SOIL, WATER, AND CLIMATE
MS DEFENSE SEMINAR

Turkey Manure Incinerator Ash a P and K Source for Crop Production

by

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Tuesday, April 22, 2007
9:00 – 10:00 am
375 Borlaug Hall

ABSTRACT:

A power plant that utilizes turkey manure as fuel to produce energy was built in Benson, MN, and started full energy production in 2007. The plant was built to meet legislative requirements governing the use of renewable sources to generate energy in Minnesota. While the use of turkey manure as biofuel generates energy, it also results in an ash byproduct (TMA) that contains phosphorus (P), potassium (K), sulfur (S), and zinc (Zn) as well as other essential and nonessential elements. A series of field, greenhouse, and lab studies were conducted with the following objectives: 1) chemically characterize the TMA, 2) determine the effects of TMA on soil test P and K, 3) compare the effectiveness of TMA with commercial fertilizers as a nutrient source for corn, soybean and alfalfa, 4) examine the potential of TMA to supply P and other essential and non-essential nutrients for corn, soybean, and alfalfa.

For the field studies on medium to high P soils, alfalfa, corn, and soybean yields were similar with TMA and fertilizer. No risk for tissue or soil trace element build up was found. Based on a short-term pot study on a low P soil, P availability with TMA was significantly lower than with commercial P fertilizer and resulted in lower corn biomass yield. However, P availability for plant uptake in TMA-amended soil was found to increase with time. In the same investigation, use of the Bray P-1 and Olsen tests for soil P extraction led to contradictory results. Bray P-1 concentrations did not correlate well with plant P uptake, while Olsen P concentrations correlated well with plant P uptake. In a soil incubation study, P solubilization was slower soon after TMA application compared with fertilizer, but then increased with time. Based on results from both the greenhouse and incubation studies, the Olsen P test appeared to provide a better estimate of plant available P in TMA amended soils than the Bray P-1 test. Overall, TMA was found to be an effective nutrient source for crop production when applied at rates equivalent to P fertilizer, but P availability must be considered as a potential yield limiting factor for short season crops.