



INFLUENCE OF UREASE INHIBITOR ON CORN YIELD IN THREE TILLAGE SYSTEMS

Being one of the most used and expensive crop inputs, nitrogen (N) is an important part of modern crop production. Farmers today are faced with escalating fertilizer prices, especially N. Depending on form of applied product and environmental conditions, fertilizer N is vulnerable to loss soon after application if it is not immediately taken up by the corn plants. While anhydrous ammonia (NH₃) tends to be the most economical source of N, fertilizers with a urea component are popular with farmers who are uncomfortable with safety risks associated with NH₃ handling and application. When applied to the soil, urea is broken down to ammonium (NH₄⁺) by the enzyme urease (Figure 1). NH₄⁺ can be taken up by plants, assimilated by bacteria, or be converted to ammonia (NH₃) and lost to volatilization. In the ammonium form, the N is held by the negative charge associated with clay particles and organic matter. Additionally, if urea breakdown occurs rapidly, it can cause an increase in pH promoting the formation of ammonia gas and ammonia volatilization. Urease inhibitors can help increase N use efficiency by delaying the N transformation process so potential loss through volatilization is minimized.

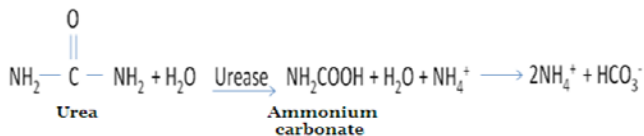


Figure 1. Breakdown of urea by the enzyme urease in the soil.

Materials and Methods

A demonstration trial was conducted at the Monmouth Learning Center in 2012 to assess the potential yield benefits of the urease inhibitor Agrotain® to surface-applied UAN in three tillage systems: conventional, strip-till, and no-till (Figure 2).

A 111 relative maturity (RM) corn product with Genuity® SmartStax® trait package was selected for the demonstration. All products were seeded at a population of 36,000 plants/acre. Strip-till and conventional plots were planted on April 19. Due to a rain delay, the no-till plots were planted on April 27. Nitrogen was applied pre-plant using 32% UAN solution at 240 lb N per acre. The field was divided into three blocks: no-till, conventional till, and strip till. All were in a continuous corn production system. Agrotain was applied to half the trial at 2.3 quarts per ton of UAN.

Weed control for the trial consisted of 2 qt/acre Harness® Xtra 5.6L preemergence followed by 22 fl oz/acre Roundup PowerMAX® when weeds were four inches tall or less.

Conventional and strip-till plots were harvested on September 12, 2012. No-till plots were harvested on September 20, 2012, and yield data adjusted to 15% moisture content.



Figure 2. Three tillage systems included in the demonstration trial at Monmouth Learning Center.

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Results

Yields increased in plots that received the Agrotain® application (Figure 4). The use of urease inhibitors can be beneficial to protect surface-applied UAN, especially when applied in fields with high residue. No-till conditions favor high levels of urease activity in surface soil due to high residue levels. UAN left on the soil and/or residue surface is susceptible to loss to the air, beginning about the third or fourth day after application and continuing until at least half an inch of rain occurs. The amount of loss varies with weather conditions; losses are greatest in dry soils and/or soils with high pH (Increased wind and humidity will also increase the rate of volatilization). Agrotain can help reduce this loss by retarding the rate of urea conversion to ammonium and increase yield potential by keeping the N intended for the crop in the soil and prevent off-target movement.

The information discussed in this report is from a single site, non-replicated, one-year demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

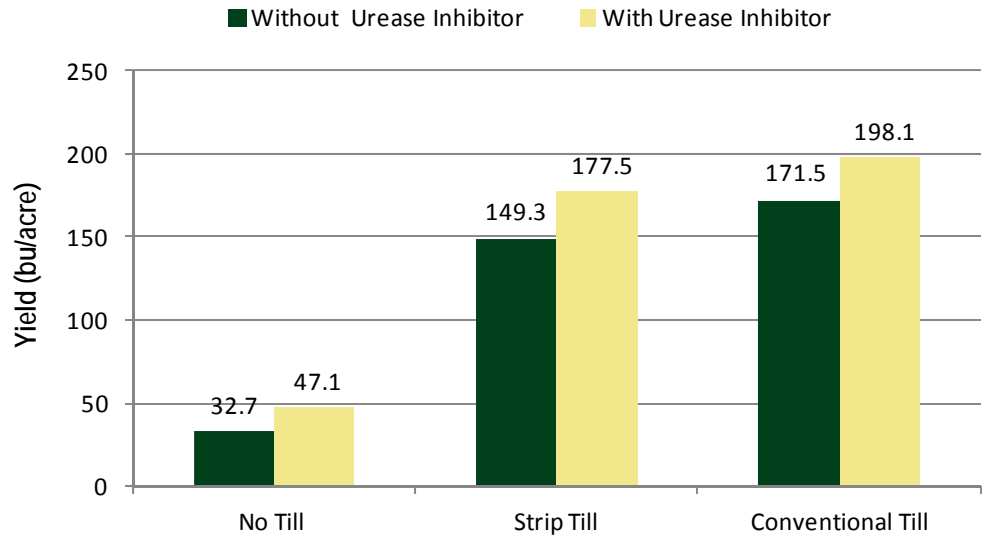


Figure 4. Corn yield response to the urease inhibitor Agrotain® in three different tillage systems in corn on corn rotation.

Resources

Scharf, P., et al. 2006. *Management practices for nitrogen fertilizer in Missouri. IPM 1027. Integrated Pest Management. University of Missouri Extension. Available on-line: <http://plantsci.missouri.edu> (verified 11/13/12).*

Varsa, E.C., et al. 1997. *An evaluation of urease inhibitor technology as a nitrogen management tool in no-till corn and wheat production. Illinois Fertilizer Conference Proceedings: January 27-29, 1997. Available on-line: <http://frec.ifca.com> (verified 11/13/12).*

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