

Runoff Quality in Bermudagrass Plots Treated with Poultry Litter

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ABSTRACT

The overall objective of this study was to quantify runoff volumes, concentrations of $\text{NO}_3\text{-N}$, $\text{PO}_4\text{-P}$, K, Cu, Fe and Zn, and near-surface hydrology of bermudagrass plots treated with poultry litter under simulated rainfall. Poultry litter with application rates of 0, 4.48, 8.96, 17.92 and 35.84 Mg ha^{-1} was applied to micro-plots (1.75 x 2 m) on a 5% slope. The soil used in this study was a loessial Memphis silt loam (fine-silty, mixed, thermic Typic Hapludalf). Rainfall simulator was used to produce two runoff events immediately and 1.55 h after poultry litter application. Soil profile water content increased with rainfall application. Cumulative runoff volumes for the 0, 4.48, 8.96, 17.92 and 35.84 Mg ha^{-1} plots for the first rainfall event were 114.6, 84.3, 102.3, 155.4 and 88.9 L, respectively. During the second rainfall event, cumulative runoff volumes were 116.8, 106.9, 121.1, 167.3, and 130.7 L, respectively. Flow-weighted mean concentrations of $\text{NO}_3\text{-N}$, $\text{PO}_4\text{-P}$ and K increased with litter application rate, however, $\text{PO}_4\text{-P}$ concentration in the 8.96 Mg ha^{-1} treatment was significantly smaller (19.68 mg L^{-1}) than the 4.48 Mg ha^{-1} treatment (24.12 mg L^{-1}) in the first rainfall event ($p = 0.05$). Nitrate-nitrogen concentrations in the 17.92 and 35.84 Mg ha^{-1} treatments were 55 and 112 times higher than the 4.48 Mg ha^{-1} treatment. Approximately 13, 8.2, 6.6 and 2.6% of soluble P was measured from runoff of the treated plots. Potassium concentration increased hyperbolically with increased poultry litter rates. In all treated plots, copper, iron and zinc concentrations were far below 0.001 mg L^{-1} for the two rainfall events.