

Weather And Soil Conditions Favoring Urea Fertilizer Losses

Additives, Irrigation Or Tillage Help Reduce Volatilization

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Dr. Gene Stevens, Extension Professor, Division of Plant Sciences, Delta Center Portageville, Missouri, spoke recently about how soil conditions will affect urea volatilization.

cause it melts the urea and promotes bacteria growth. Rainfall or irrigation after the urea is applied is a good thing if it pushes it into the soil where it forms more stable ammonium ions." In dry soil cotton plots, results were acceptable in the Delta Center test. "Where we had really dry soil and there was not enough moisture to dissolve the pellets, our yields were not

Soil conditions and how they affect urea volatilization is discussed by Dr. Gene Stevens, Extension Professor, Division of Plant Sciences, Delta Center Portageville, Missouri.

Photo by John LaRose



Soil bacteria, that cause urea fertilizer losses as ammonia gas in fields, are ubiquitous. Dr. Gene Stevens at the University of Missouri-Delta Center said that scientists use "ubiquitous" as a fancy word for meaning that these bacteria are everywhere in the environment.

Urea fertilizer is an organic compound that contains carbon and nitrogen. In the soil, urease enzymes produced by bacteria break urea fertilizer down to ammonia gas (NH₃). Then it reacts with water to form ammonium ions (NH₄⁺) which is more stable compounds. The danger occurs when urea fertilizer is broadcast on the surface and sits there for several days. Under the right weather and soil moisture conditions, ammonia will gas off. Growers need to stabilize the urea with an additive or push it into the soil with irrigation or tillage to reduce volatilization.

According to Stevens wet soil presents the greatest challenges. "We conducted tests at the Delta Center where we actually went out with a water wagon, on a field with dry soil, and applied different amounts of water on the soil. Next we broadcast the same rate of urea fertilizer on the plots. Later in the season, we measured the cotton to determine how much petiole nitrate we had in the tissue. We found where we put the highest rate of water on before urea was applied, petiole N levels were low and cotton yield was reduced."

Stevens said, "It can be confusing. Rainfall just before broadcasting urea is a bad thing be-

hurt," said Stevens.

Temperature is another factor affecting volatilization. Stevens explained, "If you have a wheat field in the spring and broadcast urea in January when the ground is real cold, there is not enough warm temperature for the bacteria to produce. In that kind of situation you really would not expect to have much volatilization. But, by the time we come to green up, which is where most people put most of their nitrogen on, early to Mid-March, by then the soil temperature is warm enough to cause volatilization. The bacteria are there so you have the potential for loss."

Rice fields are another example where volatilization can occur. "Maybe you have one well over in the corner and you broadcast the pre-flood nitrogen. It takes the well several days to pump a field up. In the meantime the urea is sitting there on the soil, suppose you had some rain the day before and the soil surface is moist, you have the potential for loss."

The best situation is to apply urea on dry soil in rice fields to prevent loss of urea. Stevens said, "then the floodwater will push the urea several inches below the soil surface where it will be converted to the more stable ammonium ion form. The worst case scenario is when the fields are already wet to start with or you didn't put any kind of stabilizer in your urea to prevent volatilization." Δ

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