

HOW ENHANCED-EFFICIENCY NITROGEN FERTILIZER CAN WORK FOR YOU

The goal of any enhanced-efficiency nitrogen (N) fertilizer is to supply enough N when and where the plant needs it. However, not all enhanced-efficiency fertilizers function the same way. It is important to select the product that will most meet your agronomic, economic, and environmental goals.

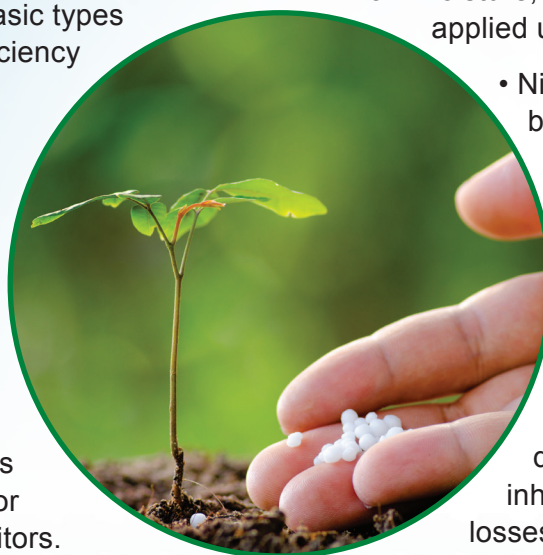
1. MODE OF ACTION

There are two basic types of enhanced-efficiency N fertilizers. The first includes controlled-release products, such as polymer-coated urea. The second is stabilized N, which includes enzyme inhibitors such as urease or nitrification inhibitors.

Each of these products target different processes in the N cycle, and therefore regulate different forms of plant-available N and downstream loss pathways.

- The coating of controlled-release products is designed to release urea under conditions favorable to plant growth thus regulating the pool of soluble urea. Studies have demonstrated that these products can decrease ammonia volatilization, reduce overwinter N losses, and increase the safety of urea placed with the seed.

- Urease inhibitors block the urease enzyme that is responsible for splitting the urea into ammonia and carbon dioxide. Therefore, urease inhibitors regulate the pool of plant-available ammonium and can also reduce ammonia volatilization. Remember that ammonia volatilization is more likely in soils with high pH, high temperature, and low moisture, particularly for surface-applied urea.



- Nitrification inhibitors block the activity of nitrifying bacteria, which are responsible for transforming ammonium to nitrate, thereby regulating the pool of plant-available nitrate. Studies have determined these inhibitors can reduce losses of nitrate leaching in coarser soils and nitrous oxide emissions in poorly-aerated, wet, warm soils. Some products combine nitrification inhibitors with urease inhibitors for multiple modes of action.

2. PRODUCT TESTING

There are a lot of enhanced-efficiency N products coming onto the market. When considering a new product, there are two major considerations. First, the specific mode of action—or how the product regulates N transformations—should be known, measurable, and explicitly stated. Secondly, even if the mode of action is well-defined,



Dr. Tai McClellan Maaz
Director, Nitrogen Program
tmaaz@ipni.net



“The goal of any enhanced-efficiency nitrogen fertilizer is to supply enough nitrogen when and where the plant needs it. However, not all enhanced-efficiency fertilizers function the same way.”

field testing data should be readily available for varying soils, weather, and crops. What works in one system may not work in another, depending on the factors limiting N use efficiency. You can utilize your knowledge of the loss pathways most relevant to your farm and select the enhanced-efficiency fertilizers best suited to combat these losses.

3. ON-FARM REPLICATED TRIALS

On-farm testing is an important first step in adopting enhanced-efficiency fertilizer. Your site-specific conditions and management affects the efficiency of your crop's use of fertilizer. Some loss pathways may be unexpected or vary from year-to-year, or some management zones may be more responsive than others.

4. TIMING WITH PLANT DEMAND

All enhanced-efficiency fertilizers are designed to match nutrient availability with crop demand. However, sometimes these products can work too well and may restrict nutrient availability under

certain conditions, such as unincorporated polymer-coated urea applied in spring during a cool, short season. At other times, banding untreated urea may be as or more effective as urea with a urease inhibitor. And so, the enhanced-efficiency fertilizer must fit into your operation and complement your rate, timing, and placement decisions.

5. MEASURE EFFICIENCY

Enhanced-efficiency fertilizers can have many benefits. You can measure your fertilizer use efficiency to ensure that you are improving your agronomic and economic performance ↗ through the use of enhanced-efficiency fertilizers.

In some parts of your farm, your current fertilizer management may already be highly efficient, whereas improvements can be gained in others. Tracking your efficiency can help you identify zones in which yields, crop quality, and profits can be improved by reducing losses.