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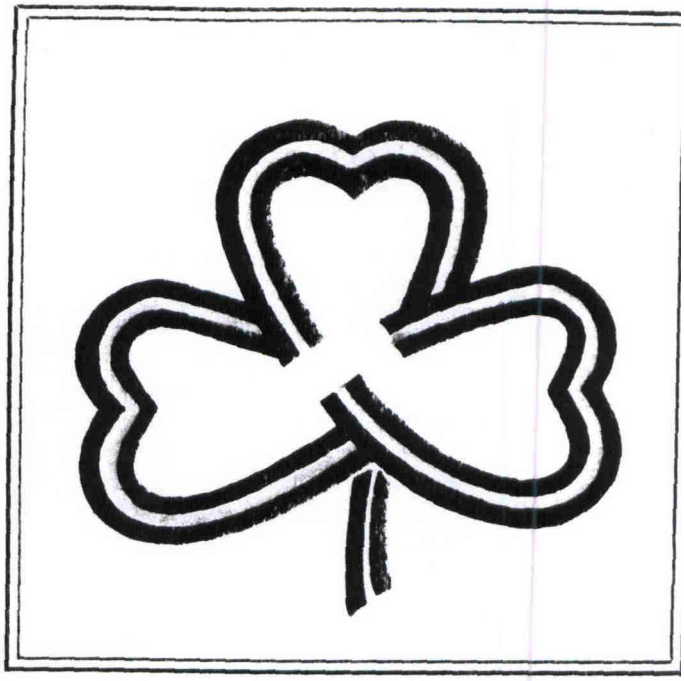

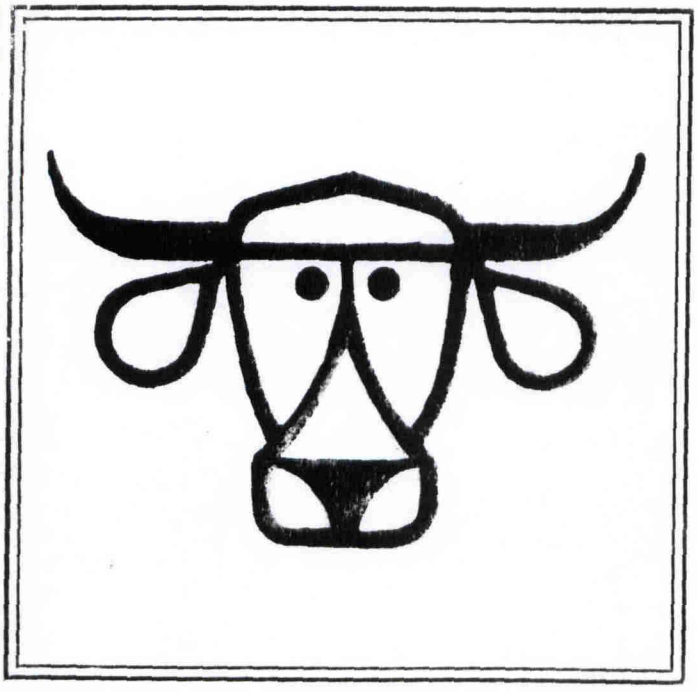

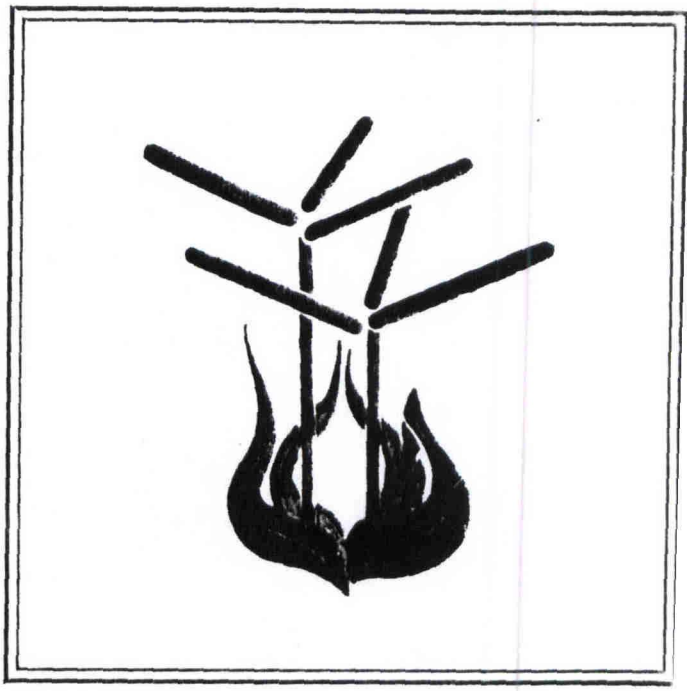

Forage Research in Texas

Departmental Technical Report No. 80-6
Department of Soil and Crop Sciences

FG - 0016

Project: H 6046 - H 6320
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COMPARISON OF RATES AND SOURCES OF POTASSIUM ON COASTAL BERMUDAGRASS

