

## Protein Strategies in Wheat

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**Aim:** To determine grain protein effects with the application of two nitrogen fertiliser sources at three different application timings

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**Research Officer:** Michael O’Dea & Justin Fuery  
**Company:** SUMMIT FERTILIZERS  
**Co-operator:** Agritech Crop Research



**Farmer:** Tim & Rhonda Fleay  
**Location:** Wickepin

### Background:

The income generated by growers through the sale of grain is greatly influenced by the quality of that grain. Grain quality refers to the protein content (%), the amount of small seed (%), the moisture content (%) and the grain weight (hectolitre). Protein percentage and screenings can have considerable impact upon the final wheat grain segregation and price. Growers can manipulate the grain protein content of wheat via late applications of nitrogen if there is sufficient moisture available at the end of the season. This trial aims to compare the effect of Urea and Summit’s liquid fertilizer, MAXamFLO, on the grain quality factors of wheat.

### Trial Details:

Plot size and replication	2.2 * 20m, 3 reps
Soil type	Loam
Sowing date	27 <sup>th</sup> May 2003
Conditions at sowing	Moist
Machinery	Harrington Point with Gumbo Boot
Seeding rate	80kg Arrino
Fertiliser	105kg Vigour® & 300kg Gypsum across all treatments
Herbicides and Insecticides	SpraySeed 2 L/ha Trifluralin 1.5 L/ha Logran 35 g/ha Chlorpyrifos 1 L/ha MCPA 500 1.2 L/ha
Paddock History	2002 =Lupins,. 2001 =Pasture, 2000= Pasture

### Soil Test results:

Depth (cm)	P (ppm)	K (ppm)	Cu (ppm)	Zn (ppm)	S (ppm)	OC%	PRI	pH
0 – 10	22	162	0.4	0.5	10	1.60	5	4.9

## Results:

**Table 1. Yield (t/ha), Protein (%) and Screenings (%) response in wheat at Wickepin to MAXamFLO and Urea applied at various rates and timings.**

No.	Treatment	Rate	N Rate	Timing	Yield (t/ha)	Protein (%)	Screening (%)	GM (\$/ha)
1	Urea	25 kg/ha	11.5 kg/ha	Z43 - booting	3.259 a	10.17 cde	5.27 bc	\$766
2	Urea	50 kg/ha	23.0 kg/ha	Z43 - booting	3.228 ab	10.37 bcd	4.85 c	\$749
3	Urea	100 kg/ha	46.0 kg/ha	Z43 - booting	3.180 ab	11.10 a	4.67 c	\$708
4	MAXamFLO	39.7 L/ha	11.3 kg/ha	Z43 - booting	3.212 ab	9.93 de	7.55 abc	\$652
5	MAXamFLO	79.4 L/ha	22.5 kg/ha	Z43 - booting	3.228 ab	9.97 de	5.48 abc	\$740
6	MAXamFLO	130.2 L/ha	37.0 kg/ha	Z43 - booting	3.111 ab	10.60 abc	9.11 a	\$599
7	Urea	25 kg/ha	11.5 kg/ha	Z61 - anthesis	3.190 ab	10.03 cde	6.17 abc	\$742
8	Urea	50 kg/ha	23.0 kg/ha	Z61 - anthesis	2.989 ab	9.60 e	6.57 abc	\$664
9	Urea	100 kg/ha	46.0 kg/ha	Z61 - anthesis	3.169 ab	10.07 cde	4.55 c	\$720
10	MAXamFLO	39.7 L/ha	11.3 kg/ha	Z61 - anthesis	3.026 ab	9.87 de	7.09 abc	\$616
11	MAXamFLO	79.4 L/ha	22.5 kg/ha	Z61 - anthesis	3.291 a	10.60 abc	4.28 c	\$762
12	MAXamFLO	130.2 L/ha	37.0 kg/ha	Z61 - anthesis	3.037 ab	10.83 ab	5.35 bc	\$670
13	Basal		7.0 kg/ha		2.921 b	10.10 cde	4.75 c	\$695
14	Urea	25 kg/ha	11.5 kg/ha	IBS	3.085 ab	10.10 cde	4.79 c	\$724
15	Urea	50 kg/ha	23.0 kg/ha	IBS	3.206 ab	10.23 bcd	5.89 abc	\$738
16	Urea	100 kg/ha	46.0 kg/ha	IBS	3.222 ab	10.80 ab	8.74 ab	\$632
LSD (P=.05)					0.3361	0.6230	3.7400	
CV					6.3800	3.6400	37.7300	

