Science Societies

Preferential Transport of Phosphorus and Nitrogen

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A large intact soil column extracted from a pasture field treated with broiler litter. Photo by Kriti

A large intact soil column extracted from a pasture field treated with broiler litter. Photo by Kritika Malhotra, Auburn University.

Repeated application of broiler litter, a mixture of poultry manure and bedding material, to agricultural lands as fertilizer can lead to nutrient enrichment of subsurface water, especially when macropores in the soil allow preferential flow paths. This nutrient leaching poses environmental risks.

Researchers at Auburn University investigated how broiler litter application and the presence of soil macropores impact the leaching of nitrogen and phosphorus at different topographical positions in a pasture field. They collected large intact soil columns from the field and took nutrient leaching measurements in the laboratory, which they linked to soil macropore characteristics quantified using X□ray computed tomography image analysis and solute transport modeling. They found that litter

application significantly increased phosphorus levels in leachate, and nutrient leaching trends varied across slope positions with highest concentrations of phosphorus obtained from upslope columns compared with those downslope. Nitrate levels in leachate exceeded drinking water standards across all slopes.

The results highlight the importance of soil physicochemical properties, especially the presence of preferential flow pathways, which can affect phosphorus loss substantially. Overall, these findings may inform optimal litter application rates and effective land management strategies for water quality preservation.

Adapted from

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