AgXplore
INTERNATIONAL, INC.
7035 State Hwy D
Parma, MO 63870
573-357-4506
www.agxplore.com

THE SCIENCE:

NZONE is a Nitrogen stabilizer that reduces the loss of nitrogen through volatilization and leaching. Volatilization is the largest form of nitrogen fertilizer loss; the average is 20% across all temperature zones and as much as 27% in southern states. Once urea is applied to the soil surface volatilization occurs as the natural soil existing enzyme, urease, begins to decompose urea forms of nitrogen. The urease converts the nitrogen into ammonia gas if not incorporated into the soil by this stage; plant useable nitrogen is lost to the atmosphere. This presents a major problem, as 60% of all dry Nitrogen fertilizer is applied in a urea form and 40% is applied without soil incorporation. The loss of Nitrogen fertilizer through leaching also presents problems for crop development, as urea is converted it is pulled downward by water out of the root zone. This process can vary depending on soil type, organic matter, CEC and other soil chemistry factors**.** **NZONE** can aid Nitrogen Fertilizers in both situations and this is how:

When Urea or UAN solutions treated with **NZONE** are applied to the soil surface, urease begins its process, converting the urea to ammonia carbonate, **NZONE'S** calcium polymers (active ingredients: Calcium Aminoethylpiperazine and Calcium Heteropolysaccharides) react with the ammonia carbonate changing it to calcium carbonate. Free ranging ammonia in the soil which contains a (+) charge, attracts the calcium carbonate which contains a (-) charge, thus containing the plant useable form of N on soil colloids. This process stabilizes and contains the N fertilizer in the root zone for plant usage, volatilization and leaching is eliminated from both acidic and alkaline soils. **NZONE** provides a stable "controlled" release of useable nitrogen to the plant once it's applied to the soil surface. The chemistry for **NZONE** is sound for all Nitrogen Fertilizer platforms, Urea, UAN Solutions and liquid manures.

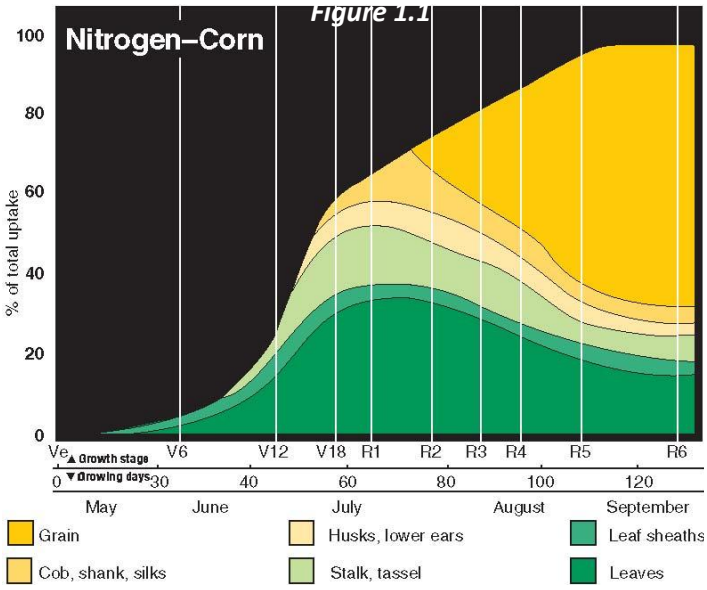
Competition & Comparison:

When comparing urease inhibitors to NZONE, its apples to oranges. **NZONE** is a nitrogen stabilizer, its chemistry and approach to reducing volatilization and leaching differs from urease inhibitors. By design both urease inhibitors and **NZONE** achieve the same purpose of reducing or preventing nitrogen losses to crops. The modes of action however are totally different with **NZONE** and from a crop nutrient standpoint and adding to yield potential, **NZONE** has more to offer.

Urease inhibitors prevent the urease enzyme from decomposing the urea into ammonia carbonate form, more or less "locking-up" the urea on the soil surface. Once the Nitrogen fertilizer source is rained in or incorporated in the soil, the urea acts as if it was never treated. Thus breaking down in the soil as it normally would. With urease inhibitors this is where the story ends. Depending on soil conditions it will take approximately 3-4 days after soil incorporation for the urease inhibitor treated fertilizer to start benefitting plant growth. The 3-4 days would be the approximate time it would take the urease enzyme to breakdown the Nitrogen Fertilizer in a plant useable form. Urease inhibitors "lock-up" urea until incorporated in the soil. **NZONE** controls the release of Nitrogen to crops before and after soil incorporation. This is a major advantage in our chemistry versus urease inhibitors. **NZONE** stabilizes the nitrogen applied to the soil from day one, in a plant useable form. Not only does **NZONE** have the capabilities of retaining the Nitrogen fertilizer on the surface of the soil up to 14 days, **NZONE** treated fertilizer continues to provide farmers with crop production benefits after soil incorporation.

