3.4.2 Different sowing and topdressing nitrogen options in wheat - Lake Bolac, Vic

Location: Lake Bolac Research Site.

Funding:
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Background/Aim:
Evaluate Nitrogen Efficiencies of various nitrogenous fertilisers on wheat

Summary of findings:
- Despite apparently adequate levels of nitrogen in the soil profile, a signficant yield response was still recorded where sulphur was supplied along with nitrogen protected by a nitrification inhibitor – Entec Granam
- Marginal S levels may have become deficient during the course of the trial due to leaching of sulfur

Trial information:
The trial initiated on the 21st of June 2010. The soil analysis results from the site are presented in Table 1. The plots were sown with wheat (*cv. Beaufort)* at 60kg/Ha and various sowing starter and top dress fertilisers as indicated in Table 2.

The fertiliser treatments were determined using two different rates, either 20 or 40 kg/Ha of applied Nitrogen. A basal application of TSP was applied at 20.7kg P/ha to ensure that P was not limiting.

Table 1: Initial Soil test results summary

Soil Test Analyte	Result
Sample Depth To	0-10cm
Annual Rainfall	mm
pH (1:5 Water)	5.5
pH (1:5 CaCl2)	5.0
Elec. Cond. (Sat. Ext.) dS/m	0.24
Chloride (mg/kg)	46
Nitrate Nitrogen (NO3) mg/kg	99
Ammonium Nitrogen (KCl) mg/kg	1.4
Phosphorus (Colwell)	45
Phosphorus Buffer Index (PBI-Col)	59
Available Potassium (mg/kg)	160
Calcium (Amm-acet.) Meq/100g	5
Calcium/Magnesium Ratio	8.5
Cation Exch. Cap. Meq/100g	6.28
Sodium % of Cations (ESP) mg/kg	3
Aluminium Saturation %	1.6
Copper (DTPA) mg/kg	0.64
Iron (DTPA) mg/kg	170
Manganese (DTPA) mg/kg	29
Zinc (DTPA) mg/kg	0.64
Boron (Hot CaCl2) mg/kg	1.3
Sulfate Sulfur (KCl40) mg/kg	10
Organic Carbon (OC) %	2.1
Soil Colour	Brown
Soil Texture	Clay Loam
Disp. Index, Loveday/Pyle	3
Slaking 2Hrs	Partial

Table 2. Treatments and nutrients rates (kg/Ha)

Treatment	Product	N%	Nsowing	NDC15	NDC31-33	Product rate kg/ha
1	Control	0	0			0
2	Urea	46	40			87.0
3	Urea	46	20			87.0
4	Entec Urea	46	40			87.0
5	Entec Urea	46	20			87.0
6	Easy N	32	40			125.0
7	Easy N	32	20			125.0
8	Urea + evaluation inhibitor	46	40			87.0
9	Urea + evaluation inhibitor	46	20			87.0
10	Urea + organic amendment	46	40			87.0
11	Urea + organic amendment	46	20			87.0
12	Entec Gran am	21	40			190.5
13	Entec Gran am	21	20			190.5
14	Gran am	21	40			190.5
15	Gran am	21	20			190.5
16	Control	0		0	0	0.0
17	Urea	46		40		87.0
18	Urea	46			40	87.0
19	Urea + solvent	46		40		87.0
20	Urea + solvent	46			40	87.0
21	Easy N	32		40		125.0
22	Easy N	32			40	125.0
23	Easy N + Agrotain	32		40		125.0
24	Easy N + Agrotain	32			40	125.0
25	Green Urea 14	46		40		87.0
26	Green Urea 14	46			40	87.0
27	Green Urea 7	46		40		87.0
28	Green Urea 7	46			40	87.0
29	Urea + evaluation inhibitor	46		40		87.0
30	Urea + evaluation inhibitor	46			40	87.0

Results and discussion:

The only treatment to give a statistically significant yield response was Entec Gran am applied at 40kgN/ha. It is suspected that the wet season may have resulted in leaching of both nitrate nitrogen and sulphur through the season. At the beginning of the season, N appeared to be sufficient based on the soil test, while S was marginal. Marginal grain protein levels however suggest that additional N may have provided additional yield as long as supply of other nutrients was not limiting. Leaching may have resulted in less than optimal S levels explaining why a nitrogen and sulphur source that has been stabilised with a nitrification inhibitor (to protect against N leaching) may have provided this outcome.

Table 3: Results

			Grain Yield	Grain Protein	Grain Fert N recovery	Screenings	Test weight
Name	**N rate kg/ha**	**Growth Stage**	**t/ha**	**%**	**%**	**%**	
Control	0		3.54	10.3	-	2.27	62.7
Urea	20	Sowing	3.85	10.13	22.2%	2.9	61.5
Entec Urea	20	Sowing	3.51	9.97	-12.8%	2.38	64.7
Easy N	20	Sowing	3.75	10.53	26.5%	2.28	63.5
Urea + evaluation inhibitor	20	Sowing	3.95	10.1	30.0%	2.42	62.9
Urea + organic amendment	20	Sowing	3.66	10.17	6.7%	2.58	61.9
Entec Gran am	20	Sowing	3.74	10.43	22.3%	2.77	62.4
Gran am	20	Sowing	3.76	10.17	15.6%	2.2	62.5
Urea	40	Sowing	3.67	10.07	2.2%	2.77	61.4
Entec Urea	40	Sowing	4.04	10.13	19.5%	2.95	62.35
Easy N	40	Sowing	3.67	10.47	8.6%	2.66	63.5
Urea + evaluation inhibitor	40	Sowing	4.05	10	17.7%	2.41	60.97
Urea + organic amendment	40	Sowing	3.97	10.07	15.4%	2.44	61.9
Entec Gran am	40	Sowing	4.16	10.13	24.8%	2.88	62
Gran am	40	Sowing	3.77	9.87	3.3%	2.73	63.4
Control	0		3.45	10.27	-	2.8	62.8
Urea	40	DC15	3.94	10.03	17.9%	2.79	61.6
Urea + solvent	40	DC15	3.73	9.97	7.7%	3.1	62.4
Easy N	40	DC15	3.52	10.07	0.1%	2.27	62.3
Easy N + Agrotain	40	DC15	3.52	10.07	0.1%	2.67	63.4
Green Urea 14	40	DC15	3.86	9.9	12.2%	2.83	61.96
Green Urea 7	40	DC15	3.50	9.9	-3.4%	2.7	60.2
Urea + evaluation inhibitor	40	DC15	3.82	10.07	13.3%	2.58	58.98
Urea	40	DC15	3.96	10	18.2%	2.48	62.5
Urea + solvent	40	DC 31-33	3.70	10.07	8.0%	2.57	60.8
Easy N	40	DC 31-33	3.31	9.97	-10.6%	3	62.5
Easy N + Agrotain	40	DC 31-33	3.48	10.23	0.7%	2.16	64.2
Green Urea 14	40	DC 31-33	3.58	10.1	3.2%	2.64	61.5
Green Urea 7	40	DC 31-33	3.78	10.27	14.8%	2.45	61.1
Urea + evaluation inhibitor	40	DC 31-33	3.88	9.83	11.9%	2.59	62.6
		CV	**8.90**	**2.4**	**-**	**15.3**	**3.4**
		LSD	**0.55**	**0.396**	**-**	**0.66**	**3.42**

Summary:
The trial suggested that marginal sulphur levels may become limiting in a wet season and that a deficiency of nutrients such as sulphur may depress nitrogen response.