

Changes in the response of wheat to nitrogen fertilizer in Northern New South Wales

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Very low rates of nitrogen fertilizer (average 5 kg N/ha for those actually using nitrogen) are currently used in the northern wheat belt of N.S.W., despite the fact that experiments in 1973 and 1974 indicated that higher rates may be required in some areas. A series of experiments was begun in 1985 to re-assess the current extent and degree of nitrogen and phosphorus deficiency in the region and to improve prediction of responsiveness of wheat to N and P fertilizers through soil testing. Responses to nitrogen in 1985 and 1986 are reported here.

Methods

Six 5N x 5P factorial experiments were conducted in 1985 and eleven experiments in 1986. Nitrogen rates were 0-93 kg/ha in 1985 and 0-116 kg/ha in 1986. Phosphorus rates were 0-50 kg P/ha in 1985 and 0-38 kg/ha in 1986.

Results and Discussion

In 1985 there was very little response to fertilizer P, but there were major responses to N - both in terms of grain yield and grain protein. Grain yields in all trials were increased to the highest nitrogen application rate of 93 kg/ha, with grain yield responses at 93 kg/ha varying from 0.7 to 1.5 t/ha. Grain protein, which generally only increased substantially with the higher rates of nitrogen fertilizer, increased by between 0.6 and 4.3 percentage points with the application of 93 kg N/ha. When premium payments were taken into account, highest profit at all sites was obtained when 93 kg N/ha were applied, profit varying from \$77 to \$172/ha.

Grain yield responses in 1986 were more variable than in 1985, but were generally again higher than anticipated. Two sites were unresponsive to nitrogen fertilizer - one of these experienced severe moisture stress and the other had adequate soil mineral N and yielded 5.4 t/ha. Grain yield responses to 116 kg N/ha on the other sites varied from 0.25 to 2.3 t/ha. Grain protein increases from 116 kg N/ha varied from 1.0 to 2.9 percentage points, in most cases making the grain eligible for premium or for increased premium payments. Of the nine 1986 sites responding to nitrogen fertilizer, two had a maximum profit at 15 kg N/ha, three at 60 kg N/ha and four at 116 kg N/ha.

Only six of 49 experiments conducted in the north from 1962-64 gave responses to nitrogen returning a profit greater than \$2.50/ha (1). On two experiments optimal N rate was > 92 kg/ha and on one experiment the optimal N rate was 27 kg N/ha, with optimal rates of less than 10 kg N/ha in all other experiments. In a survey covering a total of 141 sites in 1974 and 1975, 57 sites gave economic responses to 30 kg N/ha, with 29 of these sites giving greater profit at 50 kg N/ha (2).

The current experiments therefore provide strong evidence for a sharp decline in nitrogen fertility in wheat soils in northern N.S.W. - a region where rotation with legume pasture or grain legume crops is very limited.

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2. Doyle, A.D. 1977. N.S.W. Dept. Agric. Tech. Bull. No. 14.