

Ammonium Thiosulfate (ATS) use in Soybeans and Corn



Ammonium Thiosulfate (ATS) is a clear liquid fertilizer that contains nitrogen and sulfur with a 12-0-0-26S analysis. ATS is gaining in popularity across the country, specifically in central Illinois. Its multi-functional capabilities for corn and soybeans are what set it apart from other sulfur fertilizers.

Sulfur Needs for Corn and Soybean

Nitrogen and sulfur are critically important nutrients for corn and soybean production.

Sulfur Uptake (lbs/ac)	Yield	(S) lbs/ac
Corn bu/ac	100	15
	150	23
	200	30
	250	38
Soybean bu/ac	30	14
	50	23
	70	32
	90	41

Sulfur in the Plant

ATS is 26% sulfur. Of that, 50% is elemental sulfur and 50% is sulfate sulfur. This is important because only sulfate is readily available to the plant. Elemental sulfur slowly converts to sulfate over time. This provides a very effective, slow release capability.

Sulfur is a secondary macronutrient and its role within the plant is vitally important. Sulfur (S) aids in protein synthesis and nitrogen (N) efficiency. Sulfur (S) also plays a key role in protein synthesis and is essential for many plant functions since it is a component of amino acids, proteins and peptides.

Sulfur Availability

Sulfur has been a “free” nutrient in the Midwestern U.S. for decades. Atmospheric deposition of sulfur has provided more than enough free sulfur to meet crop needs throughout past seasons. Clean coal technologies have been very successful at reducing sulfur emissions, essentially reducing our “free” sulfur down to a very small percentage of total crop uptake.

Like nitrogen, soil mineralization is another key source of sulfur for plant nutrition. Soils mineralize sulfur very effectively. Soils with good structure, hydrology, and organic matter percentage mineralize good amounts of sulfur. A rule of thumb is 3-5 lbs of sulfur is mineralized for each organic matter percentage in the top 6” of soil.

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Sulfur Mobility

Similarly to nitrogen, sulfate is a mobile nutrient in the soil. Sulfate can be moved out of the rooting zone severely where dry soils become wet. The addition of ATS at planting can be critical during years of heavy Spring rainfall. Rainfall moves mineralized sulfate down in the soil profile out of the early season rooting zone. Elemental sulfur is immobile in the soil.

Nitrogen Inhibitor

ATS has never been registered as a nitrification inhibitor. However, its nitrification inhibiting properties are well understood and documented.

Dr. Jay Goos from North Dakota has done extensive work with ATS and provides the following bullet points after 30 years of research about ATS ability as a urease and nitrification inhibitor.

- ATS was shown to inhibit urease, especially with large droplets of UAN.
- ATS works very well as a urease inhibitor in dry soils.
- ATS is not a total replacement for Agrotain® or other registered inhibitors, however ATS has been shown to slow nitrification.

Yield Advantages

At the BRANDT Research Farm in Pleasant Plains, Illinois, ATS has shown to provide a yield increase on corn and soybeans and a very favorable ROI for central Illinois growers.



Soybeans

The past 4 years, 3 gal of ATS dribbled in a 2X0 placement yielded an average additional 5.6 bu/ac.

Sulfur (ATS at Plant)	
2013	3.8
2014	4.8
2015	4.8
2016	8.8
6 YR AVG	5.6
6 YR ROI	11.3



Corn

The past 6 years, 3 gal of ATS and 7 gal of 28% UAN dribbled in a 2X0 placement yielded an average additional 10 bu/ac.

Starter (28% Sulfur at Plant)	
2011	4.5
2012	4.0
2013	11.1
2014	13.6
2015	13.6
2016	13.4
6 YR AVG	10.0
6 YR ROI	2.3



Technical Information

ATS (12-0-0-26) @ 60 degrees is 11.10 lbs/gal.

- 1 gal/ac of ATS = 2.89 lbs/ac of sulfur
- 1 gal/ac of ATS = 1.33 lbs/ac of nitrogen
- Due to phytotoxicity, ATS should not be used in direct contact with seeds.

Kaiser, D.E., Lamb, J.A., Vetsch, J.A. 2014. Sulfur in Minnesota Soils. University of Minnesota Extension Nutrient Management. <https://www.extension.umn.edu/agriculture/nutrient-management/secondary-macronutrients/sulfur-for-minnesota-soils/docs/AG-F0-00794-B.pdf>. 2014

International Plant Nutrition Institute (IPNI), Plant Food Uptake and Removal for Northcentral Region Crops. Ref. # 15067. <http://ipni.info/nutrientremoval>.

Goos, R.J. 1985. Identification of ammonium thiosulfate as a nitrification and urease inhibitor. Soil Science Society of America Journal 49:232-235

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