

Outwit Wet Weather *Preventing Nitrogen Volatilization Can Boost Yields*

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Products that help reduce nitrogen losses especially under no-till conditions were discussed recently by Dr. Steve Ebelhar, University of Illinois Department of Crop Sciences agronomist specializing in crops and soils. Ebelhar is stationed at the Dixon Springs Agricultural Center.

"We've been looking for several years at additives that help prevent volatilization losses of nitrogen from urea and products that contain urea such as UAN," said Ebelhar.

Some of the studies are in the 35 to 50 site-year range now. (A site-year is represented by either a location or year.)

"We've been basically studying these compounds for about seven years now at several locations, which gives us a number of site years," he said.

"Several of these products actually perform well," he said. "Our biggest concern is to make sure we position the product with its intended purpose, so we want to position an urease inhibitor such as Agrotain in a condition where we're surface applying urea and we get surface volatilization of that nitrogen before it can be moved into the soil by rainfall. So basically we're positioning that product predominantly under no till where we're surface applying urea nitrogen."

Other products are positioned as nitrification inhibitors. They prevent the process of converting ammonium to nitrate because in the nitrate form there can be a lot of nitrogen loss from leaching and denitrification. It's helpful to keep nitrogen in the ammonium form which has a positive charge that's held in the soil. That's what they call "stabilized" nitrogen and it prevents that nitrogen from being lost.

"So there are inhibitors out there that are quite good at preventing nitrogen loss," he said. "It gives us about a six- to seven-bushel yield increase when these products are used. This is across all environ-

ments, but all of these products work much better under very wet conditions (wet springs, wet early summer) than they do during dry conditions. In dry weather you don't have as much nitrogen loss potential so the products aren't needed, but we recommend them as an insurance program. It's something to hold the nitrogen there if it does turn wet and it's profitable in most cases."

Special situations require the use of Agrotain, he said.

"In our no-till conditions in Southern Illinois where farmers are using the liquid nitrogen, the UAN, or the urea on the surface, Agrotain is quite effective," he continued. "We have so much residue on the surface which contains the enzyme urease and that's the enzyme responsible for nitrogen volatilization losses. The enzyme breaks down the urea and releases ammonia gas. If it's at the surface, obviously it's not going to get into the soil, it's going to release into the atmosphere. So we're losing nitrogen under no till

when we put the liquid nitrogen, UAN, or the urea on the surface.

"Agrotain is an inhibitor of the urease enzyme, which is the enzyme responsible for making that reaction occur," Ebelhar continued. "So if you've prevented the urease from breaking it down, it stays as urea for two to three weeks, often until we can get rainfall to move the urea into the soil. Once its in the soil then it's going to be held. The nitrogen is going to release as ammonia but be held by the soil and not get into the atmosphere."

Agrotain is also effective when topdressing wheat. When topdressing, the soil is not disturbed as urea is thrown on the surface. Urea is a good source of nitrogen for that, but if it's put on and the weather turns dry and a little bit warm you'll get some pretty big nitrogen losses and that's where the Agrotain will help.

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"In a minimum till application or anytime you leave residue on the surface and you put the nitrogen on the surface with that residue, as they come into contact with each other that's when we get the nitrogen losses," he said. "So minimum till would also qualify as a use for Agrotain, but not to the degree that no till does, because there's limited residue."

Another product that is effective in preventing volatilization, denitrification, and leaching losses is ESN, a polymer coated urea. Ebelhar showed how the polymer coated product increased yields, especially under no-till conditions, because the polymer coating acts as a physical barrier to prevent breakdown of the urea product before the grain crop can utilize it.

"The benefits with the ESN are that it delays the release of N from urea so it can be applied early, at planting, and is still available 4-6 weeks later when the corn begins rapid growth and rapid uptake of nutrients," he said.

Ebelhar said with all these products there's a six- to seven-bushel yield increase on average, including years where there's no response.

"In the years that we really see response, we can get as much as a 20- to 30-bushel yield increase where we see a lot of nitrogen losses occurring from volatilization, so it can be pretty significant," he added. Δ

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Dr. Steve Ebelhar, University of Illinois Department of Crop Sciences Agronomist, has been for several years, looking at additives that help prevent volatilization losses of nitrogen. Photo by John LaRose