Urea topdressing: importance of timing prior to rainfall, and benefits of Agritain® treatment.

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Background: N is usually applied pre or at sowing at a level that provides sufficient N for the crop based on a set yield potential or a conservative average. If the seasonal conditions improve (usually good rainfall), topdressing can be used to increase the soil N status, thus allowing the crop to respond to the improved seasonal conditions. The key to obtaining efficient results from topdressing is maximising the entry of topdressed N into the soil, therefore making it available for plant uptake. The crop also has to be at a stage of growth where it can respond to the extra-applied N. Topdressed urea N is subject to large losses, mainly through ammonia (NHT)
volatilisation. As a rule of thumb, it is suggested that topdressing should occur just before a rainfall event (>5 mm of rainfall) so as to wash the urea N into the soil. This allows the maximum recovery of the N fertiliser by the crop. In a practical sense rainfall events are generally difficult to predict with such certainty. This can make it difficult to achieve an optimum timing for urea topdressing.

Trials were set up at the Wirrinya and Gunning Gap CWFS PWA regional sites to further investigate the impact of rainfall timing on the effectiveness of topdressed urea N uptake, and the possible role of Agritain<reg> treated urea to over come the problems with the timing of topdressing. Agritain<reg> is a urease inhibitor that is applied as a spray to urea. Urease is an enzyme found in soil microorganisms that is essential for the break down of Urea ($CO(NH_2)_2$) to ammonia (NH/). Inhibiting urease slows down the break down of urea, which can reduce ammonia loss to the atmosphere.

Methods: Wheat and canola trials were sown at Wirrinya and Gunning Gap (Table 1). All trials were a randomised block design with 3 replicates. Nil, 50 and 100 kg N/ha were used. A combination of treatments including N applied at sowing and topdressed N were included. The N applied at sowing was completed as a separate operation just before sowing the canola or wheat. *Topdressing:* The idea was to topdress the trials with the urea and Agritain<reg> urea at two separate dates fairly close to each other. One just before a rainfall event (on time) and the other at least 1 week before a rainfall event (poor time). The weather map was monitored closely to time the topdressing dates. Topdressing was done by hand. Unfortunately, the wheat trial at Wirrinya had to be abandoned due to problems with a topdressing application. Trials were harvested with yield recorded and the grain quality analysed.

Table 1. Trial details

Location	Paddock History	Date sown	Starter Fert. kg/ha	Herbicides
Wheat - Gunn G	Clover 98	18th June	110 MAP	Tristar
Canola - Gunn G	Lucerne 98	14th May	80 DAP	Treflan Verdict Lontrel
Canola - Wirrinya	Peas 98	17* May	1l0 MAP	Treflan Verdict Lontrel

Gypsum was applied pre sowing to the Wirrinya canola trial.

Colwell P level of 23 ppm and was presown with 46 kg N/ha as urea. This suggests that a larger N response could have been achieved in the canola N trial at Wirrinya, if extra P was applied. The wheat trial at Gunning Gap was not very responsive to N, and little can be concluded from it.

Agntain<reg> was found to provide little benefit for increasing canola yield. Agritain<reg> may have a role in reducing urea toxicity to germinating seeds, when crop seeds are sown close to pre-applied urea (especially when large amounts of N are used). This warrants further investigation.

Topdressing in the canola trials was effective regardless of rainfall events. The thick canola canopy may have created a moist and humid microenvironment that allowed urea N to move into the soil and available for plant uptake, without the need for rainfall just after topdressing. Further research needs to be carried out looking at the effect of rainfall events on urea N recovery.

Wirrinya Canola

Treatment	Date of N **applied**	**N Applied Ka N/ha**	Days **before rain** (>5mml	Yield t/ha	Oil (8.5% moist)	Protein (13% moist)	Fert. N recovery %
0		Nil	NA	0.96	40.6	37.8	NA
50 urea ,0	Sowing	50	NA	1.28	40.7	38.7	47%
50 agritain,0	Sowing	50	NA	1.55	39.8	40.6	93%
0,50 urea poor time	2-Aug	50	7	1.32	39.6	39.1	53%
0,50 urea on time	26-Auq	50	1	1.40	40.3	38.9	64%
0.50 agritain poor time	2-Aug	50	7	1.51	39.2	39.5	82%
0,50 aqritain on time	26-Auq	50	1	1.40	40.1	39.2	65%
100 urea, 0	Sowing	100	NA	1.53	38.5	40.6	45%
0,100 urea poor time	2-Aua	100	7	1.71	38.9	41.3	60%
0,100 urea on time	26-Aug	100	1	1.99	38.6	41.0	79%
50,50 urea poor time	Sowing and 2-Auq	50 + 50	7	1.44	38.0	42.2	43%
50,50 urea on time	Sowing and 26-Auq	50 + 50	1	1.50	39.1	41.6	45%
Average				1.47 5%			
LSD				0.39 Co.			
Var.				15.8			

