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RESIDUAL PLANT NUTRIENT LEVELS IN DARCO SOIL AFTER FOUR YEARS OF TREATMENTS AND CROPPING TIFTON 85 BERMUDAGRASS

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Background. Tifton 85 is a more recently introduced hybrid bermudagrass that has better nutritive value and greater yield potential than Coastal bermudagrass but data on response of Tifton 85 bermudagrass to applied plant nutrients is sparse. This field research, under rain-fed conditions, was designed to evaluate the effects of potassium (K), chloride (Cl), and sulfur (S) at two nitrogen (N) rates on Tifton 85 bermudagrass yield and possible stand decline that is frequently reported as a symptom of potassium deficiency in Coastal bermudagrass. This study was located on Darco loamy fine sand near the Texas A&M University Agricultural Research and Extension Center at Overton.

Several years before initiation of this study, three tons of ECCE 100% calcitic limestone containing 4% magnesium (Mg) was broadcast on this site. Just before initiation of this study, two tons of ECCE 72% limestone and 180 pounds of P_2O_5/acre were incorporated into the Darco soil in April 2001, and the soil was packed with a roller. Tifton 85 sprigs were planted in late April 2001. We applied one-half inch of water to the experimental site after broadcasting 68 lbs of N/ac as ammonium nitrate. Potassium and Cl treatments were applied as KCl (0-0-62). Sulfur treatments were applied as K_2SO_4 (0-0-50) and compared to S treatments applied as elemental S at KCl rates equivalent to those applied with no added S. These K, Cl, and S treatments were applied to split plots as K_2O rates of 134, 268, and 402 lb/acre in increments of one-third of each rate applied three times during the growing season. In the first three years of this experiment, N rates were 60 and 120 lb/ac. The N rates were increased to 80 or 160 lb/ac/harvest, applied for each of five harvests of bermudagrass in 2004. Nitrogen rates were main plots and K, Cl, and S rates and sources were subplots in this split-plot experimental design. Individual plot size was 10 x 18 feet. Harvests from 60-inch-wide strips of variable, but measured lengths were made using a Swift Machine self-propelled forage plot harvester. Samples of soil were collected from the 0-6-in depth at random from each plot after the end of the 2004 growing season. Soil samples were dried at 60 °C, passed through a 20-mesh screen and analyzed for pH, phosphorus (P), K, Ca, Mg, and S by analytical methods used in the Texas A&M University Soil, Water, and Forage Testing Laboratory.

Research Findings. Analysis of soil samples collected from the 0-6-in depth following the 2004 growing season indicated that significant changes have occurred because of treatment (Table 1). Increasing the rate of applied N had no statistically significant effect on P, Ca, Mg, or S, but caused soil pH and extractable K to decline. A pH of 6.2 is expected to be adequate for optimum

production of Tifton 85 bermudagrass. The main effects of increasing the K, Cl, and S rates had no effect on pH, P, Ca, or Mg, but significantly increased extractable soil K and S. Since the 268 lb K_2O rate significantly increased DMY (see yield report), it is anticipated that a Mehlich III level of extractable soil K at or below 30 ppm might be considered critical for optimum production of Tifton 85 bermudagrass. However, other nutrient levels such as S could be affecting bermudagrass response. When K sources were applied, DMY was significantly increased according to KCl + S > K_2SO_4 > KCl. Where KCl + S were applied, S was measured at 17 ppm compared to 12 ppm for K_2SO_4 and 11 ppm for KCl. Since S as SO_4 is a mobile nutrient, adequacy of any S soil test level in the 0-6-in depth is difficult to interpret. Deeper sampling should be the norm for mobile plant nutrients in order to determine sufficiency for optimum crop production. The K sources, KCl and K_2SO_4 had similar effects on soil pH in the 0-6-in depth, but, as expected, adding elemental S with the KCl significantly lowered pH.

Table 1. Darco soil pH, P, K, Ca, Mg, and S levels in the 0-6-in depth after treatments with N and K rates, and Cl and S K sources for Tifton 85 bermudagrass- after the 2004 season.

N rate	Soil pH and residual plant nutrient levels[†]											
lb/ac/harv.	pH		P		K		Ca		Mg		S	
			ppm									
80	6.83	a	84		34	a	976		40		12	
160	6.22	b	77		22	b	717		38		14	
K rate												
lb K_2O/ac												
0	6.44		89		17	c	768		34		11	b
134	6.50		83		19	c	842		40		11	b
268	6.59		77		30	b	891		40		12	b
402	6.51		80		39	a	833		39		17	a
K Source												
KCl	6.58	a	77		33	a	871		39		11	b
K_2SO_4	6.70	a	81		30	a	882		40		12	b
KCl + S	6.32	b	81		24	b	813		40		17	a
R^2	0.76		0.41		0.84		0.60		0.27		0.76	
c.v.	3.9		24.4		23.8		22.3		33.1		24.1	

[†]Values in a column/group followed by a dissimilar letter are significantly different statistically ($\alpha = 0.05$).