SUMMARY

This study reports on the effect of potassium (K) sources and fertilization rates on Coastal bermudagrass production. Although the study has been underway for only 2 years, we have observed significant increases in forage yield for higher K fertilization rates. Increases in forage yields are reported for 150 lbs K_2O/acre compared to an untreated control and also for 300 lbs of K_2O compared to the 150 lb rate. Potassium applied as sulfur-coated KCl produced higher yields than when applied as either K_2O (0-0-60) or sulfur-coated K_2SO_4. The response to K fertilization was greater in the second year of the study than in the first year. This indicated that soil K reserves were being depleted under the lower K fertilization treatments. No stand losses have been observed and the study will be continued an additional year.

OBJECTIVES

To compare the influence of different rates of both single season and split applications of ordinary KCl (muriate of potash, 60% K_2O) with sulfur-coated KCl and K_2SO_4 on dry matter yield and stand maintenance of Coastal bermudagrass.

PROCEDURE

Two experiments were located on well established bermudagrass meadows. The soil at one location is a deep sand (Darco series) and the other is a somewhat rocky soil (Cuthbert series). Bermuda pastures at both sites had exhibited stand thinning, foliar diseases and reduced yield at low K rates.

Nitrogen was applied as ammonium nitrate in equal applications of 100 lbs/N/acre after each harvest. Phosphorus was applied once in the spring at 150 lbs P_2O_5/acre. Sulfur at 40 lbs S/acre was applied once in the spring as gypsum. Potassium fertilizer was broadcast over the plots by hand.

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Potassium fertilizer sources were muriate of potash (KCl), sulfur-coated muriate of potash (S-KCl), and sulfur-coated potassium sulfate (S-K_2SO_4). Each potassium fertilizer was applied once annually at 150 and 300 lbs K_2O per acre. The KCl was applied as a split application. Each split application was 1/4 of the annual rate and was applied after each cutting. The nine treatments were as follows:

Treatment #	Treatment	Source	# Applications
1	0 lbs K_2O/ac		None
2	150 lbs K_2O/ac	0-0-60 (KCl)	1
3	300 lbs K_2O/ac	0-0-60 (KCl)	1
4	150 lbs K_2O/ac	0-0-60 (KCl)	4 (split)
5	300 lbs K_2O/ac	0-0-60 (KCl)	4 (split)
6	150 lbs K_2O/ac	Sulfur-coated KCl	1
7	300 lbs K_2O/ac	Sulfur-coated KCl	1
8	150 lbs K_2O/ac	Sulfur-coated K_2SO_4	1
9	300 lbs K_2O/ac	Sulfur-coated K_2SO_4	1

Harvest was in the boot stage when possible, otherwise, as the weather dictated. Dry matter yield was determined by mowing a 3 feet by 10 feet area, weighing and taking a subsample for subsequent moisture determination.

RESULTS

Both soils in this study were fairly high in potassium (K) and no response to K fertilization early in the study was observed. On the Cuthbert soil (Table 1), significant increases in forage yield were not observed until the third clipping. In the second clipping, yields from the untreated (K) control were beginning to be diminished. In the third clipping 1978, little or no real differences existed between the K rates or treatments with the exception of 150 lb K_2O split treatment which produced a lower yield. In the third clipping in 1979, there was some indication that the 300 lb K_2O treatment was maintaining higher yields than the 150 lb K_2O rate. In particular, the 300 lb sulfur-coated KCl treatment produced highest yields.

On the Darco deep sand, a significant response to K fertilization was not observed in 1978 (Table 2). By the second year (1979), a response to K was observed on the fourth clipping and appeared to be showing up on the third clipping also. On this soil little differences were observed between the 150 and 300 lbs K_2O rates. Again, the 300 lbs sulfur-coated KCl treatment produced the highest yield.

The average response on the Cuthbert soil to the 300 lbs K_2O treatment (compared to the 150 lb rate) was only 44 lbs of forage in 1978. However, the difference increased to 1163 lbs of forage in 1979. On the Darco sand, the extra 150 lbs of K_2O produced an increase of 152 lbs of total forage in 1978 and an increase of 839 lbs of forage in 1979. Since we have observed a larger response to K fertilization during the second year than in 1978, this was an indication that the K reserves in the soil being treated with 150 lbs K_2O were becoming depleted. The K reserves in the soil being treated with 300 lbs K_2O were being maintained. At this time, we have not observed any reduction in stands under any of the treatments. The study will be carried on for at least one more year and we expect to observe a larger response to K fertilization in the third year than we did in the second year. We also may observe a loss in stands in some of the plots fertilized at the lower rates of K.

