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Increasing costs of synthetic fertilizers has resulted in many farmers adopting different animal manure like poultry litter/wastes as substitutes for synthetic fertilizers. This is especially true for Delaware which has a large surplus of poultry waste associated with a large poultry industry. The use of poultry litter as an alternative to commercial fertilizers is promising as it simultaneously reduces the cost of production and helps to dispose waste from animal operations. To encourage the use of poultry litter as fertilizer, a pelletized form is also being introduced. Pelletized poultry litter (PPL) is much more amenable to transport and land application than its raw counterpart. However, currently our knowledge limited on how the application of poultry litter in either raw or in pelletized form, applied to agricultural land, impacts surface runoff water quality. Non-point source pollution from agricultural land is an existing concern and we must ensure that large-scale adoption of poultry wastes as fertilizer on croplands does not worsen the problem.

Recent studies suggest that poultry waste contains naturally-occurring steroidal hormones which may pose a threat to the environment. These hormones are also referred to as endocrine disrupting chemicals (EDCs) and are responsible for sexual disorders in aquatic organisms, especially fish. Estrone, 17 β -estradiol, and some other related chemicals (i.e., conjugates), which are generally present in poultry litter, can also move with the surface runoff from plots receiving this manure. In addition to that, presence of trace elements like arsenic, copper, and zinc has also been observed in poultry litter and surface runoff receiving poultry litter. The specific objectives of this research are to: (1) estimate the mass load and concentrations of the naturally occurring steroidal sex hormones and trace elements in surface runoff from poultry litter applied plots and (2) understand the impact of litter types and tillage practices on (1). Presently, the transport of free estrogens (estrone and estradiol) and their conjugates, and trace elements at three different scales – pedon, field plot, and watershed - is being investigated.

At the first stage of the project, surface runoff samples from the raw and PPL applied plots, and control plots were collected and analyzed. Reduced and no-till were considered as two different tillage practices. Samples were analyzed for hormones and trace elements. It was observed that the raw litter applied plots' surface runoff had significantly higher amounts of hormones and trace elements compared to PPL and control plot runoff. Those results highlighted that the application of PPL was more environmentally suitable compared to application of raw poultry litter, at least while considering selected hormones and trace elements. No tillage with PPL was the most eco-friendly practice.

In the next stage of the study, the same chemicals will be monitored in runoff at the pedon and watersheds, with the litter applied at the same rates as previously. The intention is to monitor how the changes in scale alter the mass exports and concentrations of hormones and trace elements in the surface runoff. We hypothesize that, with the increase in experimental area from pedon to plot to watershed, the concentrations and loads of hormones and trace elements will decrease.