU N and Carbon NS (USC) which has the potential to be an efficient source of N applied in-season.

This trial design and assessments allowed for the determination of the effectiveness of BLU N and Carbon NS as a post emergent application of N compared to standard commercial products of Urea and UAN. Three application rates over at least one timing, season permitting (GS30) will determine optimal N rates.

Nitrogen Application

All trials were designed by Agronomy Solutions which allowed for maximum statistical power in the analysis. Trials were randomised in a complete block design. The SEARS group were responsible for sowing, general maintenance and harvesting the trials at Esperance. The trial had a basal application of 50 kg/ha of DAP, = 11 kg P/ha and 9 kg N/ha. N treatments were applied at GS30.

There were 4 Replicates of each treatment.

The same trial was undertaken at other sites. Seasonal conditions did not enable us to achieve any statistically significant data to report.

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Key Points

- Increased yield benefits of Carbon NS
- Increased Nitrogen uptake efficiency with BLU N and Carbon NS
- Carbon NS at the highest rate of Nitrogen gave a 14% Return on Investment.
- At 30 N Kg/Ha Carbon NS gave 0.5 T/Ha or 13% or \$162/ Ha increase in yield and return

Esperance (WA)		
Treatment Number	Treatment ID	N rate (kg/ha)
1	Control no N	0
2	BLU N 40	10
3	BLU N 80	20
4	BLU N 120	30
5	BLU N @ 250	65
6	Urea 23	10
7	Urea 45	20
8	Urea 68	30
9	Urea @ 141	65
10	UAN 25	10
11	UAN 50	20
12	UAN 74	30
13	UAN @ 155	65
14	Carbon NS 33	10
15	Carbon NS 67	20
16	Carbon NS 100	30
17	Carbon NS @ 217	65

Table 1: Treatment groups and N rate (kg/ha)

Nitrogen Trial

Results

Yield

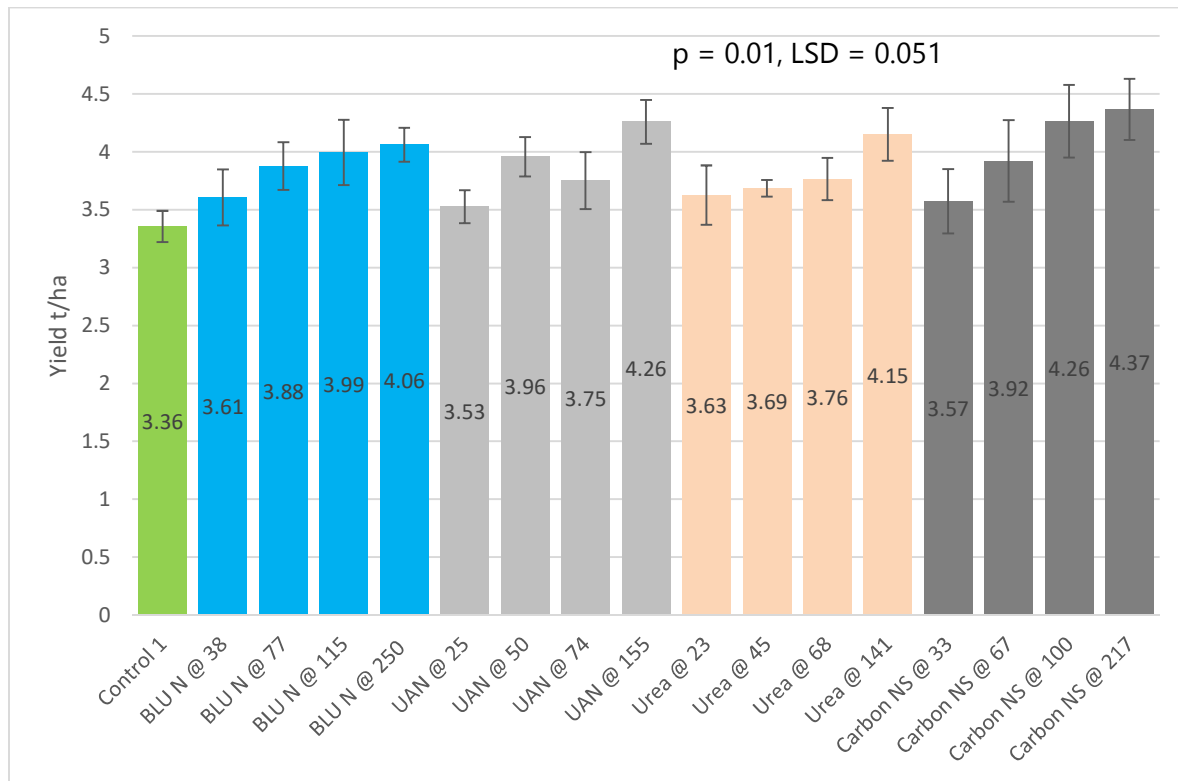


Figure 1: Grain yield results for the Esperance site

Significant increases in grain yield (t/ha) to N applications occurred at Esperance and there were no consistent differences between N treatments at each N rate. The only noticeable difference was that Carbon NS out performed Urea and UAN when applied at 30 kg N/ha. Relative yields (control (0N)/maximum yield*100) was highest with urea, UAN, Carbon NS due to the linear nature of the response curves which resulted in higher optimal N rates (>60 kg N/ha) compared to BLU N products (41-47 kg N/ha).



