New Extension Publications on Volatilization Loss from Nitrogen Fertilizers

Summary: Two new Montana State University Extension publications explain the factors that contribute to ammonia volatilization loss from nitrogen fertilizers and present management practices to minimize the losses.

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To: News-dailies, News-weeklies, AgMedia, News-local, News-tv, News-radio, MSU-All-News, News-internal, NatResourcesNonmedia, Producers, Web. From Sara Adlington, (406) 994-4602
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BOZEMAN – Agricultural scientists with Montana State University Extension are encouraging farmers to use management practices that minimize ammonia volatilization loss from nitrogen fertilizers to the atmosphere. These practices can increase yields, be a financial boost to producers, and reduce release of ammonia gas, a pollutant that contributes to green-house gases in the air.

Montana State University Extension has published two bulletins titled "Factors Affecting Nitrogen Fertilizer Volatilization" and "Management to Minimize Nitrogen Fertilizer Volatilization." The first explains various soil and climate factors that interact to affect volatilization. Understanding these factors can help crop producers avoid applying urea and other nitrogen fertilizers in situations that may promote substantial volatilization. The second presents best management practices to minimize volatilization loss and increase nitrogen use efficiency.

"Multiple and often interrelated factors make volatilization variable and difficult to predict under field conditions," said Clain Jones, the bulletin's lead author and Extension soil fertility specialist in the Department of Land Resources and Environmental Sciences (LRES) at Montana State University. However, the conditions that affect volatilization are relevant across climates and regions. Regional examples are provided by the co-authors, who are soil scientists from Montana, Idaho and Oregon.

Until recently, volatilization loss from urea application in cool temperatures was thought to be relatively low. However, at low temperatures ammonia can volatilize slowly but over a longer period of time.

"Field trials in Montana found up to 44 percent of the applied nitrogen could be lost from urea broadcast between October and April," said co-author Rick Engel, associate professor in LRES, who has conducted volatilization research in Montana for the past five years. Regional research results by Engel and others suggest that surface soil moisture at time of application and rainfall

or irrigation amounts after application play the biggest roles in affecting volatilization loss. The worst case conditions for volatilization loss were when urea was applied to a moist surface with no rain or only sprinkles for the next two to three weeks.

The first bulletin explains how moisture and other factors, such as soil pH, crop residue, and thatch influence volatilization loss. Jones acknowledged that producers cannot control all these factors, which is why the second bulletin provides some management options.

Producers are encouraged to adopt best management practices such as incorporating urea with equipment or irrigation. Incorporating broadcast urea within one to two days after application can reduce volatilization loss to less than five percent of the applied nitrogen, noted Jones.

In dryland production, the half-inch rainfall event needed to move urea deep enough into the soil to minimize volatilization is not very common or predictable.

Jones listed some alternatives: adding compounds such as N-(n-butyl) thiophosphoric triamide (NBPT, the active ingredient in Agrotain®) that inhibit fertilizer transformation, to surface applied urea, or using a nitrogen fertilizer such as ammonium nitrate that has lower volatilization potential.

Jones stressed that if at all possible, urea should not be applied in situations that promote significant volatilization, such as on moist or frozen soil surfaces or when soil temperatures are above 70°F. Management alternatives are available to ensure the nitrogen applied gets used by the crop rather than lost to the air.

The bulletins are available as printed copies from MSU Extension Publications (www.msuextension.org/store; 406-994-3273) and online at Jones' webpage at http://landresources.montana.edu/soilfertility/publications.html.