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The Environmental Impact of Aluminum Sulfate and Salicylic Acid Treated Poultry Litters on Forage Production and Watersheds

Eutrophication resulting from phosphate pollution is one of the most costly water quality problems in North America today. Algae overgrowth not only affects drinking water quality, but biologists recently discovered that chemicals released by some algae stimulate the reproduction of zebra mussels. Agricultural practices contribute much of the non-point sources of nitrate and phosphate pollution in surface and ground waters. Research to develop ways of reducing phosphate pollution in watersheds is vital due to the increasing number of confined animal feeding operations as market animal production is fast becoming a corporate farm venture. Large concentrations of animals produce large quantities of animal waste that must be disposed of properly to prevent nutrient pollution in surrounding watersheds.

This experiment combined three years of research on allelochemicals with last year's study of alum treated poultry litter in an effort to find an environmentally protective litter treatment with effective algaecide properties. Salicylic acid (SA), an allelochemical found in the roots of birch trees, has been shown to be a very effective algaecide when added directly to poultry litter run-off water. The purpose of this experiment was to evaluate the effects of poultry litter fertilizer treated with salicylic acid on forage production and run-off water phosphate levels and to determine if Closterium algae growth in the run-off water was adversely affected. Aluminum sulfate (alum) has been used successfully as a litter treatment, but its effects on forage production in phosphorus deficient soil has not been evaluated. Therefore, alum was tested in this experiment also.

Five poultry litter treatments – 10% and 5% salicylic acid, 10% and 5% alum, and plain litter - were tested in each phase of the experiment. It was hypothesized that the salicylic acid and alum litters would not adversely affect forage production and would reduce phosphorus run-off thereby limiting algae growth.

Twenty-four test plots were established in a phosphorus deficient fescue pasture. Fertilizers were mixed and applied to the corresponding plots. The Control plots were not fertilized. Forage samples were taken every 45 days, dried, and weighed. Next, fescue sod boxes with metal spouts were constructed, and treated litter was applied. The sod fertilized with plain litter served as a control. Eight run-off water samples per treatment were collected and analyzed for soluble phosphates. Five samples of run-off water from each treatment were inoculated with Closterium algae culture. Live and dead algae cell counts were performed on Day 1 and 7 post inoculation.

The two salicylic acid treatments did not adversely affect fescue production as both salicylic acid litter treatments had significantly higher yields than the control plots. Neither salicylic acid treatment significantly lowered phosphate levels in the run-off water; however, they did adversely affect algae growth. The data indicated that the salicylic acid may have had a direct effect on the algae cells rather than chemically tying up the phosphates in the litter. Overall, the data indicated that the 10% alum treated litter was the most effective litter treatment as it did not adversely affect forage production, significantly reduced run-off phosphate levels and adversely affected algae growth.