Considerations when using the end-of-season corn stalk nitrate test

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Corn growers have had a recent surge of interest in taking end-of-season corn stalk samples to assess nitrogen (N) management practices. The purpose of this article is to briefly describe the end-of-season corn stalk nitrate test with regard to the intent of the test, sampling guidelines, and interpretation of test results.

Intent of the test

Many corn growers feel that their crop needs to be dark green throughout the growing season to achieve high yields and be profitable. As a result of this belief, high fertilizer N rates are often applied to maintain dark green leaves. Research in Wisconsin and throughout the Midwest has consistently shown that the most profitable rate of N fertilizer will result in plants that are less green late in the growing season. The end-of-season stalk nitrate test is intended to be tool to help corn growers determine if their N management practices were adequate or if adjustments could be made to improve profitability and/or reduce N losses to the environment.

Sampling guidelines

The following criteria should be followed to ensure that samples are properly acquired:

- ✓ Samples should be taken 1 to 3 weeks after black layer
- ✓ An 8" segment of stalk should be taken from 6 to 14 inches above the soil surface, remove leaf sheaths
- ✓ Stalk segments from 15 plants make one sample
- ✓ A sample should not represent more than 20 acres
- ✓ If soil characteristics or past management practices vary across the field, then separate samples should be collected for each area.
- ✓ Stalks severely damaged by insect or disease should not be used

Samples should be placed in paper bags and sent to a laboratory for analysis. Samples should be refrigerated (not frozen) if they are to be stored for more than one day before shipping. Most soil testing laboratories will conduct this test. Contact your laboratory to confirm that they run the stalk nitrate test.

Interpretation of stalk nitrate test results

The interpretation of the stalk nitrate test was developed using data from 98 sites in Wisconsin collected over four years (Bundy, 1996). Results from the stalk nitrate test are reported in parts per million (ppm) of nitrate-N. Stalk nitrate test interpretations are provided in Table 1.

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Table 1. Interpretation of end-of season corn stalk nitrate test.

Category	Nitrate-N concentration	Interpretation
Excessive	> 2000 ppm	High probability that N availability was greater than if fertilized according to UW-Extension guidelines
Optimal	700–2000 ppm	High probability that N availability was within the range needed to maximize profitability
Low	< 700 ppm	High probability that greater N availability would have resulted in increased yields

It is important to keep in mind that the stalk nitrate test has several limitations. First, the test identifies excessive and optimal N rates more accurately on medium yield potential soils compared to high yield potential soils (Table 2). In addition, a little more than one-third (37%) of the high yield potential soils categorized as having excess N supply actually had optimal, not excessive, rates of fertilizer. Second, research in Wisconsin has shown that the test may occasionally incorrectly indicate that excess N was supplied to fields with recent (within two years) history of manure application and/or alfalfa in the rotation; particularly on high yield potential soils. Third, the test does not provide an indication of the amount of N that was over or under supplied. Fourth, the test can be impacted by weather. In extremely dry years, the stalk nitrate values tend to be high; in contrast, test values tend to be low in an extremely wet year.

Because the adequacy of any given N rate on a field is dependent upon environmental conditions, basing future N rate decisions solely on one year's stalk nitrate values could result in poor management decisions. Stalk nitrate data collected over several years coupled with N management and growing season weather can be useful in determining if N fertilizer rates should be reduced to improve profitability.

Table 2. Accuracy of the end-of-season stalk nitrate test to categorize sites as having low, optimal, or excessive N rates on 49 medium and 49 high yield potential soils.

Soil yield potential	Stalk nitrate test category		
	Low	Optimal	Excessive
	———— % of sites correctly categorized ————		
Medium	60	92	71
High	75	56	63

References and other reading

Blackmer, A.M. and A.P. Mallarino. 1996. Cornstalk testing to evaluate nitrogen management. Iowa State University Extension Bulletin PM 1584.

Bundy, L.G. and T.W. Andraski. 1996. End-of-season soil and plant nitrate tests to evaluate nitrogen management practices for corn. Proc. Wisconsin Fertilizer, Aglime, and Pest Management Conference. 35:247-256.