9.5 CANOLA NUTRITIONS TRIALS - GNARWARRE AND LAKE BOLAC (INCITEC)

Researcher: Matthew Robertson
(Regional Agronomist,
Incitec Pivot Ltd, North Shore)

Objectives:

- Assess the effect of timing & application method on nitrogen efficacy in canola.
- Assess a range of nitrogen products applied at sowing or bud visible stage in canola.
- Quantify the effects of nitrification inhibitors on nitrogen products.
- Investigate whether additional zinc has any effects on yield or quality of canola

Introduction:

A series of nitrogen management trials from 1999 – 2002 heralded change in timing and application methods for nitrogen fertiliser in wheat. While canola is generally grown in rotation with wheat, it is believed that its nitrogen requirements differ quite markedly to wheat based on more rapid early accumulation of dry matter and generally shorter growing season. Trials at Lake Bolac and Gnarwarre in 2003 provided a starting point for this study. Associated with these trials was an evaluation of some 'novel' nitrogen products and also a small trial considering zinc response in canola.

Table 73: Site Management Details Gnarwarre and Lake Bolac

	Gnarwarre	**Lake Bolac**
Variety	Hyola 60	Hyola 60
Sowing date	14/5/03	15/5/03
Sowing rate	4.4 kg/ha	4.4 kg/ha
Basal fert – N trial - Zn trial	150 kg/ha Granulock 12Z 110 kg/ha urea / 25 kgP/ha	150 kg/ha Granulock 12Z 110 kg/ha urea / 25 kgP/ha
pH (1:5 water) 0 – 10 cm	5.7	6.4
Phosphorus	Olsen P 20.5	Colwell P 30
Profile N kg/ha 0 – 60 cm	59	231
Zn DTPA	0.6	0.9
Organic carbon %	2.2	2.2

Treatments:

- Urea mid row banded (MRB) at 50 & 100 kgN/ha
- Urea broadcast & incorporate by sowing (IBS) at 50 & 100 kgN/ha
- 100 kgN/ha as urea split between sowing & bud visible – sowing treatments either as IBS or MRB.
- 50 kgN/ha as urea either at sowing or bud visible with nitrification inhibitor.
- 50 kgN/ha as ammonium sulfate nitrate at sowing or bud visible +/- nitrification inhibitor.
- 50 kgN/ha as ammonium sulfate at sowing or bud visible +/- nitrification inhibitor.
- 50 kgN/ha as urea ammonium nitrate either surface dribble banded or as a foliar spray at bud visible.
- Zinc applied as a Granulock product at 0.7, 1.4 & 2.1 kg/ha.

Results and discussion:

GNARWARRE

The Gnarwarre site highlights the pitfalls of small plot trials with canola. While the site appeared ideal for a nitrogen trial with only around 60 kgN/ha in the profile (0 – 60 cm), a high co-efficient of variation (15.3%) suggested that factors other than nutrition affected the experiment. Beds were pulled up only weeks before sowing leaving an extremely dry, but variable moisture profile. Despite early sowing, canola was severely moisture deficient by mid July which may have had a variable effect on different areas of the experiment. Despite the lack of profile N, using the rule of 90 kgN/ha needed for each tonne of canola yield, there is the suggestion that around 115 kgN/ha was mineralised through the growing season.

