USING PHOSPHORUS RECOVERED FROM ANIMAL MANURE IN COTTON PRODUCTION

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Abstract

Controlled environment studies suggested that phosphate recovered from animal manures is an effective fertilizer for crop production when it is mixed in the soil. We conducted this research to evaluate phosphate recovered from swine wastewater as a fertilizer for no-till cotton (*Gossypium hirsutum* L.). In 2008-2009 and 2009-2010, a field experiment was conducted on a Norfolk sandy loam soil. In the fall of 2008 and 2009, rye (*Secale cereal* L.) was planted into 12.5 ft wide plots (four 38-in wide cotton rows) that were 50 ft long in 2008 and 35 ft long in 2009. A broadcast application of three phosphorus treatments (150 lb phosphate per acre) was made immediately after planting the rye. Treatments in the experiment were diammonium phosphate (DAP), recovered phosphorus at a particle size of 0.5 – 1.0 mm, recovered phosphate at a particle size of 2.0 – 4.0 mm, and an unfertilized control. There were four replicates of each treatment each year. In April of 2009 and 2010, the rye biomass was harvested and cotton (cultivar DPL 09049B2RF) was no-till planted into the stubble. Soil test values of phosphate (Mehlich – 1) of the surface four inches were determined monthly. Two 16 square inch blocks cover with anion exchange resins were placed vertically into the surface of the soil in the middle of each plot. Resins were replaced in the same holes monthly. Phosphate sorbed to the resins was quantified. Cotton yields were determined at the end of the cotton growing season each year. Average cotton lint yield was approximately 1520 lb per acre in 2009 and 860 lb per acre in 2010. Although soil samples collected prior to planting the rye indicated the soil was 'medium' for phosphate each year, fertilizing with phosphate did not increase yield as there were no differences among the treatments for lint yield in either year. Soil test values of the surface four inches were quite variable, though soil from the DAP and the 0.5 – 1.0 mm recovered phosphorus plots tended to test higher for phosphate than the other two treatments. In both years, the phosphate on the exchange resins in the DAP treatment was higher than in the other three treatments. Phosphate on the exchange resins in both recovered phosphorus treatments did not differ from the controls. This is likely due to the low water-soluble fraction of phosphate in the recovered phosphorus material (<1.0%) compared to the citrate-soluble fraction (99%). Diammonium phosphate is highly water soluble. Our controlled environment studies indicate that the recovered appears to be an acceptable P fertilizer for conventional tillage systems. Because of the low water solubility of the material, modified management, such as blending with high water soluble materials or banding under the soil surface, may be required for optimal use in conservation tillage systems.