ABSTRACT

Field experiments designed to evaluate the effect of applied N^{15} and N, and bagasse (crushed stalk residue of *Saccharam Officinarum* L.) mulch on N uptake and yield of maize (*Zea mays* L.), were conducted during a 24 month period. At the same time experiments on the movement of NO_3-N^{15} and transformation of $(NH_2)_2CO$-N^{15}, and the effect of initial soil moisture content on its infiltration rate were performed.

The results indicated that the efficiency of use of the applied $(NH_2)_2CO$-N^{15} and $(NH_2)_2CO$-N fertilizers could be as high as 45.0 percent to 105.3 percent of the added N and that mulching has a beneficial effect on accumulation of N in the maize plant during the dry season. During the wet season, use of mulch resulted in water-logging and created alternating anaerobic soil conditions. Significantly (P = 0.05) greater amounts of N were accumulated in plants in the unmulched fertilized plots compared to the uptake by plants in the mulched fertilized plots. In both harvests, use of fertilizer resulted in significantly (P = 0.05) greater uptake of N and grain yields. Use of mulch also resulted in significant (P = 0.05) increases in grain yield during the dry season; however, during the rainy season mulch had no significant (P = 0.05) effect on grain yield.

In evaluating the movement of NO_3-N^{15} and transformation of $(NH_2)_2CO$-N^{15}, lysimeter systems (microplots) were employed. Field plots were established to afford comparison between movement and transformation within the lysimeters, and under natural conditions. The following results were obtained: (1) The movement of NO_3-N^{15} was slow

and restricted to the top 30 cm during both the dry and wet seasons; (2) $(NH_2)_2CO\text{-}N^{15}$ was completely hydrolyzed to $NH_4\text{-}N^{15}$ within 3 to 7 hours after fertilizer application; (3) Nitrification was gradual; (4) Significantly ($P = 0.05$) greater amounts of fertilizer $NO_3\text{-}N^{15}$ were found in the field plots compared to the values obtained within the lysimeter systems, since relatively higher evaporative conditions existed in the microplots and most likely resulted in comparatively higher NH_3 volatilization rates from these experimental units; (5) In the dry season mulching significantly ($P = 0.05$) enhanced the conservation of $NO_3\text{-}N^{15}$ and $NH_4\text{-}N^{15}$ in the field plots.

A multiple regression analysis showed that infiltration rate measurements were significantly correlated with soil moisture content and that water movement was faster under low initial soil moisture content.