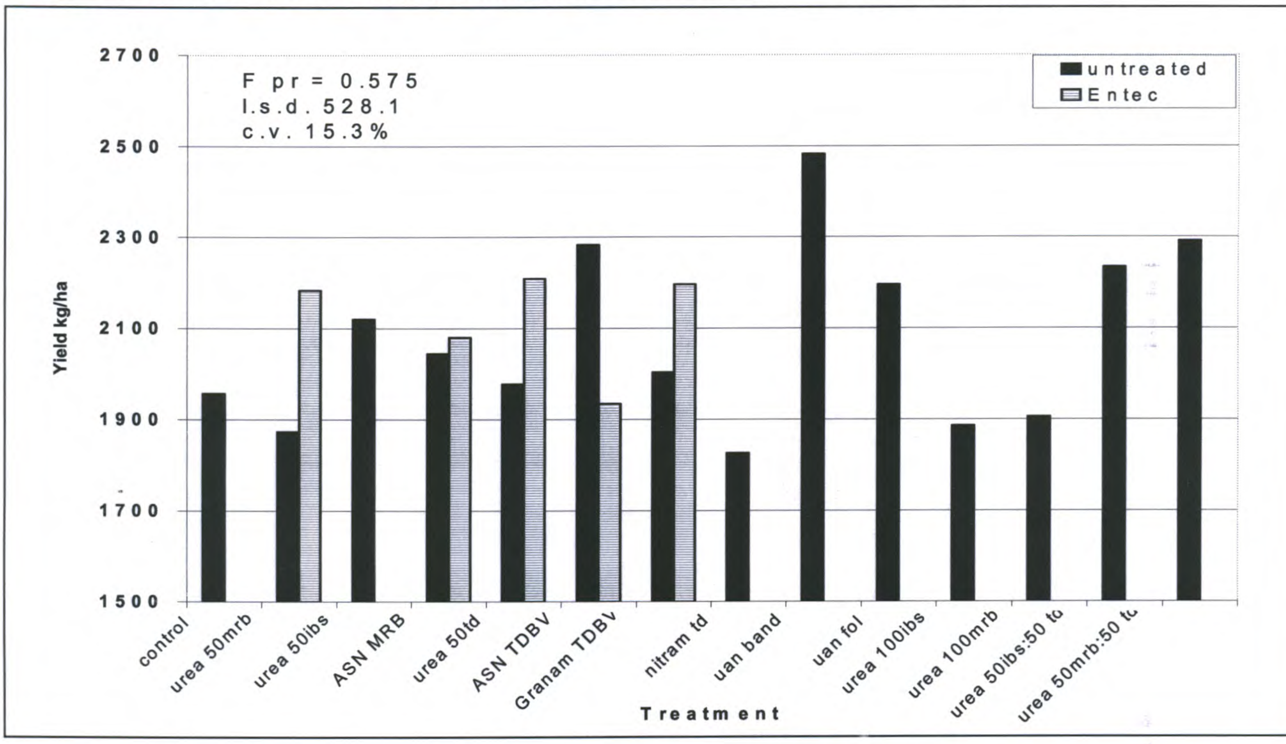
This is questionable, as while the intense cultivation of pulling up beds would enhance mineralisation, the dry autumn would have had a counter effect.

Early tissue measurements of at sowing N treatments (Table 74) supports the theory of significant increases in tissue N% with increasing N rate. In the absence of oil & protein data (still in lab), it is difficult to conclude anything from yield data other than a hint that banded Easy N at bud visible (urea ammonium nitrate solution) performed well and that at the high N rate (100 kgN/ha) split application gave better results. Investigation of grain protein & oil content may shed further light on this data set.

Table 74: Bud Visible Measurements at Gnarwarre

Fertiliser treatment	Tissue N % at bud visible	Fertiliser treatment	Tissue N % at bud visible
Control	3.77	Urea 50N mrb	4.80
ASN 50 N mrb	4.63	Entec-urea 50N mrb	4.27
Entec-ASN 50 N mrb	4.60	Urea 100 N mrb	5.50
Urea 50N ibs	5.17	Urea 100 N ibs	6.00
F pr.	<0.001	c.v.%	8.50
LSD	0.718		

Figure 14: The Effect of N Product, Timing and Entec on Canola Yield at Gnarwarre 2003



LAKE BOLAC

A very high starting profile N level deemed that this site was not ideal for a nitrogen trial. Despite no significant yield increases, there is a suggestion of improvements where sulfur fortified products were used. This is despite lower early uptake of nitrogen in tissue from Granam (Table 75) implicating the importance of nitrogen:sulfur balance under luxury nitrogen conditions. This will be confirmed once oil & protein results are available. An adjacent trial suggested that basal P inputs (25 kgP/ha) may have been sub-optimal which is likely to severely compromise the integrity of N response data.

