ANE94-020

EFFECTS OF LIQUID DAIRY MANURE APPLICATION TIMING ON CORN YIELD AND SOIL SOLUTION NITRATE CONCENTRATION

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B.S. University of Maine, 1982

A THESIS
Submitted in Partial Fulfillment of the
Requirements for the Degree of
Master of Science
(in Ecology and Environmental Science)

The Graduate School
University of Maine
December, 1997

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Conflicts between agricultural and non-agricultural land uses continue to increase as animal production intensifies and human populations expand. Groundwater quality and agricultural practices are important issues in Maine which are often at the center of the land use conflict. Manure applied to cropland can provide plant nitrients if managed properly, but is a potential environmental pollutant if managed poorly. The timing of manure application is an important part of the management of this agricultural resource.

A randomized complete block experiment with three replications was implemented to evaluate the effect of manure timing on corn (*Zea mays*) yield and soil solution nitrate (NO_3-N) concentration. Liquid dairy manure (LDM) was applied at three different times; early fall (October), late fall (November), and spring (May), at an application rate of 9000 gal acre $^{-1}$ or approximately 150 lb, of N acre^{-1}, control plots were also established. The soil type is a Boothbay silt loam. To sample soil solution (NO_3-N concentrations), lysimeters were installed at a depth of two feet in all plots. Soil solution samples were collected every two weeks depending on water availability. Subplots with

four nitrogen (N) rates; 40,80,120, 160 lb. N acre $^{-1}$ were established in each main plot. Ammonia nitrate was the N source and applied by hand. Crop nitrogen status was monitored using Presidedress NO_3-N test, earleaf TKN, and Whole plant N uptake. Corn was harvested from the center row of each main plot and subplot to determine dry matter yield and N uptake.

No significant differences in crop yield based on timing of manure application. There was a significant difference in whole plant TKN between the control and manure treatments. Even though the May treatment had the highest PSNT values all treatments would probably have responded to a sidedress application of 25 lb. of N acre $^{-1}$ in the main plots.

There was an interaction between timing and N rates. Both, October and control treatments showed a positive response to additional N application up to approximately 100 lb. of N acre^{-1}. Addition of approximately 40 lb. of N acre^{-1} to October and control treatments would be needed to achieve yields similar to November and May treatments. Neither November or May responded to additional N, indicating that sufficient N had remained in the rooting zone.

Soil solution N concentration differences, between treatments November and May, were significant after two storm events in May and June. These data indicate some environmental N loss should be expected from corn production regardless of the time of application. Approximately, 74 lb. of N applied had the potential to leach into the groundwater in this study from all treatments. The loss mechanisms and timing may vary for different application times but the amount of N loss appears to be similar in all treatments. Fall-applied inorganic N is lost in the months up to active growth while spring-applied organic N is mineralized and lost during the fall.