Overview of 2020 Soybean Sulfur Fertilization Trials

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2019 and 2020 Participants:

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Funding provided by the Soybean Checkoff fund through the Qualified State Soybean Board in each state.

Overview:

Sulfur is an essential nutrient that plants use to build proteins, among other molecules. Farmers are interested in the potential for sulfur fertilizer to increase soybean yield and profitability. However, the effect of additional sulfur-containing fertilizers on soybean yield and economic return is important to understand to maintain farm profitability. In this study we evaluated some common sources of sulfur to identify where yield response to applied sulfur is most likely to occur.

Sulfur fertilization source and rate were tested in small-plot trials at 43 locations in 9 states over the 2019 and 2020 growing seasons (Figure 1). Soil chemical properties varied by location (Table 1).

Two sources of sulfur (AMS, ammonium sulfate, 21-0-0-24S and CaSO4, calcium sulfate, 0-0-0-17S) at four rates (0, 10, 20, 30 lbs S/a) along with a nitrogen check (urea, 46-0-0) were tested in a randomized complete block design at all sites (Table 2). Measured amounts of all fertilizers were hand-applied (broadcast) in spring to soybean plots immediately after planting. No soil incorporation was performed.

After soybean grain was harvested, yield and grain composition were determined. In 2019, there was a significant difference in yield among treatments at five out of 19 locations. Grain protein, oil, and amino acid concentrations were also measured. Analysis of 2019 results are available at https://coolbean.info/wp-content/uploads/sites/3/2020/03/2019SulfurFertilizationReport.pdf and an analysis of protein, oil, and amino acid concentrations for 2020 will be performed in spring of 2021. Following the conclusion of grain analysis, we will release a report that includes yield, grain, and soil data for all 2019 and 2020 locations.

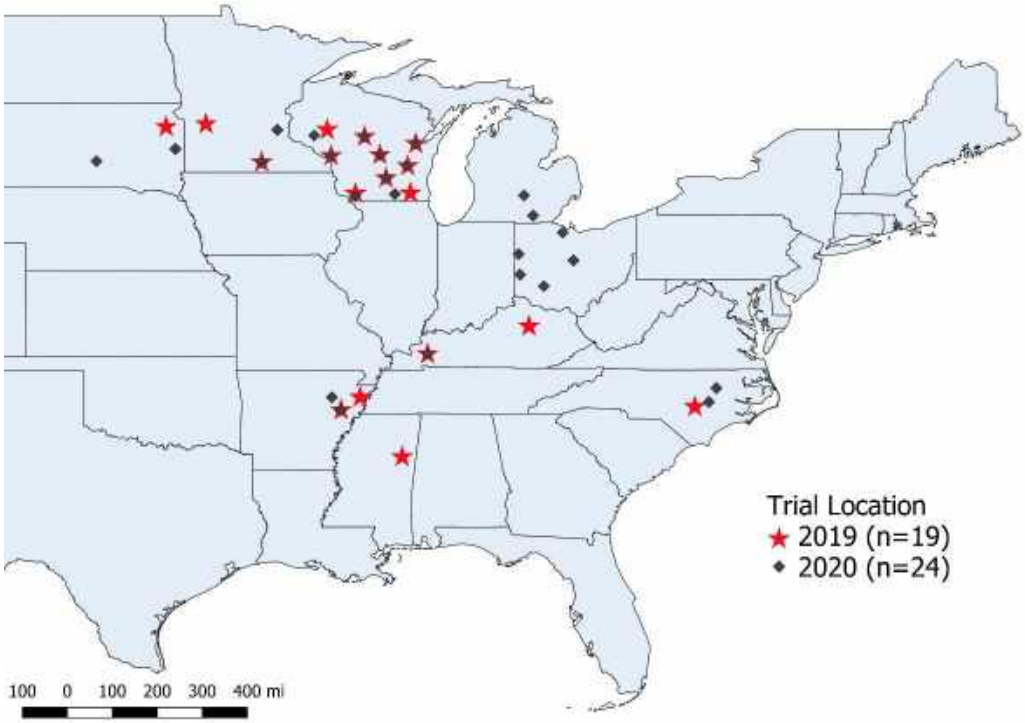

Figure 1: Map of 2019 and 2020 sulfur fertilization trial locations. In total, there were 43 locations in 9 states.

Table 1. Soil test results for 2020 locations.

