

Correlation and Calibration of the Illinois Soil Nitrogen Test for Use as a Nitrogen Fertility Management Tool

David Gardner
The Ohio State University

Brian Horgan
University of Minnesota

Kevin Frank
Michigan State University

Objectives:

1. Evaluate the production of mineral N during incubation of soils differing in N fertilizer responsiveness.
2. Refine the critical amino sugar-N levels for turfgrass quality responsiveness.
3. Determine the impact of long term fertility management practices on soil amino sugar-N values and nitrate leaching potential and to evaluate amino sugar-N concentration changes over time using the long-term N leaching plots at Michigan State University.

Start Date: 2010 (current cycle)

Project Duration: 2 years

Total Funding: \$46,962

Although a majority of research has indicated that turfgrass fertilization with nitrogen poses little risk to the environment, results of recent studies suggest that over time, mineralization will exceed immobilization on fertilized turf which may lead to potential nitrate leaching. Previous nitrate-N tests have not accurately predicted the potential of organic N fractions that will become available to the plant over the growing season.

Our research is attempting to correlate and calibrate the Illinois Soil Nitrogen Test which was developed to identify sites in production agriculture that are not responsive to N fertilizer. The test measures amino sugar-N fractions in the soil organic N pool, which supplies the plant with N through mineralization. This fraction is relatively stable compared to NO_3^- and NH_4^+ , and thus may provide an accurate measure of nitrogen fertility on managed turfgrass. A test for soil N status in turfgrass would allow superintendents to reduce excess time and money spent on unnecessary fertilizer applications and may predict the impact of our fertility practices that could reduce environmental contamination associated with nitrate leaching.

Soils have been collected from North Dakota, Illinois, Indiana, Ohio, Michigan, Wisconsin and Minnesota and are being tested in laboratory experiments. We hypothesize that North Central region soils with amino sugar-N values greater than 325 ppm and are deemed nonresponsive sites will mineralize significantly more N than those soils with amino sugar-N values less than 325 ppm.



The test measures amino sugar-N fractions in the soil organic N pool which supplies the plant with N through mineralization.

We have conducted several experiments that investigate the yield response of turfgrass to added nitrogen in soils with various amino N levels. Results of these trials suggest turfgrass clipping yield response to added nitrogen may be lower on soils with higher amino sugar-N levels. However, the results are not as conclusive as what has been found in production agriculture. We are conducting studies on soils with more extreme values of amino N while also examining other characteristics of the turf, such as turfgrass quality and color.

Part of our hypothesis is that as amino N levels increase in soil, the N needs of the turf are increasingly met by mineralized organic N. On high amino-N soils there may be an increased chance that added fertilizer N would be more susceptible to leaching. In order to test this

hypothesis, soil samples have been gathered from microplot lysimeters at Michigan State University for the years 2000-2010. Our goal with the analysis of these samples is to determine if the nitrate leaching events observed on the lysimeters at Michigan State can be correlated to changes in the amino N level in the soil.

We expect to develop sampling procedure guidelines and interpretation of the ISNT results based on amino sugar-N and mineralization rates in order to make fertility reduction management recommendations on golf courses. We also expect to demonstrate that the ISNT can be utilized to explain nitrate leaching events, such as those reported by Frank in 2005. Since Frank reports that a 50% reduction in added fertilizer effectively eliminates nitrate leaching potential, we believe the ISNT may serve as an appropriate test to assist superintendents in reducing nitrate leaching from golf courses.

Summary Points

- Our field studies suggest that the relationship between amino sugar-N and response of turfgrass to added fertilizer nitrogen is not as consistent as what has been reported in production agriculture. Additional studies are being conducted to analyze if a relationship between amino sugar N levels and turfgrass fertility response exists.
- Laboratory experiments are determining if the Illinois Soil Nitrogen Test value can be correlated to a soil's nitrogen mineralization potential.
- Analysis of soils gathered from lysimeters at Michigan State University from 2000-2010 will determine if the ISNT has any utility for predicting soils with the potential to leach nitrate due to fertilizer nitrogen.