FŪSN

Fused-Safe Nutrients™

FŪSN™ Nitrogen Fertilizer Relationship to Ammonia Volatilization Compared to Traditional N Fertilizer Formulations

2012–2015

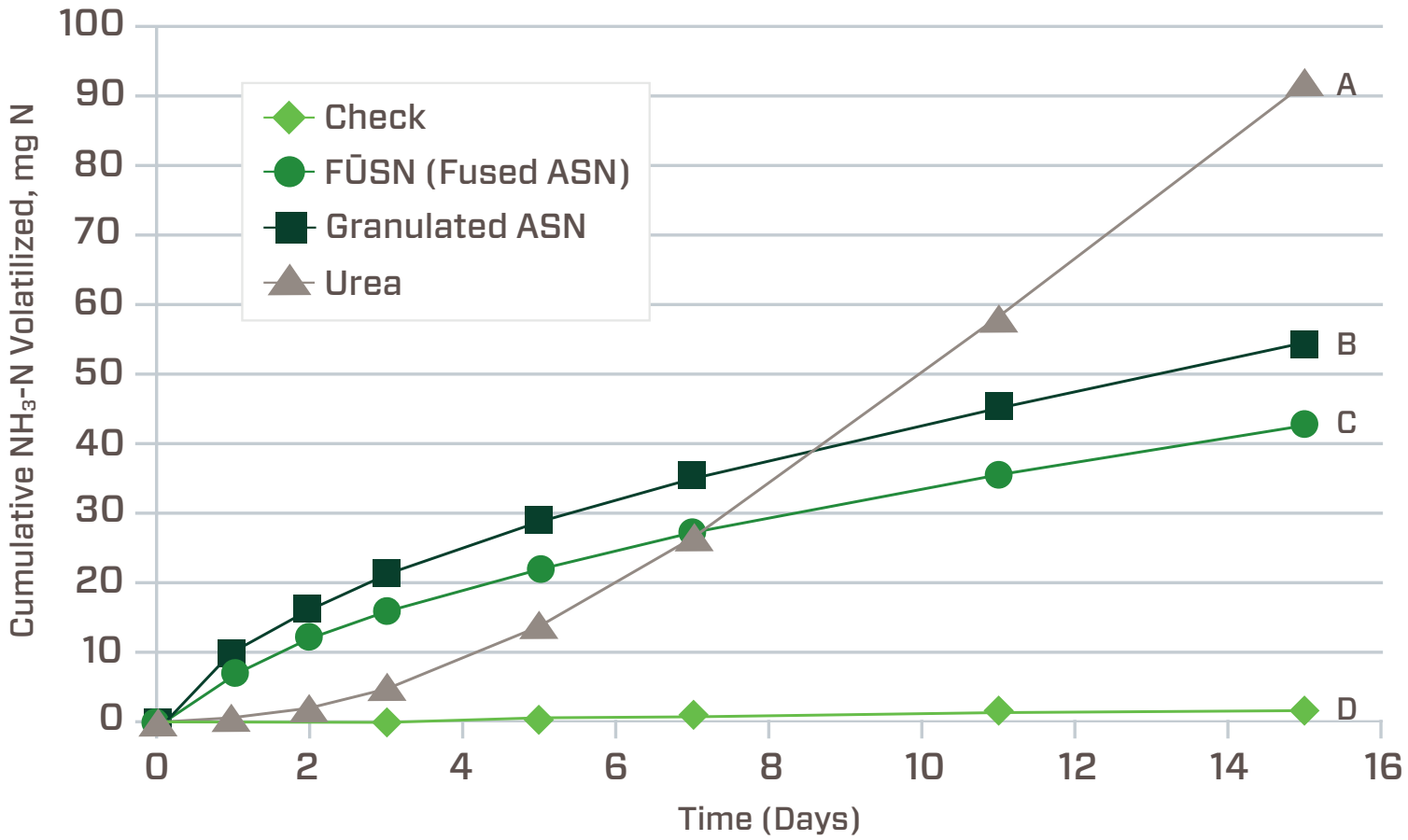
Simplot

Bringing Earth's Resources to Life

Nitrogen (N) loss by ammonia volatilization has been associated with decreased nitrogen use efficiency and increases in greenhouse gases, climate change, and air quality challenges in the Western U.S. These losses are affected by several factors that include the source of N fertilizer, soil texture, soil pH, incorporation of fertilizer N source being applied and other environmental factors. Incorporation of fertilizer granules by either mechanical means or irrigation is by far the best deterrent to these types of losses. Moreover, with many cropping systems and especially conservation tillage or with topdressing N early in the spring, it is impossible to incorporate the N fertilizers. Therefore, the fertilizer industry has developed enhanced efficiency N fertilizers or urease inhibitors that can dramatically reduce the rates of ammonia losses. These include new fertilizer formulations like fused ammonium sulfate nitrate that is now being manufactured by the J.R. Simplot Company called FŪSN™ or "fused safe nutrients."

