Effect of recent cropping history on the nitrogen and phosphorus requirement of maize

P.L. Aitken¹, T. Dickson², J.C. Dwyer² and D.L. Compton²

¹ Departrent of Primary Industries, Agricultural Chemistry Eranch, Eeiers Poad, Indooroopilly, 4068. ² Department of Primary Industries, Agriculture Branch, P.O. Box: 23, Kinearoy, 4610.

To improve fertilizer recommendations for maize in the South Burnett region of south-eastern Queensland, effects of recent cropping on nitrogen and phosphorus requirements of maize are being studied. This paper reports data obtained from the initial stages of the program.

Methods

In the 1935/86 and 1586/87 summer seasons, field trials were conducted at a total of 8 sites. At six of these sites, paired experiments (consisting of two different winter cropping practices) were conducted. Treatments were designed to investigate: N response in the presence of adequate P, P response in the presence of adequate N, and any N x P interaction. Nitrogen rates up to 300 kg N ha⁻¹ (as urea) and phosphorus rates up to 80 kg P ha⁻¹ (as DAP) were applied to define the response function for each nutrient. Treatments were replicated four times in a randomized block design. Immediately prior to planting and before fertilizer application, soil samples were obtained from each block to a depth of 120 cm. Ammonium-N and nitrate-N, in each 10 cm increment, were determined following field extraction with 2 M KCI.

Results and discussion

In the 1985/36 season paired experiments (one following winter barley and the other following a winter fallow) were established at each of two sites (one irrigated and one rainfed). On the irrigated site, grain yields of maize in all treatments on the followed area were relatively high (\approx 6,000 kg ha⁻¹) and nitrogen application resulted in only a small yield increase. Under irrigation on the winter cropped area, grain yields on the control plots were poor 2,500 kg ha⁻¹) and high rates of applied N (\approx 100 kg ha⁻¹) were required to give yields equivalent to the fallowed area. At the rainfed site, r application helped to bridge the yield gap between the cropped area and the followed area, but extremely dry conditions restricted yield in all treatments. Although the application of P resulted in small but significant (P <0.05) increases in grain yield at the irrigated site, there was no effect of cropping history on the nature of the P response.

At the time of preparing this abstract, yield data for the 1966/87 season was not available. However, in both seasons nitrate-nitrogen levels in the profile prior to fertilizer addition reflected the previous cropping history with higher amounts of mineral nitrogen in the fallowed areas. Since there was no effect of previous cropping history on stored moisture, the data obtained to date support the view that the influence of cropping systems on subsequent crop production is effected largely through changes in the available nitrogen supply. A knowledge of the nature of the response to applied nitrogen following various cropping practices will allow more refined fertilizer recommendations in the region.