Studies Show Urease Inhibitor Boosts Yields

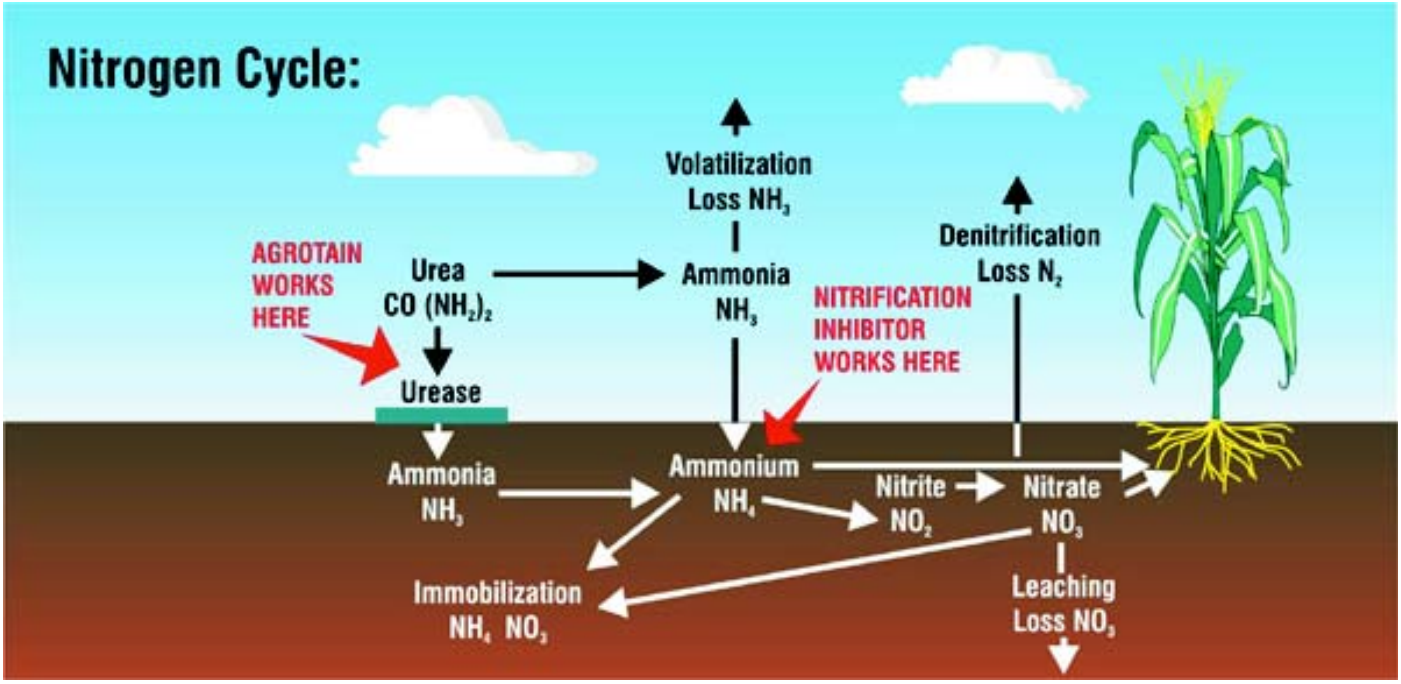
University and agribusiness studies affirm the beneficial effects inhibitors have in raising crop yields.

Nutrient management is receiving both national and international attention. The U.S. Congress recognized its importance in the *Farm Security and Rural Investment Act of 2002.* The Environmental Quality Incentives Program (EQIP) funding was increased to $9 billion through 2007, a hefty jump from the previous farm bill. In addition, nutrient management was specifically mentioned in the bill's "Statement of Managers." Included in this statement was a recommendation for use of urease and nitrification inhibitors, which reads as follows: *INHIBITOR TECHNOLOGY: To make efficient use of urea and ammonium fertilizers, reduce nitrate runoff, leaching, and the emission of ammonia and greenhouse gases. The incorporation of urease inhibitors and nitrification inhibitors into urea and ammonium containing fertilizers should be recommended as a best management practice.*

Urea-based fertilizers make up almost half the world's nitrogen (N) market. Continued growth is expected owing to urea's high-analysis safety and its ability to be applied as a dry or urea containing solution.

