

Varietal differences in response to nitrogen fertilizer

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Differences in varietal response to nitrogen (N) can affect the optimal level of fertilizer to apply. Such differences in grain yield have seldom been found in rainfed cereal experiments in Australia as measured by statistically significant N x Variety interactions e.g. (1). However, comparisons of responsiveness to N (kg grain/kg N applied) have shown varietal differences that are influenced by growing season rainfall (2). More detailed growth analyses have also revealed differences (3) as have examinations of a more diverse collection of genotypes (4). Overseas research results (5) leave little doubt that varietal differences are widespread and can have important effects on optimal N rates and variety testing procedures. This work aims to define the conditions under which varietal differences in response to N are found and to examine their possible practical significance.

Methods

A series of experiments was sown using 20 - 45 varieties and 8 or 10 N rates in the field near Aleppo, Syria.

Results and discussion

The range of characteristics illustrated by Table 1 indicates the potential to breed for more desirable responses under field conditions. The correlation between yield at zero applied N (Y_0) and yield responsiveness to N (Y/A , where A is N applied) was always negative, significantly so in three out of five experiments. Yield potential (Y_{max}) was not consistently correlated with Y_0 or Y/A but was positively and significantly correlated with N required to reach Y_{max} (N_{opt}) in four experiments.

Table 1: Mean and range of response characters to N in 1981/82 (irrigated).

| | | Y_0 (t/ha) | Y_{max} (t/ha) | N_{opt} (kg/ha) | Y/A (kg/kg) |
|---------------------------|-------|--------------|------------------|-------------------|---------------|
| Breadwheats (45 lines) | Mean | 0.8 | 3.6 | 125 | 23 |
| | Range | 0.3-1.4 | 2.6-4.7 | 55-185 | 9 - 43 |
| Barleys (45 lines) | Mean | 0.7 | 4.0 | 116 | 29 |
| | Range | 0.1-1.9 | 3.0-5.6 | 55-180 | 14-46 |

Varietal differences in uptake efficiency (total N uptake/N applied) were more closely correlated with Y/A than differences in utilization efficiency (yield/total N uptake). Grain N (%) was not significantly correlated with NHI (grainN/total N) but was negatively correlated with utilization efficiency.

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