On-Farm Sulfur Fertilization of Corn and Soybean Trials

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Introduction

In the past several years, sulfur (S) deficiency has been showing up more frequently in Iowa fields than what had been seen in the past. Yield response has especially occurred in corn and alfalfa fields in northeast Iowa. Increase in S response may be partially due to less S in rainfall from more stringent air pollution regulations, less S fertilizer applications, higher crop yields, and less widespread use of manure. S applications can offer yield increases where S deficiencies are present. The objective of these trials was to evaluate grain yield response in corn and soybean to S.

Materials and Methods

The response of soybean and corn to S application was investigated in four soybean fields and 12 corn fields in 2015 (Tables 1 and 2, respectively). Sulfur was applied to one soybean field with no manure history to test the response of soybean to S in 2014, and the residual effect in the same field with corn in 2015. Sulfur was applied to 11 corn fields and four soybean fields in 2015 to test the response of corn and soybean to S in the year of application. There was no manure history in any of the trials. Corn was at the V4 to V6 growth stage and soybeans were at the V2 to V5 growth stage at the time of application in 2015. Calcium sulfate (gypsum) was dribble applied to the soil at the rate of 17 lb S/acre in all trials. Strips receiving the S application were compared with untreated strips. All trials were in southwest Iowa except Trial 12 in corn, which was in southeast Iowa.

All trials were conducted on-farm by farmer cooperators. Strips were arranged in a randomized complete block design with at least three replications per treatment. Strip size varied from field to field depending on field and equipment size. All strips were machine harvested for grain yield.

Results and Discussion

There was no effect of S application on soybean yield in any of the trials (Table 3). There was no effect on the corn yield in 2015 after the application of sulfur on soybeans in 2014 in Trial 12 (Table 4). There also was no effect on the soybean yield in 2014 with the sulfur application in this trial. There was a significant yield increase of 10 bushels/acre in corn in Trial 1 ($P = 0.05$), a significant yield increase of 6 bushels/acre in Trial 8 ($P = 0.01$), but a significant yield decrease of 4 bushels/acre in Trial 7 ($P = 0.03$) with the application of 17 lb S/acre when corn was at the V5 to V6 growth stage (Table 4). These results indicate there are corn fields in Iowa that could benefit from S application. However, as found in prior research, not all fields planted to corn will have an S yield response. Over 110 trials conducted from 2006-2013 across Iowa had a 47 percent response rate – a higher rate than the sites in 2015. Situations with a greater chance of S response include coarse textured, sideslope landscape position, eroded, low organic matter soils, reduced/no-tillage, high crop residue, alfalfa or alfalfa prior crop, no manure application, no S applied in fertilizers. For more information on sulfur management see ISU extension publication CROP 3072 (http://www.agronext.iastate.edu/soilfertility/info/CROP3072.pdf).

Table 1. Variety, row spacing, planting date, planting population, previous crop, and tillage practices in the 2015 sulfur trials on soybean.

Exp. no.	Trial	County	Variety	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
150603	1	Pottawattamie	Asgrow 3334	30	5/12/15	150,000	Corn	No-till
150604	2	Cass	Stein 29RE32	30	6/20/15	150,000	Rye	Field cultivate
150653	3	Cass	Asgrow 3432	30	5/10/15	150,000	Corn	Vertical
150662	4	Cass	Pioneer P2483	30	5/20/15	155,000	Corn	No-till

Table 2. Hybrid, row spacing, planting date, planting population, previous crop, and tillage practices in the 2015 sulfur trials on corn.

Exp. no.	Trial	County	Hybrid	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
150601	1	Pottawattamie	Dekalb DK6298	30	5/21/15	34,000	Soybean	Disk
150602	2	Cass	Axis 62N35	30	5/5/15	33,000	Soybean	No-till
150648	3	Cass	Pioneer P1215AM1	30	6/20/15	35,000	Soybean	No-till
150651	4	Cass	Wyffels W6628	30	4/25/15	34,500	Soybean	No-till
150656	5	Cass	Epply 254	30	5/1/15	32,000	Soybean	Disk
150658	6	Cass	Epply 1405	30	5/11/15	32,000	Soybean	No-till
150660	7	Pottawattamie	Wyffels 6629	30	4/24/15	35,000	Soybean	No-till
150670	8	Pottawattamie	Dekalb DK6128	30	4/30/15	32,000	Soybean	No-till
150672	9	Cass	Channel 209	30	5/5/15	34,000	Soybean	Deep till & field cultivate
150697	10	Cass	Pioneer P0993	30	5/23/15	31,000	Soybean	Vertical
150699	11	Cass	4Star 6569	30	4/30/15	32,000	Soybean	No-till
150703	12	Washington	Dekalb 63-35 VT2PRIB	30	5/2/15	35,000	Soybean	No-till

Table 3. Yield response from the on-farm sulfur fertilization trials on soybean in 2015.

Exp. no.	Trial	Sulfur rate (lb/ac)	Application timing	Yield (bu/ac)				Year
				Sulfur	Control	Response	P-value[a]	
150603	1	17	V5 (6/19/15)	49	50	-1	0.34	1
150604	2	17	V3 (7/22/15)	43	39	4	0.23	1
150653	3	17	V5 (6/1/15)	71	69	2	0.38	1
150662	4	17	V2 (6/16/15)	51	53	-2	0.66	1

[a]P-value = the calculated probability that the difference in yields can be attributed to the treatments and not other factors. For example, if a trial has a P-Value of 0.10, then we are 90 percent confident the yield differences are in response to treatments. For P = 0.05, we would be 95 percent confident.

Table 4. Yield response from the on-farm sulfur fertilization trials on corn in 2015.

Exp. no.	Trial	Sulfur rate (lb/ac)	Application timing	Yield (bu/ac)				Year
				Sulfur	Control	Response	P-value[a]	
150601	1	17	V6 (6/13/15)	187	177	10	0.05	1
150602	2	17	V5 (6/4/15)	214	212	2	0.53	1
150648	3	17	V4 (7/20/15)	232	233	-1	0.91	1
150651	4	17	V5 (5/28/15)	209	208	1	0.94	1
150656	5	17	V5 (6/5/15)	201	195	6	0.22	1
150658	6	17	V6 (6/12/15)	188	187	1	0.25	1
150660	7	17	V5 (5/30/15)	234	238	-4	0.03	1
150670	8	17	V5 (6/6/15)	177	171	6	0.01	1
150672	9	17	V4 (6/18/15)	235	231	4	0.22	1
150697	10	17	V6 (6/30/15)	202	207	-5	0.24	1
150699	11	17	V6 (6/15/1)	273	259	14	0.25	1
150703	12	17	2014	249	249	0	0.17	2

[a]P-value = the calculated probability that the difference in yields can be attributed to the treatments and not other factors. For example, if a trial has a P-value of 0.10, then we are 90 percent confident the yield differences are in response to treatments. For P = 0.05, we would be 95 percent confident.