Northern NY Agricultural Development Program
2004 Project Report

Aminosugar Nitrogen Soil Test for Economic and Environmentally-Sound Nitrogen Management of Corn in NNY

Project Leaders:
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Background:
To identify sites where additional (sidedress) nitrogen applications are likely to increase corn yield, the pre-sidedress nitrogen test (PSNT) is currently the best option available in New York. PSNT measures soil nitrate, which is highly variable in the soil, making time and depth of sampling important test factors. The amino-sugar nitrogen test is a newly developed soil test from the University of Illinois that measures a more stable organic fraction of soil N and could possibly be used to determine if corn would be responsive to sidedressing.

The test has been shown to be able to predict soils that will be responsive to N fertilization. Amino-sugar N is a fraction of soil N that is easily mineralizable and may become available for the crop during the growing season. Whereas the PSNT measures only nitrate N, which is prone the leaching and only indicates the amount of nitrate at the time of sampling, the amino-sugar N test indicates the amount of nitrogen presently available and N that will become available – making the test a valuable tool for assessing soil responsiveness that takes into account various organic and inorganic sources of soil nitrogen. The big question is: does this test work for New York?

Methods:

We conducted field studies at many locations including six locations in Northern New York in 2004: St Lawrence Co, Lewis/Jefferson Co, the Miner Institute, and the Willsboro Research farm. Trial leaders and farm cooperators are shown in Table 1. Our goals were to:

1) assess the effect of time and depth of sampling (0-8 or 0-12 inches) on nitrate and aminosugar levels;
2) test the effectiveness of the aminosugar soil test in identifying sites responsive to N fertilization;
3) increase the use of tools that identify non-responsive fields among producers and consultants and reduce the use of "insurance N fertilizer" through extension programming.

The 2004 NNY trials consisted of 3-5 N rates (including a no N control) in 2-4 replicates. Corn was harvested for silage and subsamples were taken for silage quality analyses. The treatments (no N, 25 lbs N/acre starter, starter + 50 lbs N/acre sidedress, starter + 100 lbs N/acre sidedress, and starter + 150 lbs N/acre sidedress) allowed for assessment of yield increase due to starter N application and yield increase due to sidedress N application. Soil samples were taken over 0-8 and 0-12 inches depth at planting, at PSNT time, and at harvest. The trial at Miner Institute also included soil samples pre and post fall 2003 manure applications. In addition to analyzing amino sugar N at all sampling times and nitrate at PSNT time, soil samples taken at planting were aggregated for organic matter, phosphorus, potassium, pH and texture analyses both to characterize sites and to determine interactions with amino sugar N.

Table 1: 2004 Aminosugar trials in NNY.

County	Location	Trial Leader	Farm Cooperator	Treatments	Reps
St. Lawrence	Madrid	Pete Barney	Tim Heiden	5	2
St. Lawrence	Gouverneur	Pete Barney	Dan Desormeaux	4	2
St. Lawrence	Heuvelton	Pete Barney	Dan Chambers	4	2
Essex	Willsboro	Mike Davis	Willsboro Research Farm	5	4
Jefferson	Adams	Mike Hunter	Don Holman	4	2
Clinton	Chazy	Ev Thomas	Miner Institute	3	4

Results:

Amino Sugar Laboratory Calibration

Evaluation of the amino sugar laboratory test method revealed considerable analysis variability. Method modification in late 2003 led to an alternative methodology (Klapwyk and Ketterings, 2005) which has subsequently been adopted for soil test analyses from field trials in 2002-2004.

Amino Sugar Field Calibration

Six trials were completed in NNY in 2004 with NNYADP funds. This is in addition to 4 research station trials and 9 on-farm trials conducted elsewhere in NY in 2004 (Smith-Lever Federal

Formula Funds and Andrew W. Mellon Student Research Grant). Preliminary test results indicate that amino sugar N is more stable during the season than nitrate and is higher in 0-8" than 0-12" depth cores (Klapwyk and Ketterings, 2004). Evaluation of the test must be based on a larger number of sites and data analyses are currently ongoing. Individual trial yields (i.e. Fig. 2) and soil results must be aggregated with the larger project (total 50 field trials over 3 years) to make an accurate assessment of the amino sugar test in NY. Soil analysis and project evaluation will be completed by May 2005.

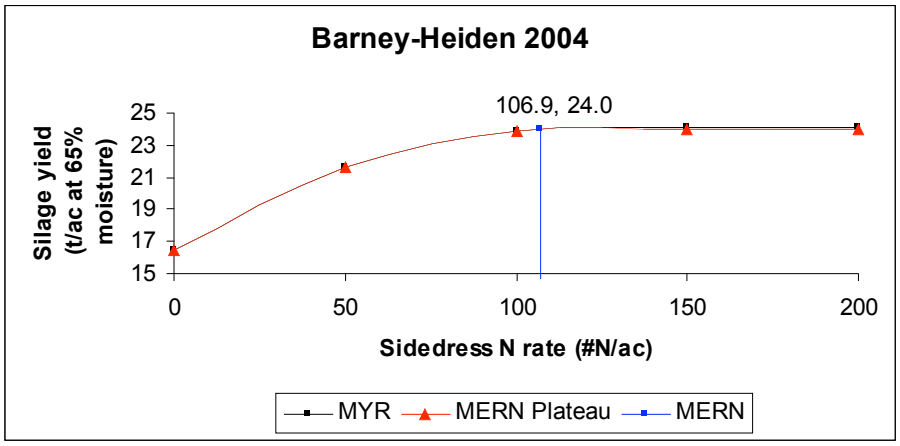

Figure 2. Corn silage yield response curve (quadratic plateau) to sidedress N in Madrid, NY in 2004. MYR (maximum yield rate), MERN (most economical rate of N) are shown.

Conclusions/Outcomes/Impacts:

Results of these trials need to be combined with the data from 2002 and 2003 (6 NNY sites) and from other studies conducted in NYS in 2002, 2003, and 2004. Preliminary assessment indicates that amino sugar N is relatively stable over the growing season. As a more stable fraction of N than nitrate, greater flexibility in time when pulling soil samples remains a potential benefit for NY producers. Final conclusions on the effectiveness of the amino sugar N test for use in NY will not be known until the complete project analysis can be completed. Since the project is designed for assessment using many locations (i.e. 50 field trials) with similar treatment structures, accurate conclusions can not be made on a trial-by-trial basis. The complete analysis is scheduled to reach completion in May 2005. At that time, it will become clear as to the utility of this test for NY corn producers. Further research needs for developing the amino sugar test for NY will also be addressed.

Outreach

Our project outline is accessible at: http://nmsp.css.cornell.edu/projects/aminosugartest.asp.

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Literature Cited:
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Klapwyk, J.H., and Q.M. Ketterings (2005). Reducing laboratory variability of the Illinois soil N test with enclosed griddles. Soil Science Society of America Journal (*in press*).

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Northern New York Agricultural Development Program:
The Northern New York Agricultural Development Program provided funding for this nutrient management research project. The Northern New York Agricultural Development Program is a farmer-driven research and education program specific to New York state's six northernmost counties: Jefferson, Lewis, St. Lawrence, Franklin, Clinton and Essex.

Thirty-three farmers serve on the Program board led by Co-Chairs Jon Greenwood of Canton (315-386-3231) and Joe Giroux of Plattsburgh (518) 563-7523. For more information, contact Jon, Joe or R. David Smith at 607-255-7286 or visit www.nnyagdev.org
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