Nitrogen Sources and Placement in Wheat

Aim: To determine the agronomic effectiveness of different nitrogen fertiliser sources and placements in wheat.

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Location: Kalannie

Background: Plants require large amounts of nitrogen for normal growth. Plants take up most of their nitrogen as either ammonium (NH^{4+}) or nitrate (NO_{3-}). The typical amount of nitrogen released from soils in WA is generally insufficient to meet the needs of a growing crop and fertiliser nitrogen is used to eliminate any deficiencies. Most nitrogen fertilisers come from the fixation of atmospheric nitrogen into ammonia and further processing of ammonia into other compounds. For example, Urea is produced by reacting ammonia with carbon dioxide. Urea is also the most widely used N source in the world because of its lower production costs. There are subtle differences in the way the different nitrogen fertilisers react when placed on the soil surface according to their individual chemistry. All nitrogen fertilisers breakdown to plant available forms over time. This trial aims to investigate the agronomic effectiveness of some common WA nitrogen fertiliser types.

Trial Details:

Plot size and replication	2.2 x 20m, 3 reps
Soil type	Sandy Loam
Sowing date	1st June 2004
Conditions at sowing	Moist
Machinery	Harrington Point with Gumbo Boot
Seeding rate	Wyalkatchem 75kg
Fertiliser	100kg MAPSZC® and 55kg MOP across all treatments IBS
Herbicides and Insecticides	Roundup PowerMax 1.5 L/ha knockdown IBS Trifluralin 2 L/ha Trisulfuron 35 g/ha Chlorpyrifos 1 L/ha Giant 900 mL/ha post emergent
Paddock History	2003 = Wheat, 2002 = Pasture, 2001= Wheat

Soil Test results:

Depth (cm)	P (ppm)	K (ppm)	Cu (ppm)	Zn (ppm)	S (ppm)	OC%	PRI	pH
0 – 10	34	49	0.7	0.6	38	0.65	6	4.42

Results:

Table 1: Wheat grain yield (t/ha) response at Kalannie to various sources of nitrogen fertiliser placements and rates.

No.	Treatment	Rate		Timing	Yield (t/ha)	LSD 5% #	GM $/ha ##
1	Untreated control				2.500	c	400
2	Urea	87	kg/ha	top dressed IBS	2.577	abc	368
3	UAN	95	L/ha	top dressed IBS	2.623	abc	372
4	MAXamFLO	143	L/ha	top dressed IBS	2.526	bc	351
5	Urea	87	kg/ha	banded	2.757	a	402
6	UAN	95	L/ha	banded	2.680	abc	389
7	MAXamFLO	143	L/ha	banded	2.593	abc	366
8	Urea	43	kg/ha	banded	2.685	abc	380
	Urea	43	kg/ha	topdressed 4 WAS			
9	UAN	48	L/ha	banded at seeding	2.608	abc	367
	UAN	48	L/ha	topdressed 4 WAS			
10	MAXamFLO	71	L/ha	banded at seeding	2.649	abc	365
	MAXamFLO	71	L/ha	topdressed 4 WAS			
11	Urea	29	kg/ha	banded at seeding	2.670	abc	373
	Urea	29	kg/ha	topdressed 4 WAS			
	Urea	29	kg/ha	topdressed Z41			
12	UAN	32	L/ha	banded at seeding	2.701	ab	377
	UAN	32	L/ha	topdressed 4 WAS			
	UAN	32	L/ha	topdressed Z41			
13	MAXamFLO	47	L/ha	banded at seeding	2.659	abc	362
	MAXamFLO	47	L/ha	topdressed 4 WAS			
	MAXamFLO	47	L/ha	topdressed Z41			
				LSD (P=.05)	0.1987		
				CV	4.4800		

 # Numbers followed by the same letter are not significantly different at LSD = 0.05
GM ($/ha) is calculated assuming wheat $160/t farm gate, then subtracting the cost of the nitrogen fertiliser (assuming $450/t UREA, $269/t MAXamFLO, $385/t Summit UAN ex Kwinana).

All treatments supplied the same amount of nitrogen, but at different timings and placements. Urea banded at 87 kg/ha significantly (LSD 5%) increased grain yield above the untreated. Applying three applications of 32L UAN by banding, spraying post at 4 weeks after seeding and again at flag leaf emergence also significantly increased grain yield above the control (Table 1). There was no significant difference between the other nitrogen treatments.

This site was generally unresponsive to applied nitrogen. The low pH recorded for the site (pH (CaCl) = 4.42) may have had some effect on the growth of the wheat. In addition, a combination of late sowing and poor spring rainfall may have also contributed to the poor response.

Summary:

- Urea increased wheat grain yield significantly (LSD = 5%) over the nil when banded at sowing.
- There was no significant difference (LSD 5%) between Urea, UAN or MAXamFLO when applied at the same rate of nitrogen and incorporated by sowing, banded or applied at pre sow, banded and post.

Technically Review By: Sandy Alexander, Agronomy Support Manager, Summit Fertilizer