4.3 Cereal Nutrition / Canopy Management Trials

4.3.1 Investigation Of The Benefits Of Specialty Nitrogen Products And Liquid Nitrogen Options In Cereals - Inverleigh, Vic

Location: Inverleigh

Acknowledgements :
Thanks to SFS staff for assistance with site location and sowing of this trial.

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Background :
It is now well accepted that post sowing application of nitrogen to cereals can provide equal or better results than pre-drill at sowing applications. Environmental issues are also becoming more prominent with respect to nitrogen use. Logistically post sowing applications can be difficult particularly in areas with unreliable rainfall patterns.

With growers, this often raises questions:

1. Is there a nitrogen product that can be applied at sowing that will have a slow or delayed release?
2. Are there alternate safer means other than spreading urea when the likelihood of rainfall is low or alternatively are there methods that will allow me to get over my country rapidly when rainfall is imminent?
3. Are products or application technologies available that can limit losses of N to the environment?
4. Is the application of liquid nitrogen sources a viable alternative?

The use of nitrification and urease inhibitors and/or liquid nitrogen sources potentially answers some of these questions, while if anything improving environmental outcomes on the farm.

▼ Table 4.8: Trial inputs

Previous crop:	Canola
Sowing date:	26 June 2007
Variety:	Bolac Wheat
Sowing rate:	80 kg/ha
Sown with:	All treatments sown with 100 kg/ha of Granulock Supreme Z (22P) sown to ensure phosphorus, sulphur and zinc were not limiting factors

In the eastern states, the adoption of such technologies has been slow, probably because the generally heavier textured soils have not resulted in leaching losses and no influential group has endorsed such technologies. Further, only a limited number of studies have quantified losses associated with poor nitrogen application practices.

As an integral part of the GRDC Nutrient Management Initiative, Incitec Pivot in co-operation with Melbourne University, DPI Victoria, Birchip Cropping Group and Southern Farming Systems has trialed the following products Urea, Entec Urea, Black Urea, EasyN and Agrotain Urea. A range of nitrogen application rates and timing of applications were used to answer some of the above questions.

Entec Urea: Entec is an ammonium stabilizer developed by BASF. It stabilizers nitrogen from urea in the ammonium form and gradually releases it in the plant available form, nitrate, to the soil.
Black Urea: Is a zeolite coated urea that offers enhanced efficiency of nitrogen uptake by the growing crop.
EasyN: UAN, A flexible liquid alternative for nitrogen application.
Agrotain Urea: (IPL Green Urea) Urease inhibitor treated urea.

Trial Design: Completely randomized split block design with 4 replicates.

Trial Inputs:
All treatments sown with 100 kg/ha of Granulock Supreme Z (22P) sown to ensure phosphorus, sulphur and zinc were not limiting factors. The site was previously canola.

Table 4.9: Soil test results

	Ec	Total Soil N Kg/ha	Organic C %	Col P Mg/kg	PBI	pH Water	pH CaCl	S Mg/kg
Rep 1	0.13	78.4	2.5	90	94	5.3	4.5	28
Rep 2	0.15	77.8	2.3	90	92	5.2	4.5	39
Rep 3	0.17	72.8	2.7	83	92	5.1	4.4	53
Rep 4	0.18	77.5	2.6	99	110	5.1	4.4	55

Observations:
Colwell P levels indicate that phosphorus levels were not limiting and total soil nitrogen levels indicate that this should be a nitrogen responsive site.

Table 4.10: Treatments and results

	Treatment		N @ Sowing	N @ DC31	N @ DC 41	Yield t/ha	Protein %
1	Control – no N		0	0	0	5.17	11.30
2	urea	DB	15	0	0	5.62	11.35
3	urea	DB	30	0	0	5.23	11.98
4	urea	DB	60	0	0	5.20	12.68
5	urea	DB	120	0	0	5.60	13.33
6	Entec urea	DB	30	0	0	5.35	11.98
7	Entec urea	DB	60	0	0	5.69	12.25
8	Entec Easy N	DB	30	0	0	5.15	11.98
9	Entec Easy N	DB	60	0	0	5.32	12.85
10	Black urea	DB	30	0	0	5.40	12.55
11	Black urea	DB	60	0	0	5.32	12.35
12	Control – no N		0	0	0	5.17	11.30
13	urea	IBS	30	0	0	5.40	11.65
14	urea	IBS	60	0	0	5.05	12.35
15	urea	MRB	30	0	0	5.35	11.98
16	urea	MRB	60	0	0	5.46	12.83
17	Easy N (UAN)	DB	30	0	0	5.17	12.15
18	Easy N (UAN)	DB	60	0	0	5.33	12.52
19	urea	DB + TD	30	30	0	5.69	12.78
20	urea	DB + TD	20	20	20	5.60	12.20
21	urea	TD	0	60	0	5.24	12.08
22	Agrotain urea 1 L	TD	0	60	0	5.61	12.18
23	Agrotain urea 2 L	TD	0	60	0	5.62	12.48
24	Agrotain urea 3 L	TD	0	60	0	5.75	12.58
25	Agrotain urea 4 L	TD	0	60	0	5.46	12.73
26	Agrotain urea 5 L	TD	0	60	0	5.96	12.48
27	Easy N (UAN) foliar	TD	0	30	0	3.49	13.38
28	Easy N (UAN) foliar	TD	0	60	0	3.35	12.83
29	Easy N (UAN) foliar + agrotain	TD	0	30	0	3.28	13.35
30	Easy N (UAN) foliar + agrotain	TD	0	60	0	3.61	13.35
31	Control – no N		0	0	0	5.17	11.30
	LSD (0.05)					**0.517**	**0.64**
	CV %					**7.2**	**3.7**

Explanation of nitrogen application methods: DB is deep-banded fertiliser below the seed, MRB is mid row banded at sowing, IBS is pre-spread and incorporated by sowing and TD is top dressed at DC 31 or 41.

Observations:
Unfortunately the Easy N foliar treatments 27, 28, 29 and 30 were "scorched" by the application of Easy N at DC 31 in late September. This was a result of following frosts and a very dry period during spring when the trial was under moisture stress.

Results:

Grain yield and protein responses should be examined as either responses to sowing nitrogen or top-dress nitrogen:

At sowing N:
There was no significant response to 30 kgN/ha and the only significant response to sowing nitrogen was to Entec Urea (treatment 7) at 60 kgN/ha.

All treatments gave significant responses to grain protein as compared to the control.

This trial has demonstrated that the application of urea at sowing would not have been economical, except for the Entec urea (treatment 9) which had a delayed nitrate release and was able to make more efficient use of the late spring rains.

Top dress N:
The dry warm and conditions during spring favoured nitrogen volatilisation. Treatment 24 and 26, Agrotain treated urea (Green Urea 7 and 14) both gave significant responses compared to treatment 21. This demonstrates that Agrotain delayed the release of plant available nitrogen, decreasing volatilisation losses and increasing grain fill after the excellent late rains in November.

The split applications, treatments 19 and 20 again performed well, thus enhancing the concept of canopy management by metering out the supply of nitrogen to the crop.

Key Message:
Protecting your nitrogen investment, using the right inhibitor, either Entec urea or Agrotain urea, payed dividends in this year's trial.

Photo 4.4: Dribble bars in use at Inverleigh

Photo 4.5: Liquid N on leaves