

Renovation of Acidic Appalachian Soil with FGD Gypsum and FBC Residue: Soil Leachate Evaluation

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KEYWORDS: agriculture, aluminum toxicity, calcium deficiency, magnesium deficiency, soil acidity, amendment.

ABSTRACT

Appalachian pastures and woodlands are often acidic and low in Ca and Mg. Limestone supplies Ca and insolubilizes toxic Al and Mn, but incorporation below the surface 15-cm layer is impractical. Addition of soluble Ca materials produced by scrubbers allows leaching into subsurface layers to reduce limitations to root growth. The top 15 cm of columns of a Typic Hapludult (Lily) loam soil were treated with dolomitic limestone (aglime), flue gas desulfurization (FGD) gypsum, FGD gypsum + aglime, FGD gypsum + 6% Mg(OH)₂, and a fluidized bed combustion residue (FBC). The 105 cm tall columns were leached with the equivalent of approximately one year of rainfall. More than half the Ca in the gypsum treatments moved below the 15-cm incorporation layer, and about 15% leached out of the columns. Approximately 75% of the important plant nutrient, Mg, added in the gypsum + aglime treatment moved below the surface layer, and more than half was found in the leachate. Percentage retention of Mg from the gypsum + 6% Mg(OH)₂ treatment was even lower. FBC and gypsum treatments successfully decreased plant-available Mn and Al levels below the incorporation layer. From 10% to 15% of the decrease in Al was attributable to Al leached out of the soil. Leachate Al concentrations reached 10 mg/L. Scrubber byproducts also increased soil leachate levels of S, Fe, P, Mn, Na, K, Si, Sr, and Zn.