An example of how **NZONE's** mode of action (*stabilize and control release of N, rather than locking it up*) is more beneficial to fertilizer efficiency consider the following scenario. If urea treated with a urease inhibitor is applied to corn at V6 stage and the urea is not incorporated for the full 14 day period. Then add 3-4 days to that before the urea actually begins feeding corn plants, the crop has at least reached the V12 stage. So how does that affect yield potential on corn without a nitrogen source for 18 days? Figure 1.1 below shows the percentage of nitrogen uptake lost to the corn crop by using urease inhibitor treated fertilizer. **At the V12 Stage corn has up taken 25% of its total nitrogen for the season, (Aprox. 40 units of N). Using NZONE will improve N efficiency in crops.**

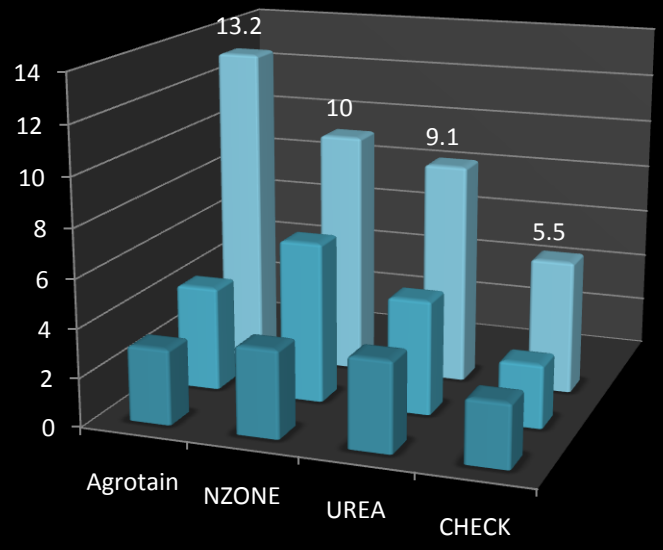
Figure 1.1

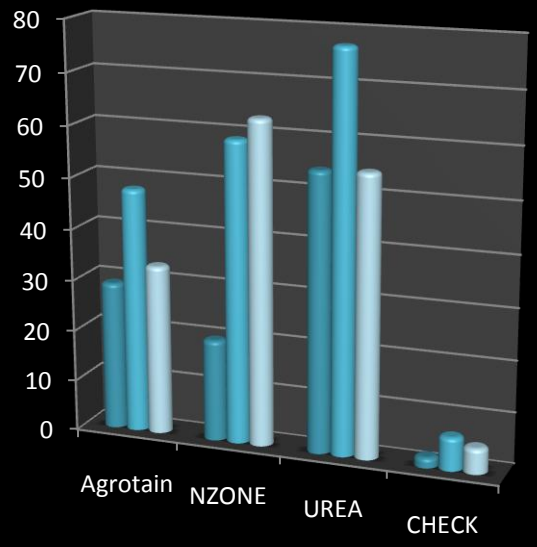


University Testing:

A test was performed by the University of Missouri to determine NO3 and NH4 levels in the soil 7, 14 and 21 days after applying treated fertilizer. Test groups included:
UTC (Untreated Check)
Urea
Urea + NZONE
Urea + Agrotain®

Treatments were applied at the rate of 100 lbs of product/acre; calculations were performed to reduce the treatment size for the test plots. Values are given in ppm (parts per million), the following soil sample results were at 21 days after applying, 14 day rate of NZone was used for this test.
The 7 day samples were taken from a shallow depth; later samples were taken at 6 inches. Soil samples were evaluated at the Univ. of Mo. Delta Center Soil Testing Lab in Portageville, MO. Only NO3 and NH4 were measured, no other nutrients were tested.
All treatments were applied to the surface of the soil, with 1 rain event occurring during the sample period.
Day 7:
Treatments 1, 2 and 3 showed consistent NO3 increases across all treatments when compared to the check. All treatments showed an increase in NH4 compared to the check. Treatment 2 showed less increase in NH4 when compared to treatment 1.
Results from the first sample indicated NZONE is working controlling the release of N to the soil. This evidence is indicated by the slightly higher level of NO3 and lower level of NH4.
Day 14:
Treatments 1, 2 and 3 showed elevated levels of NO3 and NH4 compared to the check. Treatment 3 showed the greatest amount of NH4 increase. Treatment 2 showed less of an increase in NH4 when compared to treatment 1.
It makes sense for the Urea to have the highest level of NH4; it will be most vulnerable to nitrification (breaking down). More evidence at 14 days that NZONE is controlling the release of nitrogen in the soil, with slightly higher levels of NO3 and NH4 than treatment 1 (Agrotain®)
Day 21:
Treatments 1, 2 and 3 showed elevated levels of NO3 and NH4 compared to the check. Treatment 3 showed the least amount of available NO3 and NH4 compared to the other treatments. Treatment 2 showed less NO3 than treatment 1, and the highest amount of NH4 when compared to other treatments. Treatment 1 showed the lowest amount of NH4 and the highest amount of NO3.
21 days after being applied to the soil NZONE has the highest level of available nitrogen. The urease inhibitor has a slightly higher level of NO3 than NZONE; however there is no comparison to NH4. This test has demonstrated NZONE's ability to provide a longer nitrogen residual during the growing season.