# Numbers followed by the same letter are not significantly different at  $LSD = 0.05$

## GM (\$/ha) is calculated from 03/04 AWB Golden Rewards Matrix for ASWN & ASW wheat, then subtracting the cost of the nitrogen fertilizer (assuming \$365/t UREA + \$17/t freight and \$232/t MAXamFLO + \$24/t freight ex Kwinana).

All treatments increased yield above the basal. MAXamFLO applied at anthesis and at a rate of 79L/ha and Urea applied at booting at a rate of 25kg/ha, produced significantly ( $l_{sd} = 5\%$ ) more grain yield than the basal (Table 1).

Applying 100kg/ha Urea at the booting stage produced maximum protein (Table 1). This was significantly ( $l_{sd} = 5\%$ ) more than the basal treatment as well as all other rates of urea applied at booting and anthesis (Table 1). Urea applied at the booting stage was superior to MAXamFLO at all application rates. However, there was no significant difference ( $l_{sd} = 5\%$ ) between the maximum rates of urea and MAXamFLO applied at this stage (Table 1).

There was a general increase in screenings with increasing MAXamFLO rates when applied at the booting stage (Table 1). Applying 130L of MAXamFLO at booting produced significantly ( $l_{sd} = 5\%$ ) more grain screenings than all urea rates applied at the same stage. Applying nitrogen in the liquid form can scorch leaves upon contact. The high rate of nitrogen applied at the booting stage may have reduced the photosynthetic area of leaves that are still important for grain fill at this timing.

At the later timing (Anthesis), MAXamFLO applied at 79L and 130L produced significantly ( $l_{sd} = 5\%$ ) more grain protein than urea applied at the same timing (Table

1). This may indicate that the liquid form of nitrogen was more efficacious in increasing grain protein than the granular nitrogen at this timing. This may have been due to a lack of soil moisture to facilitate the conversion of urea into nitrate and for the nitrate to then move into the root zone. The time lag for the conversion of urea to nitrate and then root uptake also may have been too late for the granular applied fertilizer. Evidence of this delayed uptake can be seen in the earlier Urea application. Urea applied at 50 and 100kg/ha immediately before seeding, increased grain protein significantly (lsd = 5%) over the same rates of urea applied at anthesis (Table 1). There were no significant difference (lsd = 5%) between the grain screenings of all rates of either MAXamFLO or Urea applied at anthesis.

The liquid nitrogen treatments were generally not as profitable as urea, once the cost of nitrogen fertilizer and freight are taken into consideration. Urea applied at 25kg/ha at the booting stage was the most profitable treatment (Table 1).

The results from this trial suggest that nitrogen applied in the liquid form may be more effective than urea at lifting grain protein, when applied at anthesis. Application of liquid N at the booting stage should be avoided as this may increase grain screenings and reduce grain quality.

**Summary:**

- Urea increased wheat grain protein significantly (lsd = 5%) over the liquid form when applied at the Booting stage and was generally the most profitable nitrogen source
- MAXamFLO increased grain protein significantly (lsd = 5%) than Urea, when applied at Anthesis.
- MAXamFLO applied at Booting significantly (lsd = 5%) increased grain screenings
- Application of liquid nitrogen fertilizer before anthesis should be avoided as it increasing the risk of small grain
- If growers are using a liquid nitrogen fertilizer to lift protein, then these results suggest that the earliest possible timing is at Anthesis