CARBON & NITROGEN TRANSFORMATION IN SOIL AFTER BIOSOLIDS OR INORGANIC FERTILIZER APPLICATION

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ABSTRACT

Biosolids are nutrient rich organic residues which could be a potential alternative to conventional fertilizers. However, their C and N mineralization rates vary depending on treatment processes and soil properties. A laboratory incubation was carried out to evaluate C and N dynamics in contrasting soils by quantifying gaseous losses and assessing N transformations between organic and inorganic pools. Soils collected from Texas (sandy clay loam, pH: 8.4) and Florida (sandy loam, pH: 7.6) were amended with electrolysis-treated biosolids (EGROW^{TM}), composted cattle manure, commercially available biosolid product (Top Choice), urea, and unamended control following a 2 × 4 factorial design with four replications. Initial results showed that top choice consistently produced higher CO_2 emissions across both soil types. NH_4^+-N and NO_3^--N were measured on days 1, 7, 14, 28, 56, and 121. Headspace gases were collected to analyze CO_2, N_2O and CH_4 after 1, 2, 3, 5, and 9 days, and weekly afterward until the end of experiment. Compared to EGROW^{TM}, N_2O emissions in the Florida soil were not significantly different from urea but were 51.3% higher with Top Choice. In contrast, N_2O emissions were 202.5% higher with urea in Texas soil compared to EGROW^{TM} but not significantly different from Top Choice. Urea resulted in greater NH_4^--N and NO_3^--N concentrations during the first two weeks compared to the biosolids in both soils. It is expected that the application of electrolyzed biosolids enhances C and N cycling and provide sufficient plant-available N, while minimizing gaseous N_2O losses compared to conventional fertilizers.

Keywords: Mineralization, nutrient cycling, biosolids, soil properties