FŪSN is a new dry, granular ammonium sulfate nitrate fertilizer made from a patented process developed by Honeywell. This process creates a unique N fertilizer product that is a double salt of ammonium and nitrate with ammonium sulfate particles within the matrix of the granule that stabilize reactions; creating a safer, less detonable material that still maintains a unique blend of both N sources that plants require, ammonium, nitrate, and also sulfur. FŪSN (26-0-0-14) is new and stable and provides increased benefits relative to N atmospheric losses when compared to urea or blends that are made up of urea and ammonium sulfate with the same guaranteed analysis.

Studies have been conducted over the last several years evaluating differences in ammonia losses.



Cumulative NH_3-N volatilized from urea, granulated ASN, and fused ASN surface-applied to calcareous Sumter soil at each sampling date during the volatilization period. Cumulative values of NH_3-N at the end day (Day 15) with the same letters are not statistically different from each other (P G 0.05) based on the pairwise contrast test.

Figure 1. Relative comparisons of urea to granulated ammonium sulfate (granulated ASN) and FŪSN (fused ASN). (Chien et.al. 2013.)

There is a difference in ammonia volatilization between a granulated combination of AMS and urea compared to the FŪSN molecule. There was reduction of ammonia loss by 22% when comparing the two formulations after the 16 days. Both the granulated ASN and FŪSN were less than urea, but it does not appear that merely creating a granulated blend is as effective at decreasing ammonia losses as the new FŪSN formula.

Additional studies were conducted over a two-year period on an acid, neutral, and calcareous soil to measure ammonia losses through volatilization. FŪSN was compared to urea, ammonium sulfate (AMS), and a 26-0-0-14 granulated blend, with significantly higher N losses from FŪSN < AMS < granulated AMS < urea.

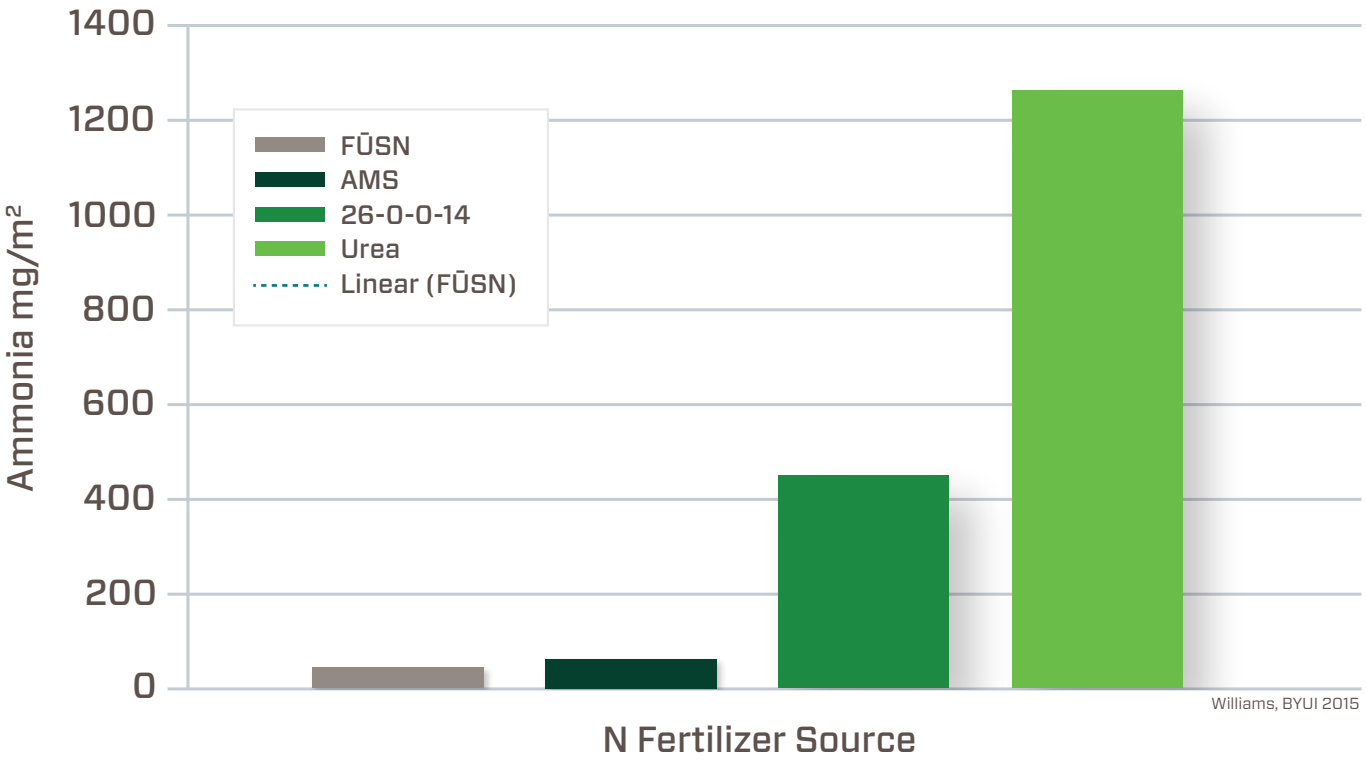


Figure 2. Ammonium volatilization comparisons for FŪSN, AMS, Granulated AMS (26-0-0-14) and urea. Values are the means of 3 soil pH acid, neutral, and calcareous soils. (Williams, BYUI, 2015.)

