

Ammonia volatilization and ammonium accumulation from urea mixed with zeolite and triple superphosphate

ABSTRACT

Ammonia volatilization from surface-applied urea fertilizer reduces N fertilizer use efficiency by crops. Beneficial formation of NH_4 over NH_3 leading to reduction of NH_3 loss may be possible through addition of zeolite and acidic materials. The objective of this laboratory study was to evaluate the effect of four different urea-triple superphosphate (TSP)-zeolite mixtures on NH_3 volatilization and NH_4 and NO_3 contents in soil, compared with surface-applied urea without additives. The soil was a sandy clay loam Typic Kandudults (Bungor Series). The mixtures significantly reduced NH_3 loss by 34 to 49% compared with urea (straight urea, 46% N) and larger reductions were obtained with higher rates of zeolite (0.75 and 1 g kg^{-1} of soil). All the mixtures of acidic P fertilizer and zeolite with urea significantly increased soil NH_4 content but not NO_3 content. The mixtures with acidic P fertilizer and zeolite also significantly increased soil-exchangeable Ca, K and Mg, and benefited the formation of NH_4 over NH_3 compared with urea without additives. The increase in soil-exchangeable cations, and temporary reduction of soil pH, might have impeded urea hydrolysis in the microsite immediately around the fertilizer. It could be possible to improve the efficiency of urea surface-applied to high value crops by addition of TSP and zeolite.

Keyword: Acid soils; Acidic fertilizers; Ammonia loss; Clinoptilolite zeolite; Nitrogen fertilizers; Nitrogen efficiency