Reduction of ammonia loss by mixing urea with liquid humic and fulvic acids isolated from tropical peat soil

Abstract

Problem statement: Fertilizer N use efficiency is reduced by ammonia volatilization. Under low soil CEC and high pH, N from soil solution is released to the atmosphere. Ammonia loss due to low worldwide N use efficiency (33%) has been implicated in global warming. Thus, the objectives of this laboratory study were to evaluate the effectiveness of liquid humic and fulvic acids, isolated from tropical peat soils in reducing N loss from urea fertilizer as well as to investigate the ability of these acids to retain NH4+ and NO3 or reduce soil pH. Approach: Formulated liquid N fertilizers consisting of urea and different types of humic molecules (HA or FA or mixture of both), solid and liquid urea were surface applied to 250 g of soil. A closed dynamic air flow system was used to trap NH3 loss in boric acid after which samples were titrated with 0.01 M HC1 to estimate NH 3 loss. After 30 days of incubation, the soil was air dried and analysed for pH, exchangeable NH4+, available NO 3 and exchangeable cations. The results were analysed using SAS and treatments means were compared using Duncan's New Multiple Range Test (DNMRT). Results: The use of humic molecules reduced NH3 loss and increased exchangeable NH4+. The high CEC of Humic Acids (HA) made the LHA treatment the best in reducing N loss after surface application. The presence of HA and Fulvic Acids (FA) increased NH4+ recovery. Even though, the soil pH of all the treatments were high, significant reduction of N loss was observed for humic molecules treatments. Conclusion: The use of liquid organic N fertilizer has the ability to reduce NH3 volatilization in acid soil. The use of both humic and fulvic acids could be effective in promoting NH4+ retention. Thus, it can be concluding that, humic substances, in general, have great ability in controlling NH3 loss and retaining NH4+ in acid soils. It could be a cheapest, practical and easiest way to control N loss.