The data suggests that it is not nearly enough to create a blend of ammonium sulfate and urea and expect to have the same benefits of controlling ammonia losses into the atmosphere as volatilization. FŪSN therefore provides benefits of both ammonium and nitrates as well as the added benefits of N loss reductions while delivering a higher N concentration than AMS.

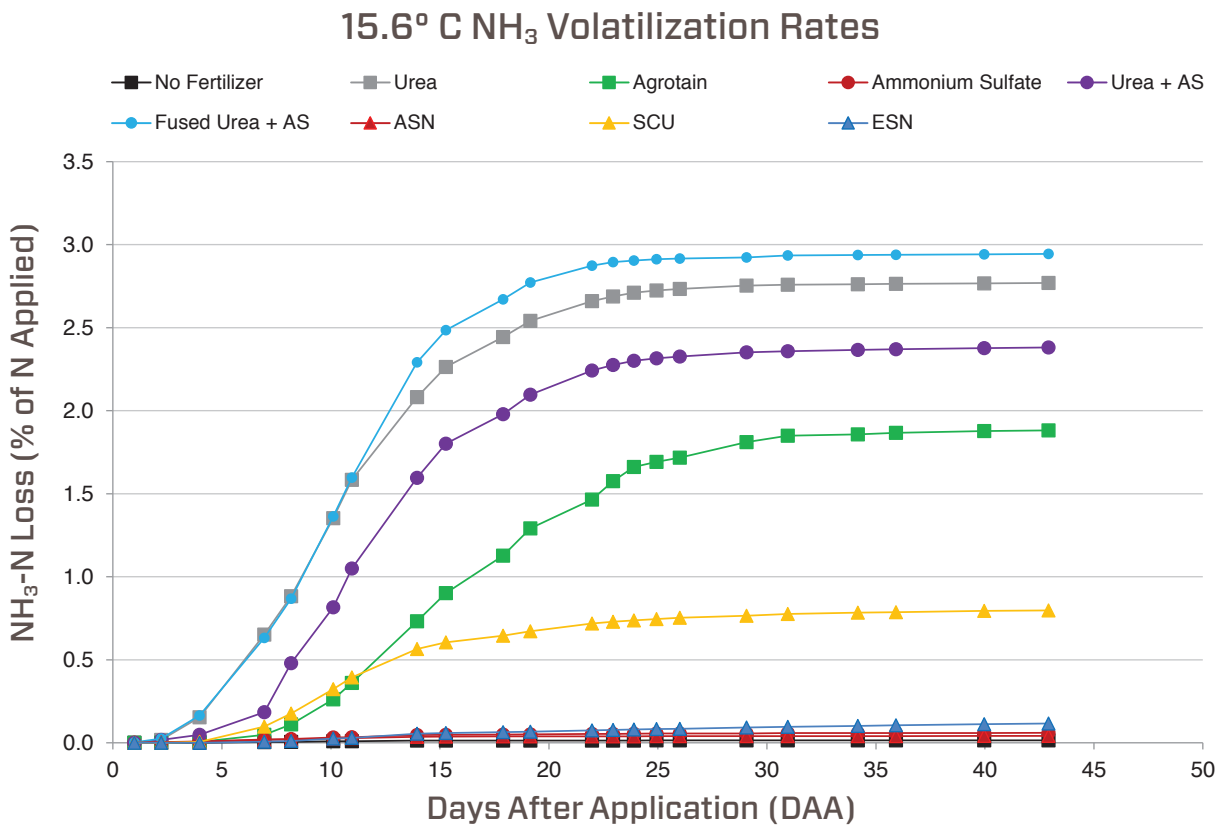


Figure 3. Ammonia volatilization studies in Oregon on low-temperature calcareous soils comparing various N fertilizer sources including ASN (FŪSN). (Sarah Del Moro and Don Horneck, Oregon State University, 2014.)

Ammonia losses can be observed even during cooler spring weather. While these cold weather losses are less than in hot-humid environmental conditions, they can impact a larger amount of ammonia losses for winter wheat where spring topdressing of N is a common practice. Under similar conditions field trials were established where sources of N were compared to the amount of ammonia being lost over a 43-day period. There was a significant decrease of ammonia where FŪSN was used compared to urea, urea + AMS, sulfur-coated urea (SCU), and other N formulations (Fig. 3). Benefits and detriments exist for each fertilizer form depending on conditions or cropping systems. Significant reductions in ammonia losses across a variety of temperatures were observed with FŪSN compared to other fertilizer forms (data not shown). In the Del Moro study field trials also exhibited an increased growth rate for FŪSN compared to other treatments (complete study on file). These researchers concluded: "Based on results from field and laboratory studies, ASN (FŪSN) offers greater agronomic and environmental efficiency than many other fertilizer choices, including urea. This is by supplying plants with their most necessary form of N and simultaneously minimizing N losses through ammonia volatilization." (Del Moro and Horneck 2014, Oregon State University.)

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