SULFUR FERTILIZATION OF SMOOTH BROMEGRASS

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ABSTRACT

Studies were initiated in 1987-88 on established smooth bromegrass at two sites in eastern Kansas to evaluate the effects of sulfur fertilization on bromegrass forage production and quality. Sulfur rates (0, 15, 30 lb S/ac) and sources (ammonium sulfate and ammonium thiosulfate) were evaluated. The addition of sulfur consistently and, in most cases, significantly increased bromegrass forage yields and forage S concentrations. Sulfur had little effect on forage protein levels. Ammonium thiosulfate and ammonium sulfate performed equally well as sulfur sources. Results indicate 15 lb S/ac is adequate to meet needs in most cases. Considering hay and sulfur prices over the past two years, forage production increases obtained with sulfur fertilization would be economically viable.

OBJECTIVES

Kansas has nearly 2.5 million acres of cool-season grass pasture, primarily smooth bromegrass and tall fescue. Cool-season grasses have excellent forage production potential, but require intensive management to produce high yields of high quality forage. The high productive potential of bromegrass, coupled with the fact that growth and development of brome occurs during times when soils are cool and S release from organic matter is slow, raises questions about S needs. Studies were designed with the following objectives: 1) to evaluate S fertilizer rates (0, 15, 30 lb S/ac) on brome forage production and quality, and 2) to compare ammonium sulfate and ammonium thiosulfate as S sources for brome.

METHODS

Studies were initiated in 1987 in Riley County (Smolan silty clay loam) and in 1988 in Greenwood County (Kenoma silt loam) on established smooth bromegrass.

Sulfur, as either ammonium sulfate (AS) or ammonium thiosulfate (ATS), was applied surface broadcast in late winter (late January-February). Sulfur rates were 0, 15, or 30 lb/ac. Nitrogen was balanced on all treatments at 120 lb/ac using ammonium nitrate. Studies were harvested in late May and forage yields determined. Sub-samples were collected at harvest for moisture, N, and S determinations. Forage yields are reported at 12.5% moisture.

RESULTS AND DISCUSSION

The effects of sulfur fertilization on brome forage yields and forage quality are summarized in Tables 1 - 3.

Table 1. Effects of sulfur fertilization on bromegrass forage yields.

S	S	Riley Co.				Greenwood Co.		
Rate	Source	1987	1988	1989*	1990	1988	1989	1990
lb/ac		lb/ac						
0	---	6230	4090	2990	8280	5410	3910	5930
15	ATS	6800	4160	3480	9040	6010	4190	7090
30	ATS	6890	4100	3260	9270	5690	4160	6750
15	AS	6480	4480	3570	8770	5810	3950	7220
30	AS	7240	4080	3230	9250	5700	4360	7120
LSD(.05)		570	NS	NS	680	NS	NS	NS
LSD(.10)		--	NS	440	--	320	330	960

*1989 Yields in Riley County are for fall harvest only.

Table 2. Effects of sulfur fertilization on bromegrass forage quality.

		Forage Protein						
S	S	Riley Co.				Greenwood Co.		
Rate	Source	1987	1988	1989	1990	1988	1989	1990
lb/ac		%						
0	---	13.2	13.1	16.1	8.9	7.1	10.3	7.5
15	ATS	13.5	13.3	14.9	9.9	6.6	10.7	6.8
30	ATS	12.3	13.3	15.8	9.3	7.0	10.5	6.9
15	AS	12.6	13.2	14.7	9.4	7.1	11.1	7.3
30	AS	12.8	12.4	15.5	10.0	6.8	10.6	7.4
LSD(.05)		NS	NS	NS	NS	NS	NS	NS

Table 3. Effects of sulfur fertilization on bromegrass forage quality.

		Forage S						
S	S	Riley Co.				Greenwood Co.		
Rate	Source	1987	1988	1989	1990	1988	1989	1990
lb/ac		%						
0	---	.10	.14	.12	.09	.07	.07	.05
15	ATS	.13	.16	.17	.10	.07	.09	.07
30	ATS	.13	.17	.21	.10	.08	.09	.07
15	AS	.13	.17	.18	.10	.07	.09	.06
30	AS	.14	.17	.23	.10	.08	.09	.07
LSD(0.05)		.02	.02	.02	NS	NS	.01	.01

The addition of sulfur resulted in consistent and, in most years, significant increases in brome forage production at both locations (Table 1). Forage yields were increased with sulfur in 6 of 7 site years. Over the course of this work, brome forage yields were increased an average of about 500 lb/ac by sulfur fertilization. Differences between the 15 and 30 lb/ac S rates were nonsignificant and 15 lb S/ac appears to be enough to meet needs. In 1990 in Riley County, where yields were exceptional, the 30 lb/ac S rate did produce higher yields than the 15 lb/ac rate although the differences were nonsignificant. Both sources of S performed equally well.

Sulfur fertilization effects on brome forage protein levels were minimal (Table 2). Forage protein levels at harvest time were unaffected by the addition of sulfur. However, the addition of sulfur did increase forage S concentrations (Table 3). In 1990 (Riley County) dramatic visual responses to applied S became apparent in early April. Results of forage analyses from samples taken early (April 24) at this site are quite interesting (Table 4).

Table 4. Effects of sulfur fertilization on early-season forage quality.

S Rate	S Source	Riley County, 1990 Protein	S
lb/ac		------- % -------	
0	---	19.8	.08
15	ATS	21.8	.19
30	ATS	22.2	.22
15	AS	23.3	.21
30	AS	22.6	.24
LSD(0.05)		NS	.06
LSD(0.10)		2.1	--

Results from the early samples show the addition of sulfur did increase forage protein levels and dramatically increased forage S concentrations. However by harvest (1 month later) these differences had largely disappeared (Tables 2 and 3).

Overall, this work has some practical applications. Producers who put high demands on bromegrass should strongly consider application of 10-20 lb S/ac. Brome forage yield increases were sufficient to make S fertilization economical, considering average hay, beef, and S prices over the past 4 years. If sulfur is needed, ammonium sulfate and ammonium thiosulfate are viable sulfur sources.

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