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Better Crops, Better Environment...through Science

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ENHANCED EFFICIENCY FERTILIZERS

The idea of improving the efficiency of applied crop nutrients is not new. For example, one slow release N product (urea formaldehyde) was patented in Europe in 1924, with production in the U.S. beginning in the 1950s. Enhanced efficiency (EE) fertilizer materials have long been used in specialty applications such as turf and ornamentals. However, because of increased fuel and fertilizer costs and improvement in manufacturing technology, there is a growing interest and usage of these materials in production agriculture.

The American Association of Plant Food Control Officials has described EE fertilizer as "fertilizer products with characteristics that minimize the potential of nutrient losses to the environment, as compared to 'reference soluble' products." This description says nothing about agronomic effectiveness, but we can generally assume that in most cases agronomic effectiveness and reduced environmental impacts go hand-in-hand. Notice too that the description is not nutrient specific…in other words, it is not restricted to N fertilizers. Nevertheless, most EE technologies are applied to N.

Commercially available EE N fertilizers generally fall into one of three categories: 1) Synthetic organic compounds containing N, e.g., urea-aldehyde condensation products (urea-formaldehyde [UF] reaction products, IBDU), triazines, etc.; 2) Physical coating or barrier around soluble N fertilizer, such as SCU, PCU, and combination products; 3) Stabilized materials, such as nitrification and urease inhibitors.

The mechanisms controlling release of N from these materials is variable…differing among sources. For example, with UF products temperature is the major factor controlling N release because it is a biological (microbial) breakdown. On the other hand, release of N from IBDU involves chemical decomposition and is thus less temperature-dependent.

Several EE N fertilizers involve applying technology to commonly available soluble products. One example is the coated urea products. Polymer-coated urea products have made significant inroads in production agriculture over the past few years. An important aim of these materials is to match the kinetics of N release with the kinetics of crop uptake. Another example is the treatment of urea or UAN with urease and/or nitrification inhibitors. These materials have been shown to reduce the loss of N through volatilization or leaching where potential for loss is high. A complete coverage of EE fertilizer materials is far beyond the scope of this brief article. More information on these products is available through extension and industry professionals, and in published literature. Nonetheless, a few brief summary statements can be made concerning the suitability and advantages of these materials. EE fertilizer materials are best suited for: • Traditional applications, e.g., turf, ornamentals, nurseries, etc.; • High value crop production; • In crops with shallow root systems; • Where potential for N loss is large, e.g., surface application, sandy soil, high rainfall, etc.; • Environmentally sensitive circumstances.

Where used appropriately, these materials can aid in the accomplishment of our primary objective…to get more of the applied nutrient into the plant. It follows then that they have the potential to reduce loss of nutrients to the environment. Other potential benefits include reduced application frequency, more uniform plant growth, and improved yields. It's important to understand that EE fertilizer materials are tools, not "magic bullets". **And, as with any tool, we must understand where it fits and how to use it to best serve its purpose.**

—WMS—

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Abbreviations in this article: N = nitrogen; IBDU = isobutylidene diurea; SCU = sulfur-coated urea; PCU = polymer-coated urea.