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Report on 1971 Nitrogen Trials

M.G. Mason, Research Officer

1. Comparison of Nitrogen Rates on Wheat and Rape

There were 27 trials planned in which the response to nitrogen fertilisers on both wheat and rape could be directly compared. It was hoped that a constant relationship between the responses on these two crops would allow the large amount of information on wheat trials in the past to be used in formulating recommendations for nitrogen use on rape.

One of these trials (Esperance Plains) was not planted because of the very wet conditions, i.e. 26 trials were planted. Of these there was little or no rape on 3 trials and fairly poor establishment on one other trial. In four trials rape plant numbers were reduced where the higher rates of nitrogen fertiliser were used and at Eneabba plant numbers were progressively reduced as the rate of ammonium nitrate was increased. Plant counts taken one month after seeding are shown below.

Rate of Ammonium Nitrate	Mean Plant Numbers
Nil	180
34 lb/ac	150
68 "	125
101 "	104
135 "	82
203 "	47
406 "	30

This ammonium nitrate was topdressed immediately before seeding.

Two of the trials were not harvested, one of which (Tenderden) was completely flattened by hail. Four or five other trials suffered some hail damage especially on the rape.

When all results were compared there was no clear overall constant relationship between responses on wheat and rape. Twenty one trials were used in the final comparison. In 11 of these rape gave a higher percentage yield response than wheat. Wheat gave a higher percentage response in 5 trials, but hail damage may have been greater on the rape in 3 of these. In the remaining 5 trials both wheat and rape gave similar percentage responses to nitrogen fertiliser (there was no response in one of these). When the most profitable rate of nitrogen fertiliser was determined for wheat and rape in all trials, it was found that the most profitable rate for wheat was higher than for rape in 9 trials and was less than for rape in a further 9 trials, with no difference in the remaining 3. There was no obvious correlation between the results obtained and area involved.

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From these results a firm conclusion, as to the relative amount of nitrogen to be used on wheat and rape, cannot be reached. However, it is likely that rates similar to those recommended for wheat (pre-quotas) or slightly higher can be used on rape. These recommendations for wheat in the rape growing areas were :-

Light land - 1st crop after clover	- 23.5 - 26 kg N/ha
" " - Other situations	- 41.5 - 51.5 kg N/ha
Heavy land	- 13 kg N/ha.

2. Comparison of Nitrogen Rates on Wheat and Linseed

The response to nitrogen fertilisers on these two crops were compared in four trials - Nabawa, Dandaragan, Mt Barker and Badgingarra. Plant numbers were reduced by the higher rates of nitrogen at Badgingarra.

When the response to nitrogen as a percent of the control was examined, wheat gave a higher percentage response than linseed in 3 of the 4 trials. When the most profitable rate of nitrogen fertiliser was considered for each trial it was found that higher rates could have been used for wheat than for linseed in two of the trials and there was little difference in the other two trials. The data from this limited number of trials suggests that possibly less nitrogen fertiliser should be used on linseed than on wheat.

3. Rate of Seed x Rate of Urea for Rape. (Also M. Poole)

One trial was carried out at Wongan Hills Research Station. In this trial the rape seed was mixed with the super to give 120 lb super/acre. The super seed mix was sown through the fertiliser box at the same time as the urea rates were applied through the grain box. All seed and fertiliser was dropped on the soil surface and covered by trailing harrows. The seed and super would have mixed with the urea in the hoses of the drill.

Plant counts one month after seeding are shown in the attached table and the final seed yields are set out in the accompanying report.

There was a marked reduction in plant numbers as the rate of urea increased. In the absence of urea the highest seed yield was obtained with 6 lb seed/acre. However, at the highest rates of urea better yields were obtained with 8 lb seed/acre due to the survival of more plants.

This method of application of urea would be very harmful to emergence and survival of rape plants.

4. Rates of Nitrogen on Rape Varieties. (Also M. Poole)

Four trials were planned to compare the response to nitrogen by Arlo and Target Rapes. One of these trials was a failure due to very wet conditions. In one trial the Arlo rape results were lost due to harvester blockages. Only the trials at Avondale and Wongan Hills Research Stations gave a final comparison on both varieties.

In both trials Arlo outyielded Target convincingly. However, there were no significant variety x nitrogen rate interactions, i.e. the varieties responded to nitrogen in a similar manner.

