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Does ammonium sulphate (AMS) improve soybean yields on clay loam or silt loam soils?

Sulphur (S) is an essential nutrient necessary for plant growth. In the past it was assumed that soil sulphur supplies were adequate to meet soybeans full yield potential. Since air-borne sulphur emissions have been drastically reduced in the Great Lakes Basin, is it now necessary to feed soybeans sulphur?

The simple answer

In 2023 three trials compared a pre-plant application of 87 lb/ac urea and 110 lb/ac urea/AMS blend to untreated soybeans. There was no significant yield increase to the application of S on these clay loam and silt loam soils. These results agree with 15 trials conducted in 2018-19 which also showed no yield gain to S. There was a small yield gain (2.7 bu/ac) to the pre-plant urea but only on 30" rows in a late planting window. It should be noted that while we did not observe a benefit on the clay loam soils tested, S has been shown to provide yield gains on course texted (sandy) soils in other Ontario trials.

Figure 1. Sulphur deficiency in a soybean field where the effected areas will take on a greenish-yellow appearance. Photo: Horst Bohner, OMAFRA

A little more information

Much like nitrogen (N), sulphur moves quickly in the soil and can be depleted rapidly even if soil levels were adequate just a few years previously. One major challenge in assessing the need for S fertilizer is that soil tests for S are unreliable. S deficiency symptoms are also not obvious in soybeans. Soybeans are known to remove relatively little S compared to other crops such as canola or corn. An average soybean crop will remove 5 lb/ac of S while canola will remove 15 lb/ac of S and corn will remove 10 lb/ac of S.

Figure 2. Sulphur deficiency in soybean where the newer leaves will turn a greenish-yellow colour. Photo: Jake Munroe, OMAFRA

The full story

Three replicated trials were conducted in 2023 in both 15” and 30” rows and at two planting dates to assess the possible yield benefits of a small amount of pre-plant urea or a urea/AMS blend applied to soybeans. Trial sites were located near Stratford, Elora and Winchester. The soil at Stratford is classified as a clay loam, Elora as a silt loam and Winchester as a clay loam. The variety used was Viper R2X. When comparing N to the untreated control in the same row width, only the 30” rows showed a yield gain at the late planting date (2.7 bu/ac). This gain could be caused by a faster canopy closure, especially beneficial in a late planting window. The addition of the S in the urea/AMS blend did not provide any additional yield over the straight urea application, see Table 1.

Table 1. Soybean response to nitrogen and a nitrogen/AMS blend.

	Row width	Treatment*	Seeding rate	Planting** date	Yield bu/ac	Gain to N or AMS compared to untreated of same row width (bu/ac)
1	15"	Untreated	165	Early	80.7	
2	30"	Untreated	140	Early	76.6	
3	15"	N	165	Early	80.7	0
4	30"	N	140	Early	76.2	- 0.4
5	15"	N + AMS	165	Early	79.6	- 1.1
6	30"	N + AMS	140	Early	76.8	0.2
7	15"	Untreated	165	Late	75.5	
8	30"	Untreated	140	Late	70.6	
9	15"	N	165	Late	74.0	- 1.5
10	30"	N	140	Late	73.3	2.7
11	15"	N + AMS	165	Late	75.3	- 0.2
12	30"	N + AMS	140	Late	73.7	3.1

*N = 87 lb/ac (40 lb/ac actual N) of urea broadcast pre-plant.
Urea/AMS = 68 lb/ac urea + 42 lb/ac AMS (40 actual N and 10 actual S lb/ac).
Least Significant Difference (LSD) = 1.9 bu/ac.
**Early = the first planting window when the soil was fit (May 11-16). Late = (May 30 – June 1).

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