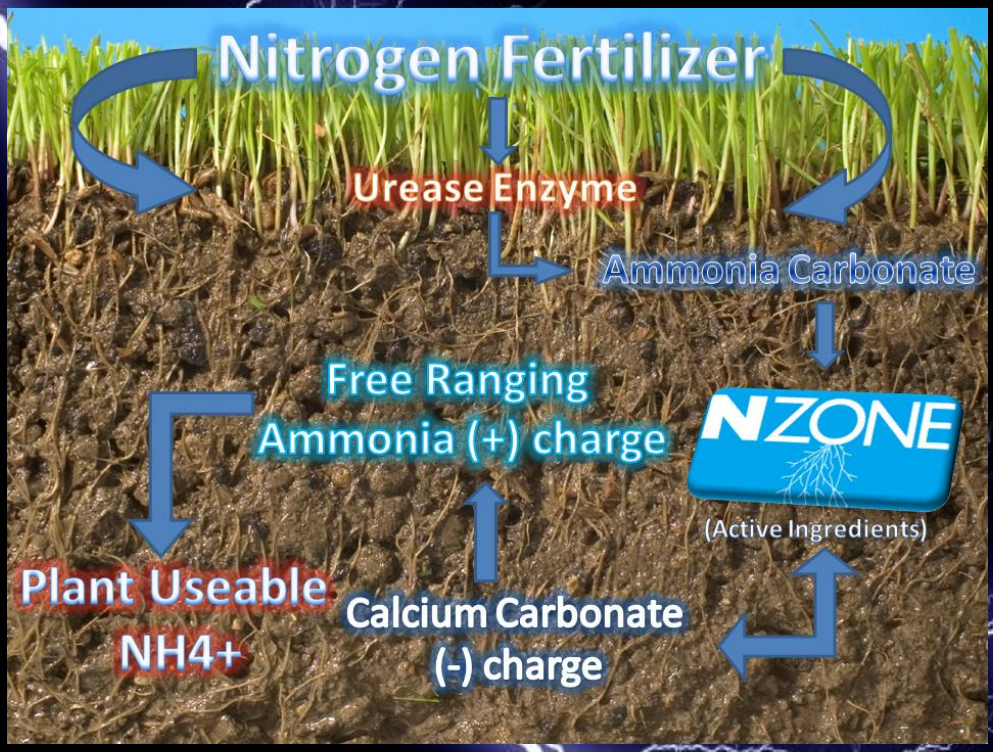
NO3 **NH4**

N 100 lb N/A	Soil NO3 ppm	Soil NH4 ppm
UTC (No Urea)	3.5	3.200
Urea	9.1	54.70
Urea + NZONE	***10.0***	***63.10***
Urea + Agrotain®*	13.2	33.30

Summary:

This test performed by the University of Missouri has produced positive results for NZONE. The test has demonstrated NZONE's ability to "stabilize and utilize" available fertilizer nitrogen in the soil. The higher level of NH4 means a longer window of opportunity for plants to absorb nitrogen over the course of a growing season. The test provides scientific data that NZONE reduces nitrogen losses by maintaining the plant useable nitrogen in a NH4 form, a more stable form of plant useable nitrogen than NO3. Although both forms are up taken by the plant, NO3 is vulnerable to nitrification losses by volatilization and leaching. NZONE provides a high level of nitrogen efficiency by maintaining fertilizer inputs in the NH4 form. A high level of NH4 over the course of a cropping season means a higher yield potential.

MODE OF ACTION:



Application Rates:

	5 to 7 days Control	8 to 10 days Control	14 Days Control
Urea	*2.0 qt/ton*	*3.0 qt/ton*	*4.0 qt/ton*
UAN 28%	*1.0 qt/ton*	*1.5 qt/ton*	*2.0 qt/ton*
UAN 30%	*1.5 qt/ton*	*2.0 qt/ton*	*2.0 qt/ton*
UAN 32%	*1.5 qt/ton*	*2.0 qt/ton*	*2.0 qt/ton*

***Liquid Manure Application:** Apply 2-4 qt/ton NZone*

**the rate of NZone for liquid manure is based on treatment of manure prior to water incorporation.*

***PrePlant or Band Injection Application:** Apply 1 – 2 qt/ton NZone*

***Broadcast Application:** Apply 1 – 2 qt/ton NZone*

***Side Dress Application:** Apply 1 – 2 qt/ton NZone*

Active Ingredients

Calcium Aminoethylpiperazine

Calcium Heteropolysaccharides

For More Information Contact:

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