

Residual nitrogen and wheat production

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This paper examines the residual value of N applied as urea to a previous year's crop of wheat grown on a red brown earth soil. The residual value is important where large amounts of fertilizer have been applied at sowing or at head emergence with no apparent increase in yield of that crop. Lack of response was attributed to a dry season after anthesis.

Methods

In 1987 N (0, 50, 100 kg/ha) was applied at sowing and a split application of 50/50 kg/ha made at sowing and at head emergence. The soil was analysed for extractable NO_3^- and NH_4^+ to a depth of 75 cm before sowing wheat (Hartog) in 1988.

Results and discussion

The total NO_3^- in the soil profile in the 50/50 and 100 kg/ha pretreatments was nearly double that detected in the 0 and 50 kg/ha pretreatments while the NH_4^+ content was higher only in soil which received the split application of urea (Table 1).

Grain yield, head number m^{-2} , grain number and grain weight/head as well as grain protein were positively related to the initial NO_3^- levels (Table 1).

Table 1. Residual N and yield components of Hartog wheat.

| Parameter | Previous year's N (kg/ha) | | | |
|--|---------------------------|--------|--------|--------|
| | 0 | 50 | 50/50 | 100 |
| Residual NO_3^- (mg N kg soil ⁻¹) | 25.3 | 22.9 | 50.4 | 47.6 |
| Residual NH_4^+ (mg N kg soil ⁻¹) | 17.1a | 18.0a | 20.2b | 16.4a |
| Grain yield (t ha ⁻¹) | 2.13a | 2.37a | 2.83b | 2.92b |
| Head count (m^{-2}) | 224a | 243a | 312b | 334b |
| Seed wt (mg) | 32.0a | 31.2a | 26.0b | 26.1b |
| Grain no./head | 29.7a | 31.5ab | 35.2bc | 35.7c |
| Grain wt/head (g) | 0.95 | 0.89 | 1.00 | 0.88 |
| Grain protein (%) | 9.21a | 9.82a | 11.27b | 11.51b |

Values followed by the same letter are not significantly different (LSD, $P < 0.05$).

The yield differences between treatments were attributed to an enhanced tiller production and survival rather than any attributes associated with individual heads (e.g. the product of seed size and number) as grain weight per head was similar in all treatments. This experiment showed that considerable amounts of residual mineral N can occur on a red brown earth soil. This residual N was available for the successive crop. However, the relatively low grain protein concentration in all treatments was an indication that some fertilizer N would still be required to achieve optimum N response in the crop.