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Synthesis and Effect of Double-Coated Urea with Nano-Sulfur and Organic Material on N_2O Emissions

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Abstract

Fertilizer coating is a new technique in fertilizer management in an effort to make them more efficient in use and reduce their negative effects on the environment. Nitrous oxide (N2O) is a major greenhouse gas, and the agricultural soils are apparently one of the major anthropogenic sources of N2O gases, principally due to the application of N fertilizers like urea. This experiment investigated the impacts of the application of the double coating of urea with nano sulfur and organic substances; lignite, biochar and compost on the fluxes of N2O emitted by silty clay and sandy loam soils. The fluxes of N2O were recorded in an N2O analyzer in a controlled environment for 26 days. We determined cumulative fluxes of N2O of the various treatment with propagated uncertainties. Maximum N2O emission (155.64 µg N m -2 h -1) was greater in Sandy loam soil than silty clay soil (24. 47 N m -2 h -1). In both soils, the uncoated urea and urea + nano sulfur coating led to increased N2O emissions. In the meantime, organic second layer surfaces reduce the N2O fluxes particularly in sandy loam. This was because the second organic layer coating reduced the N2O emissions with relatively less effects in silty clay soil (3.8-7.0%), but more in the sandy loam soil (35.2-41.5%). Lignite was found to be the best organic coating material followed by biochar and compost. The findings reveal that fertilizer induced N2O emissions are significantly influenced by the urea coating as fertilizer management treatment and the soil texture. The results indicate that the urea coating as fertilizer management strategy as well as soil texture have considerable effects on fertilizer induced N2O emissions.

Keywords: nitrogen, urea, flux, coating, fertilizer, soil