Table 1. Yield of Coastal bermudagrass under nine potassium treatments on a Cuthbert rocky soil in 1978 and 1979.

Treatment	Cut 1	Cut 2	Cut 3
	lbs of oven dried forage/acre		
1978			
0 lbs K_2O/acre	3334[2]	2693[2]	2023c
150 lbs K_2O/acre of 0-0-60 (KCl)	3389	2946	2511abc
300 lbs K_2O/acre of 0-0-60 (KCl)	2885	3652	2727ab
150 lbs K_2O/acre of 0-0-60[1] (KCl)	3408	3310	2265bc
300 lbs K_2O/acre of 0-0-60[1] (KCl)	3416	3128	3696ab
150 lbs K_2O/acre of S-coated KCl	3414	3412	2623ab
300 lbs K_2O/acre of S-coated KCl	3060	3282	2730a
150 lbs K_2O/acre of S-coated K_2SO_4	3424	3048	2504abc
300 lbs K_2O/acre of S-coated K_2SO_4	3246	2984	2624ab
1979			
0 lbs K_2O/acre	4517[2]	2290[2]	1743[3] d
150 lbs K_2O/acre of 0-0-60 (KCl)	5812	3457	4116bc
300 lbs K_2O/acre of 0-0-60 (KCl)	5027	3351	4279bc
150 lbs K_2O/acre of 0-0-60[1] (KCl)	5209	2989	4154bc
300 lbs K_2O/acre of 0-0-60[1] (KCl)	6684	4586	4693ab
150 lbs K_2O/acre of S-coated KCl	6658	3222	3790c
300 lbs K_2O/acre of S-coated KCl	7116	3750	5275a
150 lbs K_2O/acre of S-coated K_2SO_4	6637	3330	4163bc
300 lbs K_2O/acre of S-coated K_2SO_4	5532	3498	4401bc

[1] Potassium fertilizer split into four equal applications.

[2] Yields not followed by any letters are not significantly different at the 5% level of probability as judged by Duncan's multiple range test.

[3] Yields followed by the same letter are not significantly different at the 5% level as judged by Duncan's multiple range test.

Table 2. Yield of Coastal bermudagrass in nine potassium treatments on a Darco deep sand in 1978 and 1979.

Treatment	Cut 1	Cut 2	Cut 3	Cut 4
	lbs of oven dry forage/acre			
1978				
0 lbs K_2O/acre	3871[2]	2737[2]	2444[2]	
150 lbs K_2O/acre of 0-0-60 (KCl)	4035	2823	2293	
300 lbs K_2O/acre of 0-0-60 (KCl)	3497	2771	2624	
150 lbs K_2O/acre of 0-0-60[1] (KCl)	3736	2761	2523	
300 lbs K_2O/acre of 0-0-60[1] (KCl)	3689	2925	2468	
150 lbs K_2O/acre of S-coated KCl	3831	2812	2448	
300 lbs K_2O/acre of S-coated KCl	3947	3144	2869	
150 lbs K_2O/acre of S-coated K_2SO_4	3886	3196	2181	
300 lbs K_2O/acre of S-coated K_2SO_4	3699	2808	2693	
1979				
0 lbs K_2O/acre	4167[2]	3976[2]	5677[2]	4771c[3]
150 lbs K_2O/acre of 0-0-60 (KCl)	4274	3668	6470	5666ab
300 lbs K_2O/acre of 0-0-60 (KCl)	3811	3661	6134	5436bc
150 lbs K_2O/acer of 0-0-60[1] (KCl)	3035	3645	4850	5713ab
300 lbs K_2O/acre of 0-0-60[1] (KCl)	4601	3966	5293	5788ab
150 lbs K_2O/acre of S-coated KCl	2803	4117	4980	5923ab
300 lbs K_2O/acre of S-coated KCl	4083	4113	7101	6226a
150 lbs K_2O/acre of S-coated K_2SO_4	4254	3758	6568	5824ab
300 lbs K_2O/acre of S-coated K_2SO_4	3661	3689	5695	5745ab

[1] Potassium fertilizer split into four equal applications.

[2] Yields not followed by any letters are not significantly different at the 5% level of probability as judged by Duncan's multiple range test.

[3] Yields followed by the same letter are not significantly different at the 5% level as judged by Duncan's multiple range test.