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TITLE - Rates of Urea x Rate of Seeding Rape  
 DATE - Plant counts as at July 19, 1971  
 LOCATION - Wongan Hills Research Station  
 SUPER RATE - 120 lb/ac  
 TIME OF N APPLICATION - Applied at seeding (drilled with seed - hoses out of boots)  
 CROP - Arlo Rape @ 4, 6 lb/ac, 8, 10 lb/ac.

Treatments		Tr. No.	Plant Numbers			Total	Mean
Rates of Urea	Seeding Rate		Rep 1	Rep 2	Rep 3		
Nil	4 lb/ac	1	169	205	216	590	197
50 lb/ac	4 lb/ac	2	142	160	139	441	147
100 lb/ac	4 lb/ac	3	86	61	75	222	74
150 lb/ac	4 lb/ac	4	19	43	54	116	39
300 lb/ac	4 lb/ac	5	2	10	4	16	5
Nil	6 lb/ac	6	255	250	223	728	243
50 lb/ac	6 lb/ac	7	177	161	264	602	201
100 lb/ac	6 lb/ac	8	108	129	170	407	136
150 lb/ac	6 lb/ac	9	58	77	78	213	71
300 lb/ac	6 lb/ac	10	16	17	27	60	20
Nil	8 lb/ac	11	430	349	620	1,399	466
50 lb/ac	8 lb/ac	12	221	247	267	735	245
100 lb/ac	8 lb/ac	13	49	109	151	309	103
150 lb/ac	8 lb/ac	14	70	89	96	255	85
300 lb/ac	8 lb/ac	15	7	20	21	48	16
Nil	10 lb/ac	16	332	448	565	1,345	448
50 lb/ac	10 lb/ac	17	211	197	345	753	251
100 lb/ac	10 lb/ac	18	201	185	172	558	186
150 lb/ac	10 lb/ac	19	105	110	128	343	114
300 lb/ac	10 lb/ac	20	20	64	32	116	39
			2,678	2,931	3,647	9,256	

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#### 5. Time of Application of Nitrogen

Three trials were planned to look at times of application of nitrogen on rape and one trial on linseed. With the linseed trial there was little or no response to nitrogen. One of the rape trials was abandoned due to very wet conditions. The two remaining trials were at Mount Barker and Wongan Hills Research Stations. The former was fairly badly affected by "blackleg" but yield results were obtained.

At Wongan Hills, overall, best results were obtained with applications 8 or 4 weeks after seeding. At Mount Barker best results were obtained with applications 2 or 6 weeks after seeding.

More information is needed on this aspect and will be further investigated, along with split applications, in 1972. In the meantime it is recommended that the application of nitrogen fertiliser be delayed for 3-4 weeks after seeding. Earlier applications may cause some drop in plant numbers.

#### 6. Timing of Application of Urea and Ammonium Nitrate on Wheat

One of the first products of urea breakdown is ammonia. Therefore if urea is topdressed on to the soil surface and left uncovered the urea can take up some moisture and begin to breakdown. Much of the free ammonia released could be lost into the atmosphere and therefore become unavailable to the plants. This loss will largely be avoided if the urea is covered by soil. This can be achieved either by topdressing the urea just before seeding so that it is covered during the seeding operation, or it can be moved into the soil by reasonable rains after applications. As there is a fair chance that we will not receive sufficiently heavy rain soon after application to wash the urea into the soil, it is advisable to topdress the urea prior to seeding in the medium and lower rainfall areas. On the other hand ammonium nitrate does not normally form free ammonia and could therefore be safely topdressed and left uncovered. The only time ammonia will be formed from this fertiliser is on very alkaline soils.

Three trials were planted to look at this aspect of the use of these two fertilisers. These trials were at Merredin, Badgingarra and Newdegate Research Stations.

At Badgingarra there were no significant differences between sources and methods of application of urea or ammonium nitrate. At Merredin urea gave best results when topdressed before seeding, but in this case ammonium nitrate also gave best results when applied at this time. At Newdegate urea gave poorer results when topdressed just before seeding, while ammonium nitrate gave best results with application at this time. These results at Newdegate are opposite to the expected result and at Badgingarra it appears that volatilization loss in this case was not important.