Protein

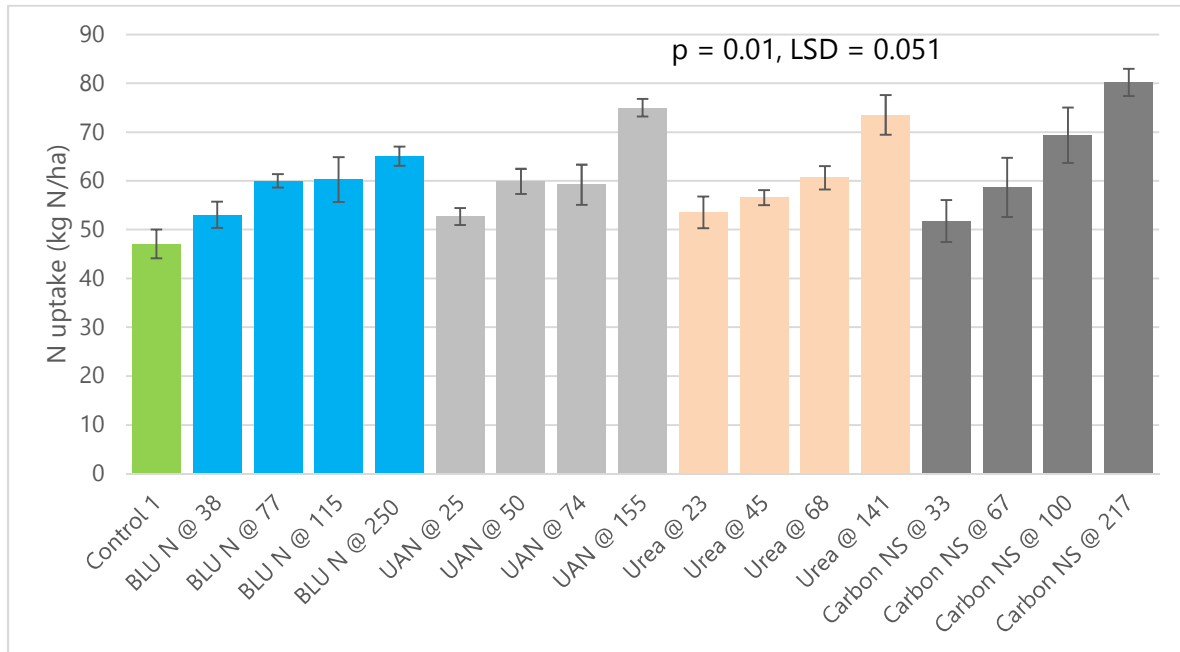


Figure 2: Grain Protein results for the Esperance site

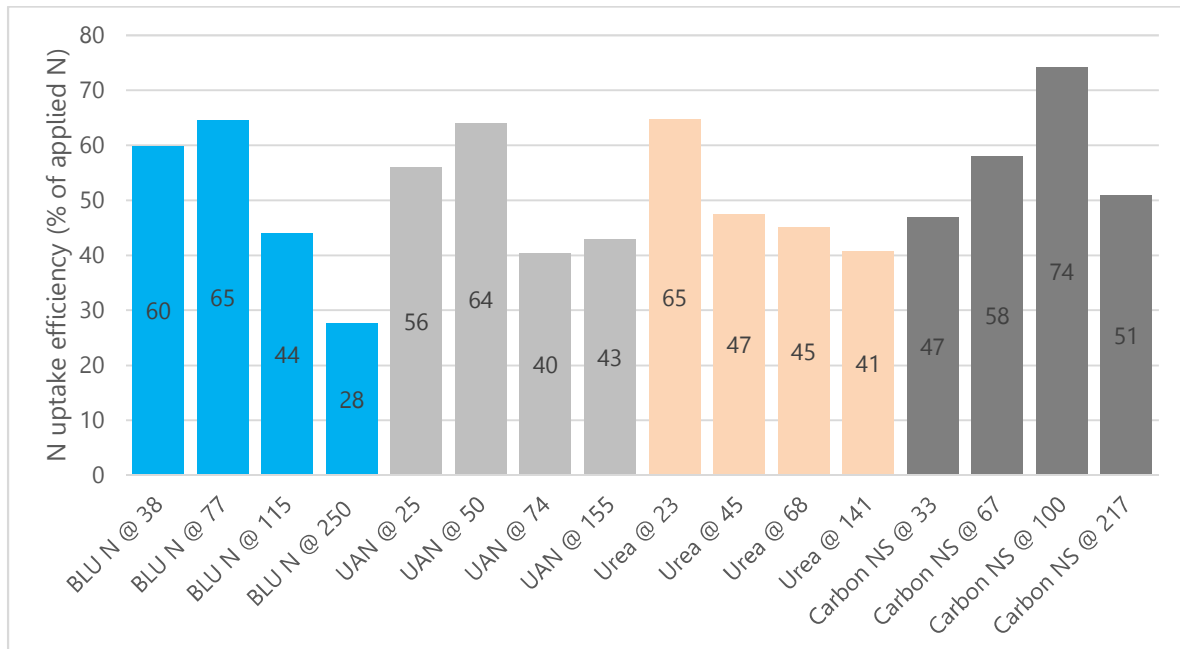


Figure 3: Nitrogen Use Efficiency for each treatment calculated by subtracting the soil supply as measured by the control off the applied N treatments as a % of the overall N applied.

Cost Analysis

	GS30 Application	Kg/ha N	Product N (%)	Kg/ha Product	Unit	\$/t	\$/L	\$/ Kg N	Cost (\$/ha)	Grain Yield (t/ha)	Grain Price (ASW1) \$/t	Gross Margin (\$/ha)	Top 5
1	Control no N	0	0	0	0	0	0	\$ -	\$ -	3.36	355	\$ 1,192.80	
2	BLU N @ 40 L	10	26	38	L/ha		\$0.56	\$ 2.15	\$ 21.54	3.61	355	\$ 1,260.01	
3	BLU N @ 80 L	20	26	77	L/ha		\$0.56	\$ 2.15	\$ 43.08	3.88	355	\$ 1,334.32	
4	BLU N @ 120 L	30	26	115	L/ha		\$0.56	\$ 2.15	\$ 64.62	3.99	355	\$ 1,351.83	
5	BLU N @ 250 L	65	26	250	L/ha		\$0.56	\$ 2.15	\$ 140.00	4.06	355	\$ 1,301.30	
6	Urea @ 23 Kg	10	46	22	kg/ha	\$450		\$ 0.98	\$ 9.78	3.63	355	\$ 1,278.87	
7	Urea @ 45 Kg	20	46	43	kg/ha	\$450		\$ 0.98	\$ 19.57	3.69	355	\$ 1,290.38	
8	Urea @ 68 Kg	30	46	65	kg/ha	\$450		\$ 0.98	\$ 29.35	3.76	355	\$ 1,305.45	
9	Urea @ 141 kg	65	46	141	kg/ha	\$450		\$ 0.98	\$ 63.59	4.15	355	\$ 1,409.66	4
10	UAN @ 25 L	10	42	24	L/ha		\$0.6	\$ 2.31	\$ 23.08	3.53	355	\$ 1,230.07	
11	UAN @ 50 L	20	42	48	L/ha		\$0.6	\$ 2.31	\$ 46.15	3.96	355	\$ 1,359.65	
12	UAN @ 74 L	30	42	71	L/ha		\$0.6	\$ 2.31	\$ 69.23	3.75	355	\$ 1,262.02	
13	UAN @ 155 L	65	42	155	L/ha		\$0.6	\$ 1.43	\$ 92.86	4.26	355	\$ 1,419.44	3
14	Carbon NS @ 33kg	10	30	33	kg/ha	\$450		\$ 1.50	\$ 15.00	3.57	355	\$ 1,252.35	
15	Carbon NS @ 67kg	20	30	67	kg/ha	\$450		\$ 1.50	\$ 30.00	3.92	355	\$ 1,361.60	5