Studies have shown that urea-containing fertilizers can lose up to 30 percent or more of their N if not incorporated within 72 hours by tillage or rainfall. Volatilization occurs when urea hydrolyzes, that is it reacts with soil moisture and breaks down. The enzyme urease, which is produced by soil microbes, facilitates the reaction. A product we market called *Agrotain* (NBPT) inhibits the urease enzyme, making volatilization virtually impossible for up to 14 days. Nitrification inhibitors block microbial conversion of NH_4 to NO_3, thereby maintaining applied N in the NH_4 form. Since only NO_3 is subject to leaching and denitrification, nitrification inhibitors can reduce these losses. These inhibitors are tools producers can use to manage field applications of N as part of their total nutrient management programs.

In the past, farmers adopting residue management techniques usually were forced to find alternatives to N fertilizers. With our product, growers can surface-apply urea-containing fertilizers according to their schedule and expect minimal loss. The inhibitor



increases the likelihood that N will be available to crops when needed. Additionally, growers' investments are protected by ensuring crops receive the full benefit of N applications.

Domestic studies

Cool weather. We know urease is abundant in most soil environments and its activity increases as soil temperatures increase. According to Dr. Mark Coyne of the University of Kentucky, urea hydrolytic rate will approximately double in soils between 50 and 86° F. However, urease activity can still be detected in frozen soils to –4°F and can abruptly change as periodic thaws raise temperatures above freezing in the first few inches of soil. Studies by Cargill Ag Horizon in Canada have shown that when UAN + NBPT was topdressed under such cool conditions (early spring), wheat yields increased 15 bu/A. Similar results have been reported by Miles Farm Supply in Centralia, Illinois, where UAN + NBPT increased wheat yields by 4.3 bu/A.

Over-applying. Urease inhibitors have particular environmental value for growers who traditionally over–apply N to compensate for subsequent N losses. Properly used, urease inhibitors moderate N use by these growers. As explained by Dr. Wilbur Frye of the University of Kentucky, "Surface application, especially broadcast UAN, can result in substantial N losses through NH_3 volatilization during hydrolysis of the urea, which is catalyzed by the urease enzyme."

Corn trials. University of Illinois studies conducted by Dr. Bob Hoeft, have reported 15- to 20-bu/A increases when using NBPT with N applications. "Farmers should consider using *Agrotain* if tilling or if imminent rains are not going to push the N into the soil," Dr. Hoeft says.

Bermudagrass. Researchers at the Noble Foundation in Ardmore, Oklahoma, have reported dry forage yield increases of 205 lbs/A when NBPT is added to N, even after significant rainfall four days after application.

Cotton. At the University of Georgia, first-year research revealed that NBPT had the potential to increase sidedressed N efficiency, boosting lint yields 105 lbs/A more than untreated UAN—this despite receiving irrigation soon after sidedressing.

Rice. A University of Arkansas study, evaluating several N fertilizer sources applied at several times 5 to 10 days prior to flooding, showed that adding NBPT to N significantly lowered ammonia volatilization losses. "The product," notes Dr. Rick Norman, "shows promise as a viable nitrogen source for delayed-flood rice when a farmer cannot get a flood across his field in less than three days."

Canada

Dr. Cynthia Grant of Agriculture Canada has worked extensively in demonstrating that urease inhibitors reduce ammonia toxicity when urea-containing fertilizers are placed near the seed. In studies at the Brandon Research Center, "*Agrotain* effectively reduced N volatilization in no-till where the N was not incorporated with tillage," said Dr. Grant. In recent wheat studies, the product reduced the risk of seedling damage when urea was placed next to the seed.

Brazil

Sugarcane. Urease inhibitors (Sao Pedro do Ivai in Parana) increased yield 7.1 tons/A, compared to N alone.

Corn. L. A. Henkes of Sarandi, Rio Grade do Sul, reports that when urease inhibitor was combined with N in dry conditions, corn yields increased 8.3 bu/A. Other research in Mococa by Dr. Heitor Canterella, reports a 13.5 bu/A increase on no-till corn with the application of NBPT impregnated urea.

The ability to inhibit urea and ammonium forms of nitrogen is the next frontier in achieving nitrogen efficiency.

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