

Enhancing the urea-N use efficiency in maize (*Zea mays*) cultivation on acid soils using urea amended with zeolite and TSP

Abstract

Problem Statement: Ammonia loss significantly reduces urea-N use efficiency in crop production. Efforts to reduce ammonia loss are laboratory oriented, as such limited in reflecting actual field conditions. This paper reports the effects of urea amended with triple superphosphate (TSP) and zeolite (Clinoptilolite) on soil pH, soil nitrate, soil exchangeable ammonium, dry matter production, N uptake, fresh cob production and urea-N uptake efficiency in maize (*Zea mays*) cultivation on an acid soil in actual field conditions. **Approach:** The treatments evaluated were: (i) Normal N, P, K application (74.34 g urea, 27.36 g TSP, 24.12 g KC1) (T1), (ii) Urea-TSP mixture (74.34 g urea+27.36 g TSP)+24.12 g KC1 (T2), (iii) 74.34 g urea+27.36 g TSP+9.0 g zeolite (T3), (iv) 74.34 g urea+27.36 g TSP+13.5 g zeolite (T4) and (v) No fertilization (T5). Note, the same amount of 24.12 g KC1 was used in T3 and T4 plots. Standard procedures were used to determine the selected chemical properties of zeolite, soil, TSP and urea. The pH of the urea, zeolite, soil and TSP were determined in a 1:2.5 soil: distilled water suspension and/or 0.01 N CaCl₂ using a glass electrode. The CEC of the zeolite was determined by the CsCl method. Soil CEC was determined by leaching with 1 N ammonium acetate buffer adjusted to pH 7.0 followed by steam distillation. Soil samples at harvest were analyzed for pH using the method previously outlined. Exchangeable ammonium and nitrate at harvest were extracted from the soil samples by the method of Keeney and Nelson and the amount determined using a LACHAT Autoanalyzer. Total N of the plant tissues (stem and leaf) was determined by the Micro-Kjeldhal method. **Results:** Urea amended with TSP and zeolite treatments and Urea only (urea without additives) did not have long term effect on soil pH and accumulation of soil exchangeable ammonium and nitrate. Treatments with higher amounts of TSP and zeolite significantly increased the dry matter (stem and leaf) production of Swan (test crop). All the treatments had no significant effect on urea-N concentration in the leaf and stem of the test crop. In terms of urea-N uptake in the leaf and stem tissues of

Swan, only the treatment with the highest amount of TSP and zeolite significantly increased urea-N uptake in the leaf of the test crop. Irrespective of treatment, fresh cob production was statistically not different. However, all the treatments with additives improved Urea-N uptake efficiency compared to urea without additives or amendment. Conclusion: Urea amended with TSP and zeolite has a potential of reducing ammonia loss from surface-applied urea. © 2009 Science Publications.