16	Carbon NS @ 100kg	30	30	100	kg/ha	\$450		\$ 1.50	\$ 45.00	4.26	355	\$ 1,467.30	1
17	Carbon NS @ 217 kg	65	30	217	kg/ha	\$450		\$ 1.50	\$ 97.50	4.37	355	\$ 1,453.85	2

Table 2: Shows the cost analysis of the nitrogen trial

Discussion

Esperance

After a late start the season finished off well and resulted in yields pushing 4.4 t/ha. Throughout the season there was responses to N applications which translated to grain responses thanks to a soft season finish. Significant increases in grain yield (t/ha) to N applications occurred at Esperance and there were no consistent differences between N treatments at each N rate. The only noticeable difference was that Carbon NS out performed Urea and UAN when applied at 30 kg N/ha. Relative yields (control (0N)/maximum yield*100) was highest with urea, UAN and Carbon NS due to the linear nature of the response curves which resulted in higher optimal N rates (>60 kg N/ha) compared to BLU N products (41-47 kg N/ha). With the grain quality data determination of N uptake in the grain showed that the Carbon NS product was quite efficient in terms of delivering N to the wheat crop. Calculating Nitrogen Use Efficiency (NUE) showed efficiencies were quite high with the highest result of 74% using Carbon NS at 30 kg N/ha. Efficiencies for higher application rates decreased. The highest gross margin return was for the Carbon NS product applied at 65 kg N/ha.

Note: All trials were conducted by independent contractors and data was collated and statistically reviewed by Agronomy Solutions

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