Location	pH	OM	P	K	Ca	Mg	B	Mn	Zn	S
		%	---------- ppm ----------							
Newport, AR	5.7	.	56	120	960	97	0.23	200	2.9	13
Pine Tree, AR	7.2	.	24	110	1900	300	0.30	170	2.6	16
Princeton, KY	5.6	1.8	15	410	3100	160	0.60	.	1.8	17
East Lansing, MI	7.1	1.8	22	73	1100	290	0.60	39	2.1	7
MN Lake, MN	6.1	5.2	12	150	3200	530	0.84	36	1.7	28
St. Paul, MN	6.2	3.0	61	110	1500	300	0.44	17	2.5	7
Goldsboro, NC	5.4	1.7	25	91	.	.	.	.	.	.
Rocky Mount, NC	6.4	1.2	34	97	.	.	.	.	.	.
Clinton, OH	6.6	3.2	33	120	2100	370	.	.	.	.
Henry, OH	6.2	3.4	44	160	2800	330	.	.	.	.
Mercer, OH	7.2	2.8	140	170	2900	400	.	.	.	.
Morrow, OH	6.7	2.5	28	81	1500	300	.	.	.	.
Preble, OH	6.2	3.5	81	160	2800	470	.	.	.	.
Sandusky, OH	6.8	1.6	46	91	530	64	.	.	.	.
Brookings, SD	6.9	3.8	21	120	2800	460	.	.	.	15
Reliance, SD	5.9	3.3	18	300	2100	660	.	.	.	8
Arlington, WI	7.0	3.5	55	170	1800	470	0.45	5.3	4.0	3
Chippewa Falls, WI	6.4	1.5	50	170	660	160	0.38	13	3.0	2
East Troy, WI	6.1	3.5	94	140	1800	380	0.52	6.8	3.9	2
Fond du Lac, WI	7.0	3.4	41	150	1700	440	0.41	6.6	4.0	6
Galesville, WI	6.2	3.0	28	170	1300	260	0.40	9.5	3.6	8
Hancock, WI	6.0	0.7	85	88	160	34	0.16	7.4	1.3	3
Janesville, WI	6.4	2.8	58	150	1500	410	0.31	4.7	3.7	2
Marshfield, WI	7.0	3.6	37	260	1300	350	0.41	20	3.3	9
Menomonie, WI	5.9	2.1	28	84	710	150	0.27	11	1.7	4
Platteville, WI	6.6	2.9	25	110	1500	430	0.32	5.9	10	2
Seymour, WI	7.1	2.3	28	130	1300	240	0.40	8.6	2.0	4

Table 2: List of products, application rates, and nutrients applied.

Treatment	Form	Product	Supplied S	Supplied N
		lbs/a	lbs/a	lbs/a
1	UTC		0	0
2	AMS	42	10	9
3	AMS	83	20	18
4	AMS	125	30	26
5	CaSO4	59	10	0
6	CaSO4	118	20	0
7	CaSO4	176	30	0
8	Urea	19	0	9
9	Urea	39	0	18
10	Urea	56	0	26

2020 Yield Results:

Of the 24 locations of fertilizer trials in 2020, 6 had significant differences in yield among treatments. No product or rate consistently increased yield at all locations.

*Table 3: Yield of soybeans at six sites with significant differences. An asterisk (*) indicates value is not different from the highest value (**bolded**) at that location.*

Treatment	Arlington, WI	Galesville, WI	Hancock, WI	MN Lake, MN	Platteville, WI	Princeton, KY
Control	81.5*	75.4	74.4*	69.3	75.6	68.5
AMS Low	83.1*	74.9	73.4*	75.4*	88.8*	75.5*
AMS Med	82.2*	75.6*	74.7*	75.8*	87.3*	70.4
AMS High	84.4*	74.0	76.8*	74.4*	***89.8****	75.8*
CaSO4 Low	81.4*	72.9	73.1*	74.4*	83.9*	73.3*
CaSO4 Med	77.2	75.3	79.8*	73.3*	83.0*	73.1
CaSO4 High	79.7*	69.5	65.5	***75.8****	89.8*	68.8
Urea Low	83.7*	***78.9****	***82.6****	71.4	72.8	***78.7****
Urea Med	82.6*	75.8*	66.6	70.1	78.3	69.9
Urea High	***84.6****	77.3*	73.5*	68.4	75.3	74.2*