

Water Quality Enhancement Activity – WQL04 – Plant tissue tests and analysis to improve nitrogen management



Enhancement Description

Use plant tissue tests to adjust nitrogen application rates.

Land Use Applicability

Cropland

Benefits

The use of either plant tissue testing or leaf tissue testing is an adaptive nitrogen management technique used to adjust nitrogen application rates in-season (leaf tissue test) or for the following crop year (stalk test). Test such as

these help provide a thorough analysis of how nitrogen is being used by the current crop, giving a basis for adjustments to nitrogen rates. The end result is a more complete utilization of the nitrogen applied and less nitrogen remaining in the soil to be lost to the environment through nitrate leaching or soil emissions of nitrous oxide.

Conditions Where Enhancement Applies

This enhancement applies to all crop land use acres.

Criteria

This enhancement requires the use of an analysis of appropriate plant tissue to monitor the uptake of nitrogen and other nutrients during the growing season or for the following year and to make necessary adjustments in nutrient applications.

In-season tissue testing and analysis

1. This enhancement is limited to crops and state’s with one or more of the following:
 - A Land Grant University (LGU) that provide tissue analyses,
 - That recognize private commercial laboratory analyses,
 - Where chlorophyll tissue testing is a recognized methodology, or
 - Where aerial imagery (infrared) technology is a recognized methodology.
2. Participant must have a current soil test (no more than 3 years old).
3. Nutrient application rates are within the LGU recommendations based on soil testing and established yield goals and considering all nutrient sources.
4. Follow guidelines from the laboratory and local LGU for interpretation of the results and appropriate adjustments in the application of N and other nutrients.

Plant tissue testing and analysis for the following year

Corn stalk testing and analysis - The nitrogen status of the corn crop can be determined by measuring the nitrate concentrations in the lower portions of cornstalks at the end of the



growing season. This involves taking an 8” sample of the cornstalk after black layer development in corn. The stalk is analyzed for nitrate to determine if the corn received insufficient, sufficient, or excessive levels of nitrogen. Since this test is conducted after the current corn crop is mature, the results are used to “fine-tune” nitrogen recommendations in the next corn crop. Follow your LGU guidelines for the use of this type of test.

Adoption Requirements

This enhancement is considered adopted when the results from plant tissue testing have been used to make nutrient application adjustments, either in-season or for the next crop year.

Documentation Requirements

Each year, documentation for each treatment area (field) shall describe the following essential items:

1. A map showing where the activities are applied,
2. Test used (stalk, leaf, chlorophyll, infrared, or other plant tissue),
3. Dates of test(s),
4. Acres for each treatment area,
5. Soil test results for each treatment area,
6. Manure analysis results (if applicable),
7. Crop yields (both yield goals and measured yield, if available),
8. Amounts of all nutrients applied in each treatment area,
9. Plant tissue test results (including reference strips), and
10. Change in annual N applied due to adaptive management change per treatment area.

Note: In lieu of documenting each individual item listed in the Documentation Requirements, a Certified Crop Advisor plan that contains each of the items may be substituted.

Michigan Supplement

WQL04

Test and analysis information specific to N management for corn follows:

- Corn stalk testing and analysis
Follow the procedure given in Purdue bulletin, “End-of-Season Corn Stalk Nitrate Test”, which is found in Section IV of the Michigan electronic Field Office Technical Guide (eFOTG), G. Technical Tools, Nutrient Management, in the Nutrient Management References folder. Samples can be sent to the Michigan State University (MSU) Soil Testing Lab or any county Extension office.

According to MSU Extension bulletin E2904, nitrate concentration between 450 and 2,000 ppm generally indicate good N use efficiency with optimum yields and limited residual soil nitrogen. Values below 450 ppm may indicate very efficient N use and optimum yields or a corn crop that ran short on N with some reduction in yield. Values above 2,000 ppm indicate more N was available than was necessary. Maintaining a database of stalk nitrate values from field to field and from year to year is a good way to fine-tune N management.

- Corn leaf tissue testing and analysis
For corn leaf tissue testing using the **chlorophyll meter method**, follow the procedure given in the Nebraska bulletin, “Using a Chlorophyll Meter to Improve N Management.” It is found in Section IV of the Michigan eFOTG, G. Technical Tools, Nutrient Management, in the Nutrient Management References folder.

For corn leaf tissue testing using **collected leaf tissue samples**, follow the procedure given in A&L Fact Sheet No. 34, “Plant Tissue Sampling of Row Crops”. It is found in Section IV of the Michigan eFOTG, G. Technical Tools, Nutrient Management, in the Nutrient Management References folder. Contact the MSU Soil Testing Lab or any county Extension office for forms and information on submitting tissue samples.

A range for tissue N in corn between 2.90% and 3.50% is considered a sufficient concentration.

The following are plant tissue testing guidelines for other crops that require significant N inputs:

- For vegetable crops, follow the tissue sampling procedure given in the Minnesota Extension Bulletin 5886, “Nutrient Management for Commercial Fruit and Vegetable Crops in Minnesota”. It is found in Section IV of the Michigan eFOTG, G. Technical Tools, Nutrient Management, in the Nutrient Management References folder.
- For potatoes, follow the guidance found in MSU Extension Bulletin E2779, “Nitrogen Management for Michigan Potatoes”. It is found in the Nutrient Management References folder in the Michigan eFOTG, as referenced above.
- For fruit crops, follow MSU Extension Recommendations <http://news.msue.msu.edu/news/category/fruit>