**Air Quality Enhancement Activity– AIR08 –Nitrification inhibitors or urease inhibitors**

**Enhancement Description**
The use of an ammonia or ammonium fertilizers with a substance that inhibits the biological oxidations of ammoniacal nitrogen to nitrate nitrogen or the use of surface applied urea products with a substance that inhibits hydrolytic action on urea by urease enzyme that when applied to soils results in less urea nitrogen lost by ammonia volatilization (AAPFCO). This enhancement is only applicable to nitrogen applied within 30 days of planting. This does not apply to “pop-up” or starter nitrogen sources applied at planting time.

**Land Use Applicability**
Crop, Pasture

**Benefits**
When ammonia or ammonium N is added to the soil, it is subject to a process called nitrification. Soil bacteria called nitrosomonas convert the ammonia (NH₃) or ammonium (NH₄) to nitrate (NO₃). This conversion is strongly temperature dependent and occurs quickly under warm soil temperature conditions. Using a nitrification inhibitor with early spring applications of ammonia or ammonium nitrogen will slow the conversion to nitrate until it can be readily used by crops. This will allow the crop to take up more of the N and ultimately reduce the release of nitric oxide (an ozone precursor) and nitrous oxide (a greenhouse gas) to the atmosphere. These conversion processes can produce nitrous oxide as a byproduct due to inefficiencies in the conversion processes. Nitrous oxide is a potent greenhouse gas which, on a molecular basis, has 310 times the global warming potential of carbon dioxide.

Using a urease inhibitor (with surface applied urea products) will reduce the volatilization and release of ammonia into the atmosphere that occurs as urea hydrolyzes. Urease is an enzyme produced by bacteria in the soil. It catalyzes the hydrolysis of urea into carbon dioxide and ammonia. Ammonia released to the atmosphere is a pre-cursor to PM2.5 particulate matter.

**Conditions Where Enhancement Applies**
This enhancement applies to climatic areas and soils on cropland or pastureland where nitrogen fertilizer is applied AND where either nitrification inhibitors or urease inhibitors are recommended by the Land Grant University.

**Criteria**
Use either a nitrification inhibitor or urease inhibitor product (depending upon the type of nitrogen fertilizer or manure used) on the treatment acres.
1. Nutrient application rates must be within Land Grant University recommendations based on soil tests and established yield goals considering all nutrient sources. The nutrient application rate must take into account the additional nitrogen that will remain available to the plant due to the inhibition of the nitrification processes.
2. Apply the nitrification inhibitor or urease inhibitor according to manufacturer recommendations.
3. The methods used to apply the nitrification inhibitor or urease inhibitor must not increase soil surface disturbance.
4. This enhancement is only applicable for nitrogen applications that take place within 30 days prior to planting time.
5. Materials which are acceptable for this enhancement must be defined by the Association of American Plant Food Control Officials (AAPFCO) and be accepted for use by the State fertilizer control official, or similar authority, with responsibility for verification of product guarantees, ingredients (by AAPFCO definition) and label claims.

Adoption Requirements
This enhancement is considered adopted when ammonia or ammonium fertilizers or urea products that contain a substance as described in the Enhancement Description above have been utilized in accordance with the Criteria of this job sheet on the land use acreage.

Documentation Requirements
1. A map showing where the enhancement was applied,
2. Date(s) of application of fertilizer with inhibitor,
3. Acres of land treated,
4. Soil test results,
5. Manure analysis results (where applicable),
6. Crops grown and yields (both yield goals and measured yield), and
7. Calibration of application equipment.

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.

References


Colorado Supplement
to
National CSP 2014 Enhancement Activity Job Sheet: AIR08
Nitrification inhibitors or urease inhibitors

Pastureland/ Hayland/ New seedings - To avoid excessive weed growth and competition, do not apply nitrogen fertilizer to new seedings until after establishment.

Base the selection of nitrification inhibitors or urease inhibitors on local resource concerns.

Select nitrification inhibitors to decrease potential nitrate (NO$_3$) leaching and the production and release of nitrous oxide (N$_2$O). Select urease inhibitors to decrease potential ammonia (NH$_3$) volatilization and nitrate (NO$_3$) leaching.

Criterion #1

Annual soil and manure sampling and analysis is required for systems that receive organic nutrient applications.

Soil tests for mineral systems that do not receive organic nutrients must be less than three years old.

Acceptable soil test labs are those that meet the requirements of the North American Proficiency Testing Program – Performance Assessment Program (NAPT-PAP).

Acceptable manure testing labs are those that meet the requirements of the Minnesota Department of Agriculture, Certified Manure Testing Labs Program.

Complete a Colorado Nutrient Management 590 Job Sheet to document planned and applied nutrient applications. Planned nutrient application rates will be based on Colorado State University fertility recommendations.

Completion of a Colorado Nitrogen Leaching Index Risk Assessment is required for each field and soil test cycle unless the Preliminary Nitrogen Leaching Risk Screening Tool indicates that a risk assessment is not necessary.

Completion of a Colorado Phosphorus Index Risk Assessment is required for each field and soil test cycle when any of the following conditions apply:

- The planned phosphorus (P$_2$O$_5$) application rate exceeds CSU fertility recommendation for the planned crop and realistic yield goal, or...
• The site is located within a phosphorus-impaired watershed (contributes to 303d-listed water bodies), or
• The Preliminary Phosphorus Risk Screening Tool directs the planner to complete a Phosphorus Index Risk Assessment.

Criterion #5

The Colorado Department of Agriculture (CDA), Inspection and Consumer Services Division, Fertilizer Program, is responsible for registering fertilizers, soil conditioners and plant amendments for use in Colorado. As such, the Fertilizer Program does not register nitrification inhibitors or urease inhibitors directly if the manufacturers label specifies application to fertilizer. The Fertilizer Program may require registration of nitrification or urease inhibitors as soil conditioners if the manufacturer’s label specifies soil application. Additionally, the application of such products to fertilizer would change the fertilizer product and if that product was re-sold, it may be subject to registration as a separate fertilizer product.

For additional information regarding registered products, contact Jonathan Handy, CDA Fertilizer Program Administrator at jonathan.handy@ag.state.co.us or 303-867-9237.

CDA Fertilizer Program Home Page (http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1167928218802)

Additional Documentation Requirements

Provide a copy of the Nutrient Management Plan including CSU fertility recommendations based on soil test analysis and established yield goals, that considers all nutrient sources and the additional nitrogen that will remain available to the plant due to the inhibition of the nitrification processes.

References