Gunning Gap Canola

Treatment	Date of N applied	N Applied KgN/ha	Days before rain (>5mm)	Yield t/ha	Oil (8.5% moist)	Protein (13% moist)	Fert. N recovery %
0	NA	Nil	NA	1.43	39.4	37.8	NA
50 urea,0	Sowing	50	NA	1.72	37.3	38.4	42%
50 agritain.O	Sowing	50	NA	1.77	37.8	39.9	58%
0,50 urea poor time	29-Jul	50	11	1.79	36.7	38.5	53%
0.50 urea on time	26-Auq	50	1	1.67	36.9	40.7	49%
0.50 agritain poor time	29-Jul	50	11	1.88	37.7	39.0	67%
0.50 agritain on time	26-Auq	50	1	1.74	37.1	39.7	53%
100 urea,0	Sowing	100	NA	1.86	37.3	40.8	38%
0,100 urea on time	26-Auq	100	1	1.94	36.3	41.2	45%
50.50 urea poor time	Sow and 29-Jul	50 + 50	25	1.95	36.2	39.2	39%
50.50 urea on time	Sow and 26-Aug	50 + 50	1	1.82	35.1	L 39.2	30%
Average				1.78 5% LSD			
0.20 Co. Var.				6.7			

Gunning Gap Wheat

Treatment	**Date of N applied**	**N Applied KgN/ha**	**Days before rain (>5mm)**	**Yield T/ha**	**Protein %**	**Screenings**	**Test Wt kg/hL**	**Fert. N recovery %**
0	NA	Nil	**NA**	3.87	13.07	3.4	76.5	**NA**
50 urea,0	Sowing	50	**NA**	**4.01**	13.17	**4.1**	75.6	**7.8%**
50 agritain,0	Sowing	50	**NA**	3.94	13.27	3.5	75.7	**6.2%**
0.50 urea poor time	29-Jul	50	11	4.16	13.30	3.3	76.2	16.6%
0,50 urea on time	26-Aug	50	**1**	4.09	13.27	3.3	76.2	13.2%
0,50 agritain Door time	29-Jul	50	11	4.23	13.30	3.4	76.2	20.0%
0,50 agritain on time	26-Auq	50	**1**	4.01	13.40	4.0	75.7	11.0%
100 urea,0	Sowing	100	**NA**	4.02	13.43	3.0	76.3	**6.2%**
0.100 urea Door time	29-Jul	100	11	4.08	13.47	3.5	76.3	**7.6%**
0,100 urea on time	26-Aug	100	**1**	4.15	13.70	3.0	76.0	11.0%
50,50 urea poor time	29-Jul	50 + 50	11	4.06	13.37	3.9	75.8	**6.4%**
50.50 urea on time	26-Aug	50 + 50	**1**	3.92	13.43	3.5	75.5	**3.6%**
Average				4.05	13.35	3.5	76.0	
5% LSD				0.58	0.17	0.9 no	1.0 **no**	
Sigificant				no	yes 0.7	15.9	**0.8**	
Co. Var.				**8.4%**				

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Table 2. Performance of pulses at Nyngan.

Crop	Cultivar	Yield (t/ha)
	25th April sowing	
Faba beans	Icarus	0.75
AJbus Lupins	Ultra	2.05
Vetch	Blanchfleur	0
Angustifolius Lupins	Myallie **25th**	0.88
	May sowing	
Fieldpeas	Dundale	1.80
Fieldpeas	Bohatyr	1.77
Fieldpeas	Excell	1.67
Lentils	Digger	0.57
Chickpeas	Amethyst	0.92

The SED = 0.10 & 0.04 t/ha for the early and late sown trial, respectively.

Future plans: Plans for the regional site involve sowing a range of canola and pulse crops followed by a subsequent wheat crop to look at the benefits in yield and protein. Other trials involve crop nutrition strategies with wheat and canola.