Figure 15: Canola Yield at Lake Bolac

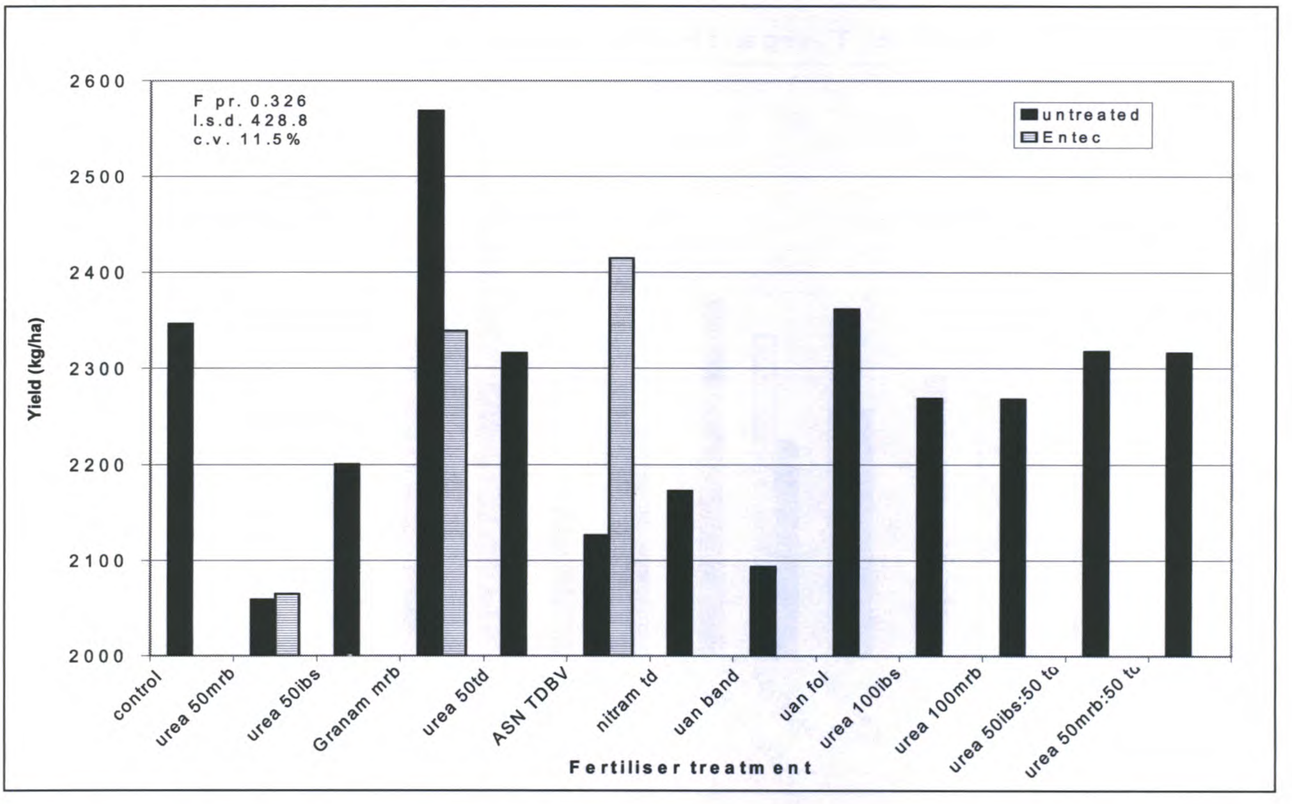


Table 75: Bud Visible Measurements at Lake Bolac

Fertiliser treatment	Dry matter at bud visible (kg/ha)	N uptake at bud visible (kg/ha)
Control	1920	101.3
Granam 50 N mrb	2166	122.7
Urea 50N mrb	2547	144.7
Urea 50N ibs	2483	140.0
Urea 100 N mrb	2559	130.4
Urea 100 N ibs	2042	117.5
F pr.	*0.136*	*0.121*
LSD	**613.0**	**37.92**
CV %	**14.9**	**16.5**

Zinc trials:

At the two sites, a small replicated zinc trial was conducted. While canola has higher removal rates of zinc in grain, it is believed that it has a more efficient harvesting mechanism for uptake from the soil. Trials were balanced for N and S by mid row banding a blend of Urea and Granam (SOA) at sowing so that the only variables were whether P or Zn were applied. P rate was 25 kg/h.

Table 76: Canola Yield (kg/ha) in Zinc Trials 2003

Treatment	Gnarwarre	Lake Bolac
Control (no starter P, Zn)	1739	2003
MAP	1886	2351
Granulock 10Z (1.25% Zn)	1994	2108
Granulock 10Z Pluz (2% Zn)	2467	2114
F pr.	*0.029*	*0.172*
LSD	**444.0**	**331.8**
CV %	**11.0**	**7.7**

Despite what would traditionally be accepted as a sufficient soil test level for zinc on an acid soil, there was a significant yield response to a higher rate of zinc at Gnarwarre. The most likely explanation of this is that the crop did not respond to added phosphorus fertiliser unless sufficient zinc was added into the system. While the reasons for this are unclear, often the greatest responses to zinc are observed where early root growth is disrupted. The extended period of moisture stress during the early growth phase may have caused this.

While not significant at Lake Bolac, visual observations throughout the trial simply suggested the need for more phosphorus, a trend which is indicated in the data. To further explore any response to zinc, it is suggested that optimum P rates (estimated at 40 – 60 kgP/ha) be employed before attempting to assess zinc responsiveness.

<u>Conclusion:</u>

While the 2003 series of trials is largely inconclusive, they do highlight a number of take-home messages:

- Do not expect nutrients like nitrogen to work effectively where other essential nutrients like phosphorus are lacking.
- Site selection for nutrition trials is vital – conduct of trials on recently constructed beds is advised against. Ideally, trials will be conducted in situations where beds have been in a normal cropping rotation for at least 5 years.
- The jury is still out on best approach to N management for canola, but where reasonable profile N is present before sowing a crop, split applications are advisable to mitigate risk.