

Article title	Impact of Micronized Sulfur and Nitrogen Stabilizers on Nitrogen Transformation and Losses from Urea
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Abstract	<p>While fertilizers are vital for food production, their environmental and health impacts necessitate a redesign. This study explores new micronized sulfur-containing nitrogen fertilizers (MSN) that offer potential benefits compared to traditional options. The objective is to understand the transformation and loss pathways of MSN such as 40-0-0-13 (MSN40) and 11-0-0-75 (MSN11) in different soil types. This study evaluated the transformation and loss pathways of nitrogen (N) from above fertilizers with and without urease (UI) and nitrification (NI) inhibitors in comparison to Urea. Results of the study showed that the MSN fertilizers had slightly lower and delayed peak NH₃ volatilization compared to Urea. The use of UI with MSN fertilizers reduced NH₃ volatilization losses more effectively than UI usage with Urea, indicating potential synergies between UI and S. The hydrolysis of MSN fertilizers was slowed down by the UI under both acidic and alkaline conditions similar to Urea fertilizer. The coating of MSN fertilizers with UI+NI significantly delayed NH₄⁺ nitrification, in a manner that was either better (with MSN11) or similar to what was observed with Urea fertilizer. Coating of MSN fertilizers with UI or UI+NI delayed N leaching losses, indicating prolonged N availability in the soil. These results were corroborated by a greenhouse sorghum study where MSN fertilizers with UI or UI+NI led to higher total N uptake and higher grain yield than Urea fertilizer with UI or UI+NI. MSN fertilizers also resulted in higher total sulfur (S) uptake by sorghum, indicating improved S nutrition. Overall, the study revealed MSN fertilizers had significantly improved total N uptake by sorghum and had similar to significantly higher grain yields, especially at lower N application rate due to decreased N losses. Both urease and nitrification inhibitors show potential to further improve grain yields with MSN fertilizers similar.</p>
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