#### 7. Nitrogen Use on First Crops After Legume Pastures

Overall there were 22 trials with nitrogen rates on first crops after legume pasture. These all had wheat in them. Of the six trials in Zone A, 3 did not give a profitable response. The most profitable rate was 42 kg N/ha for 2 sites and 51.5 kg N/ha on the other site. These profitabilities are worked out assuming a non-quota situation. In Zone B 2 of the 7 trials did not give a profitable response. The most profitable rates were 13 kg N/ha at 2 sites, 26 kg N/ha at

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2 sites and 42 kg N/ha at the remaining site. In Zone C four of the 9 trials did not show a profitable response. The most profitable rates were 13 kg N/ha at one site, 26 kg N/ha at 2 sites, 42 kg N/ha at one site and 77 kg N/ha at the remaining site.

### 8. Glasshouse Trials

A number of glasshouse trials were carried out to investigate the effect of placement of a number of fertilisers on the emergence and survival of various crops.

It has been previously shown that rape and linseed were much more sensitive to nitrogen fertiliser damage than the cereals. However, in this series of trials the most sensitive plant was Uniwhite lupins. At the equivalent of 50 lb urea/acre there was almost a complete suppression of emergence when the fertiliser was banded with the seed. When these seeds were dug up later they were intact but dead. Lime pelleting of the seeds did not protect them against this banded urea. However it did afford some amount of protection against topdressed urea. On the other hand the number of pea plants emerging was unaffected by the equivalent of 50 or 100 lb urea/acre banded with the seed. Many of these pea plants showed leaf mottling and retarded growth, but eventually they recovered from this condition. Safflower appeared to be more sensitive than sunflower. However, sunflowers were still adversely affected by urea applied at seeding. Where the sunflowers were topdressed with the equivalent of 300 lb urea/acre at seeding, they emerged and grew quite well for a while but many then wilted and died.

The sensitivity of the rape varieties Arlo, Echo, Target, Turret and Masoweiki, to urea damage was compared. Turret appeared to survive a little better than the other varieties, which were no different from one another.

Where urea equivalent to 100 lb/acre was topdressed within four days after seeding rape, there were plant deaths. At the equivalent of 300 lb urea/acre there were deaths even when the application was made 2 weeks after seeding.

The number of rape plants emerging when banded with superphosphate fell markedly when rates rose above the equivalent of 105 lb/ac. However, the conditions were such that harmful effects were most likely to occur i.e. the sowing was made into a moist seed bed and there was no water applied for 3-4 days after seeding; and there was very intimate contact between seed and fertiliser.

Both N-P Compound 24:24 and ammonium nitrate + super were very harmful to emergence and survival of rapeseed when seed and fertiliser were banded together. The compound fertiliser was the more harmful of the two sources.

The harmful effect of urea on rape was most marked when the sowing was made into moist soil and there was a dry period following this. There was little difference due to the length of this dry period from 1 to 7 days. Watering immediately after seeding caused this effect to disappear. If no water was added immediately after seeding there was more damage in a moist rather than a dry initial seedbed.

Various placements of the equivalent of 230 lb/acre super and/or the equivalent of 150 lb/ac of ammonium nitrate were compared in relation to emergence of rape.

With both fertilisers most damage was done when the fertiliser was banded with the seed. With ammonium nitrate the next most harmful placement was to topdress this fertiliser over the seeding row. Banding ammonium nitrate 1 inch below the seed was also harmful. Banding either 1 inch to the side of the seed or simultaneously one inch below and 1 inch to the side were comparatively safe. Superphosphate was less harmful than ammonium nitrate and was least harmful when topdressed above the row.

Arlo and Target rape plants were grown in sand culture with various nutrient solutions lacking only one essential element. In this way deficiency symptoms of rape plants lacking N,P,K, S,Ca,Mg,Mn,B,Zn and Cu(?) were reproduced and recorded photographically. It is hoped to publish typical photos and descriptions of these deficiencies in a bulletin. Symptoms on wheat and Uniharvest lupin were also recorded.

#### In Conclusion

Rape will require nitrogen fertiliser in many situations in the field and present tentative recommendations for rates of application have been given in the report. No nitrogen fertiliser should be sown in contact with the seed and it is suggested that applications of nitrogen fertiliser be delayed for at least three weeks after seeding. Obviously the amount of nitrogen required on a first crop after clover will depend, among other things, on how good the legume stand was. After a very good clover stand it may pay to sow the rape without added nitrogen except for some test strips. Since rape appears to respond very quickly to nitrogen, it could be added to the bulk crop if a response shows up in the test strips.

March 9, 1972  
MGM:EC