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EFFECT OF POULTRY LITTER RATE ON RESIDUAL SOIL P OVER A FIVE SEASON STUDY PERIOD

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Background. A rapid growth in the poultry industry is being experienced by several southern states. This expanded production increases the amount of poultry litter requiring disposal in a timely, profitable, and environmentally sound manner. Nitrogen (N) - phosphorus (P) - potassium (K) ratio in poultry litter does not match the ratio of nutrients required by vegetable crops. As a result, complete nutrient utilization is rarely accomplished. The amount of litter to apply is based on N content of the litter and N recommendation for specific crop production. When litter is applied in this manner, P can accumulate and result in conditions that increase the risk of non-point source pollution of surface water. A three-year study was initiated in the spring 1995 at the Texas A&M University Agricultural Research and Extension Center, Overton. The purpose was to investigate the feasibility of growing warm- and cool-season legume crops to remove excess P supplied by poultry litter and commercial blend fertilizer.

Research Findings. Litter rates were applied according to soil test recommendation for N for the specific vegetable crop being grown. Rates were 0 (control), 1X (recommended rate), 2 times or 4 times the recommended rate. A commercial blend fertilizer was applied for comparison. The vegetable crop, percent N, dry matter, tons per acre litter, and pounds per acre commercial blend for each season were: spring 1995 - watermelon, 3.4% N, 57% DM, 1.0 tons/A, 40N-10.9P-25K lbs/A; fall 1995 - broccoli, 3.4% N, 51% DM, 3.7 tons/A, 130N-21.8P-25K lbs/A; spring 1996 - tomato, 3.3% N, 60% DM, 3.0 tons/A, 90N-15.3P-70K lbs/A; fall 1996 - collards, 3.3% N, 60% DM, 4.0 tons/A, (summer veg.-fall veg), 4.0 tons/A (summer legume-fall veg.), 165N-17.4P-83K lbs/A and 170N-21.8P-99.6K lbs/A to the respective systems; spring 1997 - squash, 3.4% N, 61% DM, 1.7 tons/A, 80N-19.6P-45.6K and 150 KMgSO₄, 15 S lbs/A (summer veg.-fall legume), 80N-13P-33.2K and 150KMgSO₄, 15 S lbs/A (summer veg.-fall veg.).

Application rates of poultry litter affected soil P over time (Fig. 1). Applying litter at the recommended rate from soil testing (1X), maintained P levels in the surface 0-6 inch soil depth at approximately 60 ppm (160 lbs/A) during the study period of 5 seasons. This is below the maximum rate set by Soil Conservation Standards for the typical soil types of East Texas (600 lbs/A). Leaching of P through the soil profile was also reduced. Increasing litter application rate from 2 times (2X) to 4 times (4X) the recommended rate increased concentration. The least amount of P accumulation was from commercial blend fertilizer. This treatment maintained P levels

approximately equal to the control plot.

Application. Management is the key to efficient utilization of litter nutrients by a crop. Proper management will increase economic returns, sustain soil productivity, and reduce environmental concerns. This study has shown that by utilizing soil test results for litter application, P concentrations in the soil can be held in check, thus reducing the chance for non-source pollution of surface water.

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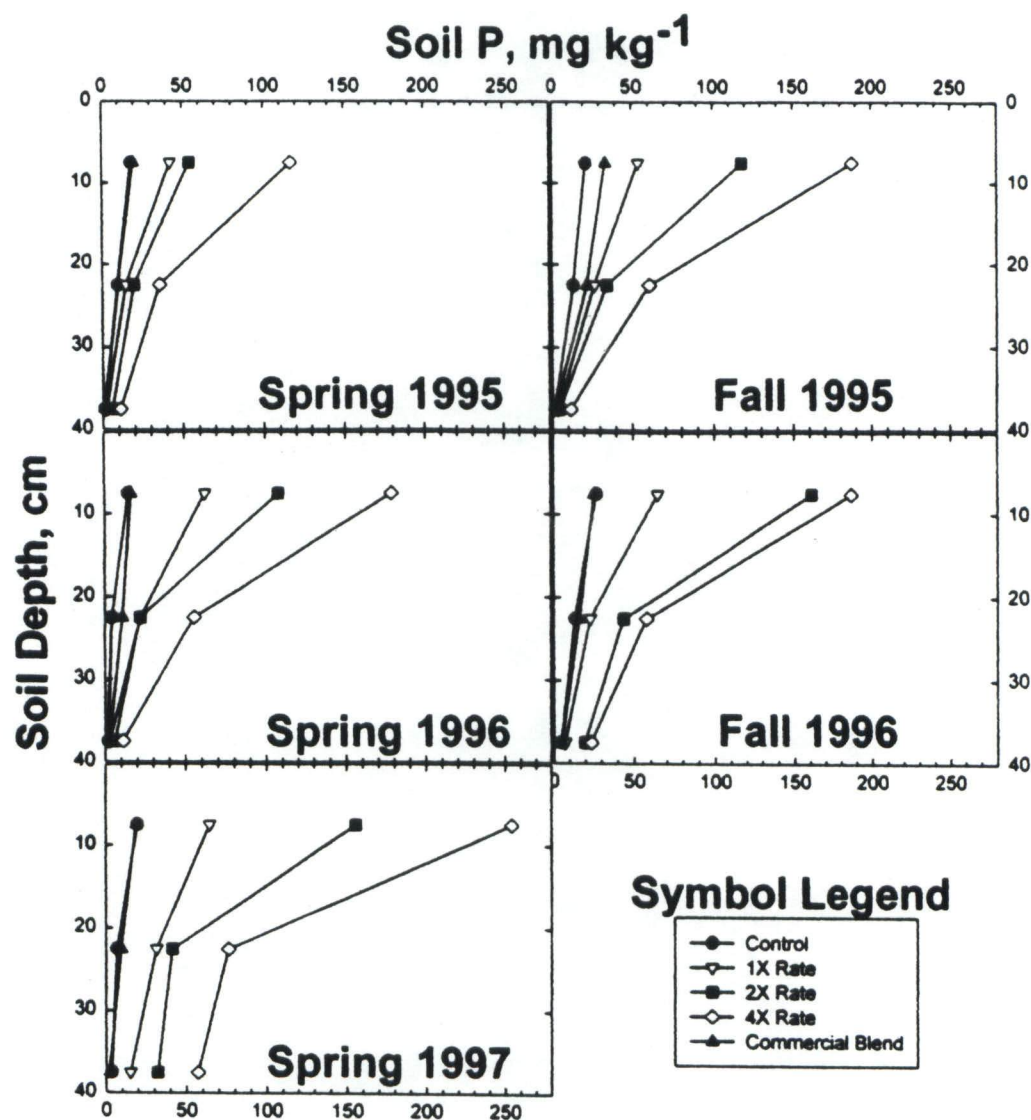


Fig. 1. Residual soil P vs. soil depth following poultry litter fertilizer application rates and blended commercial fertilizer treatments. Fertilizer treatments were applied to watermelon (Spring 1995), broccoli (Fall 1995), tomatoes (Spring 1996), and collard greens (Spring 1997).