

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

Cropland, Pastureland

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

- Nelson, D. R. and D. Huber. Nitrification Inhibitors for Corn Production. National Corn Handbook, Iowa State University. <http://www.extension.iastate.edu/Publications/NCH55.pdf>
- Rankin, M. Nitrification Inhibitors and Use. University of Wisconsin Extension. <http://www.uwex.edu/ces/crops/ninhib.htm>
- The Pennsylvania State University 2003, Agronomy Facts 51, Starter Fertilizer <http://cropsoil.psu.edu/extension/facts/agfacts51.cfm>
- AAPFCO. 2011. Association of American Plant Food Control Officials, Official Publication No. 64. AAPFCO Inc., Little Rock, Arkansas.

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The use of urease or nitrification inhibitors is necessary to qualify for this enhancement. Urease or nitrification inhibitors function by reducing the population or inhibiting the activity of the soil bacteria responsible for converting Nitrogen into forms (nitrate and nitrogen gas) that can be lost from the soil profile. Current products on the market include N-Serve, Agrotain, Instinct, Super-U and Nutrisphere-N. Written documentation shall include documentation of the fertilizer product name, method of stabilization, formulation and method of application. Slow release requirement is not applicable to starter fertilizers.

Criteria #3 Clarification: Application of inhibitors should be performed such that soil surface disturbance is minimized.

This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.