

The effect of irrigation method on the response of maize to mineral and organic fertilizers

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Agriculturally manure lost its importance when mineral fertilizers became readily available and cheap. Manures notoriety as a pollutant, however, has increased, particularly as animal industries have intensified. Subsequent environmental pressures and increasing costs of mineral fertilizers has rekindled interest in the fertilizer value of manure. Nitrogen is of particular interest as it often is the largest single cost associated with irrigated cropping. The relative contribution of mineral and organic fertilizers to nitrogen (N) uptake by irrigated maize is reported here.

Methods

Maize was sown 23 November 1983 into a replicated split plot design with two main plots of furrow (F) and border check (BC) irrigation. Cow manure (1.2%N) at 0, 15 t DM/ha incorporated and 15 t DM/ha mulched, and a pre-planting application of urea at 0 and 100 kg N/ha formed a complete factorial in the F main plots, but the mulched manure was omitted from the factorial set in the BC main plots. All plots were irrigated simultaneously at an evaporative interval of approximately 70 mm and received 45 kg P/ha as superphosphate pre-sowing.

Results and Discussion

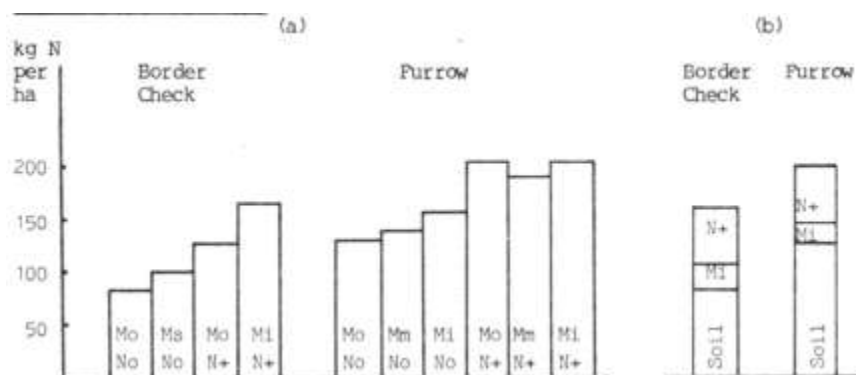


Figure 1(a) Nitrogen uptake by the total maize plant according to treatment; Mo no manure; Mm Manure mulched; Mi manure incorporated; Mo no urea; N+ plus urea.

Figure 1(b) Source of nitrogen taken up by maize.

The uptake of N by maize in response to mineral fertilizer was similar for both furrow and BC irrigation (Figure 1) with an apparent efficiencies of 60%. For manure, apparent N efficiency was greater for B.C. (12%) than F (7%). The greater N uptake by maize in the furrow plots was probably because of greater denitrification or some root uptake limitation associated with BC irrigation.

Dry matter responses were similar to N uptake with manure and urea giving an extra 0.7 t and 4.1 t of DM per ha respectively. Without these treatments maize yielded 11.1 t DM/ha for BC and 16.1 t DM/ha for furrow.

For maize, responses to manure were small, perhaps indicating low mineralization rates of organic N during the cropping period. Residual responses to the fertilizer treatments are currently being assessed by a following oat crop.

