ANHYDROUS AMMONIA APPLIED AS COLDFLO™ TO WHEAT

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The Coldflo™ method involves injecting banded liquid anhydrous ammonia (NH_3) into soil at -30?C. Wheatgrowers in the southeast are adopting this method of applying N on soils with lighter textured and lower ion exchange capacity than the clays to which it has been applied in the north. This project investigates yield and protein response of wheat to NH_3 in comparison with other forms of N and assesses possible NH_3-loss and damage to soil microorganisms.

RESULTS AND DISCUSSION

In 1994 *wheat yield,* the responses to NH_3 were compared with responses to urea applied at the same rates and depths and all cultivated to the same depth (Table 1). In the drought conditions (May-November rainfall 124mm) yields were low and grain proteins high and the responses to applied N were small and non-significant. NH_3 gave a small yield increase (0.14 t/ha) and protein decrease (0.7%) over equivalent urea treatments.

Table 1. Wheat yield (t/ha) and grain protein *(% in italics)* responses to NH_3 and urea applied at different depths at the time of sowing on a red-brown earth at Cootamundra.

Treatment		**50N**	**100N**	**150N**	**200N**
Control	2.17 *(13.7)*				
NH_3-coldflo 10cm		2.18 *(14.1)*	2.13 *(13.7)*	1.96 *(13.4)*	2.24 *(14.9)*
Urea 10cm		1.94 *(14.6)*	2.11*(14.8)*	1.76 *(15.0)*	2.21 *(15.3)*
NH_3-coldflo 18cm			2.39 *(13.8)*		
Urea 18cm			2.17 *(14.0)*		

SE_{diff} = 0.25 t/ha and 0.2% protein

Ammonia volatilisation

Loss of ammonia was measured immediately after fertiliser injection into moist (26% v/v) soil in autumn 1995, using closed containers consisting of split 200 litre drums sealed onto the soil, with air recirculating through an acid trap. There was a 2% loss of NH_3 over the 2 hours following injection at 5 cm but no detectable loss in the following 3 days. There was no measured loss detected from NH_3 injected at the normal injection depth of 10 cm and no loss from conventional high pressure ammonia injected at 10 cm or from urea.

Soil microbes

Soil microbial biomass, activity and the populations of protozoa and nitrifying microorganisms were measured immediately after NH_3 injection and during the following 5 weeks. Within the injection bands, microbial activity was inhibited for 3 days after which it returned to the previous level. Protozoan populations decreased for the 5 weeks but the population of nitrifying microorganisms increased in both the NH_3 (100-fold) and urea (10-fold) treatments. There was no detectable change to microbes between the bands.

CONCLUSIONS

The yield and protein results from the 1994 drought are inconclusive and studies are continuing. Loss of NH_3 from injected fertilisers in 1995 was negligible. There was a transitory decrease in microbial biomass followed by a longer term increase in protozoa and decrease in nitrifiers.