

Tracking poultry litter phosphorus: Threat of accumulation?

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The Delmarva Peninsula, flanking the eastern shore of the Chesapeake Bay, is home to some 600 million chickens. The resulting poultry manure and some of the chicken house bedding material is usually composted and then spread onto croplands as a fertilizer.

Phosphorus-31 nuclear magnetic resonance (^{31}P NMR) and other methods of soil analysis have previously shown that two forms of phosphorus - orthophosphate and phytate (aka myoinositol hexakis phosphate) - dominate composted poultry litter. Although much is known about the transport of orthophosphate in soils, very little is known about the fate of phytate, a compound that is indigestible by poultry and abundant in poultry litter. With six phosphate groups per molecule phytate has the potential to be a significant player in non-point phosphorus pollution.

As part of her doctoral dissertation research at Yale University, scientist Jane Hill worked with scientist Barbara Cade-Menun at Stanford University to investigate the fate of phytate in crop soils on the Delmarva Peninsula. Specifically, Hill and Cade-Menun measured changes in phosphorus forms along a spatial transect on two active poultry farms. Using ^{31}P NMR and supporting analytical methods, they found that phytate concentration was high in manures (about 50% of total P) but was not retained in crop soils and ditch sediments, where concentrations dropped to 2 to 15% of the total P. A corresponding increase in soil and sediment orthophosphate was also measured.

The study concluded that phytate does not accumulate in soils, but rather, is most likely to be hydrolyzed in situ by microorganisms. Results of the study were published in the January-February issue of the *Journal of Environmental Quality*.

Research in the respective groups of Drs. Hill and Cade-Menun is ongoing. Dr. Hill is focused on assessing the timing and controls on phytate hydrolysis in soils. Dr. Cade-Menun is currently a nutrient cycling scientist with Agriculture and Agri-Food Canada at the Semiarid Prairie Agricultural Research Station, focusing on the impacts of agricultural nutrients on the environment.

View the paper abstract at jeq.scijournals.org/cgi/content/abstract/38/1/130 .

Source: Soil Science Society of America

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