Fertilizer Value of Lime-Stabilized Biosolids as a Soil Amendment

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ABSTRACT

To promote and guide agricultural uses of lime-stabilized biosolids (LSB), the fertilizer value of this particular organic waste was determined. Lime-stabilized biosolids from a regional wastewater treatment plant were examined for total nutrient content, liming effectiveness, and nutrient release kinetics and supply capacity using chemical characterization, batch incubation, and column leaching techniques. The LSB contained 279 g kg^{-1} organic carbon, 40.3 g kg^{-1} N, 13.2 g kg^{-1} P, 1.8 g kg^{-1} K, 151 g kg^{-1} Ca, and 6.6 g kg^{-1} S, and its lime equivalency was 261 g $CaCO_3$ kg^{-1}. Incubation of the LSB with a sandy loam (pH 5.3; lime buffer capacity 350 g $CaCO_3$ kg^{-1} per unit pH) at 4 and 12.5 g kg^{-1} for 90 d raised the soil pH to 6.3 and 7.1, respectively, indicating 56% of the LSB's $CaCO_3$ equivalency was effective in neutralizing soil acids. Intermittent water leaching of 10 g kg^{-1} LSB-amended soil columns resulted in sigmoidal release of 15.9 g N, 0.23 g P, 1.1 g K^+, 42.0 g Ca^{2+}, 10.7 g SO_4^{2-}, and nearly 0 g toxic elements in the leachate per kg of the applied LSB in the leachate in 140 d. If applied at 10.4 t ha^{-1}, the LSB would significantly reduce soil acidity and furnish 165 kg N, 2.4 kg P, and 11.4 kg K available to per hectare of seasonal crops.