

Using soil water to control ammonia emission from acid soils with and without chicken litter biochar

ABSTRACT

Although urea use in agriculture is on the increase, increase in pH at soil microsite due to urea hydrolysis which causes ammonia emission can reduce N use efficiency. Among the interventions used to mitigate ammonia loss include urease inhibitors, clinoptilolite zeolite, coated urea, and biochar but with little attention to the use of soil water levels to control ammonia volatilization. The objective of this study was to determine the effects of soil water levels on ammonia volatilization from soils with and without chicken litter biochar. Dry soils with and without chicken litter biochar were subjected to 0%, 25%, 50%, 75%, 100%, and 125% soil water. There was no urea hydrolysis in the soil without water. Chicken litter biochar as soil amendment effectively mitigated ammonia loss at 1% to 32% and 80% to 115% field capacity. However, urea used on soil only showed lower ammonia loss at 33% to 79% and 116% to 125% field capacity compared with the soils with chicken litter biochar. At 50% field capacity ammonia loss was high in soils with and without chicken litter biochar. Although chicken litter biochar is reputed for improving soil chemical properties, water levels in this present study affected soil chemical properties differently. Fifty percent field capacity, significantly reduced soil chemical properties. These findings suggest that timely application of urea at the right field capacity can mitigate ammonia emission. Therefore, whether soils are amended with or without chicken litter biochar, urea application should be avoided at 50% field capacity especially in irrigated crops.

Keyword: Ammonia volatilization; Chicken litter biochar; Soil water; Urea hydrolysis