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CHLORIDE CONCENTRATION AND UPTAKE BY TIFTON 85 BERMUDAGRASS IN FIVE CUTTINGS IN 2004

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Background. The response of Tifton 85 bermudagrass to chloride (Cl) was evaluated in a potassium rate and source at two N-rates study that was adequately fertilized with 180 lb P_2O_5/ac disked into the Darco soil at initiation of the study in 2001. In 2002, 2003, and 2004, an additional 120 lb of P_2O_5/ac/yr as triple superphosphate (0-46-0) was surface-applied at growth initiation of the Tifton 85 bermudagrass. Chloride sources were potassium chloride (KCl, 0-0-62-47% Cl) and KCl plus elemental sulfur (S) compared to potassium sulfate (K_2SO_4, 0-0-50-17.6% S) that contains 2% Cl. Potassium rates from all sources were 0, 134, 268, and 402 lb/ac as K_2O split-applied one-third at growth initiation and one-third each after early- and mid-season harvest, to 10 x 18-ft plots that were fertilized with 80 or 160 lb of N/ac for each re-growth during the 2004 season. Chloride was applied at rates of 102, 204, and 306 lb/ac in the KCl and KCl + S sources. Yield data and samples of Tifton 85 were collected from each plot at each harvest for dry matter and chemical analysis using a Swift Machine forage plot harvester. Samples were dried 48 hours at 60 °C and ground to < 20-mesh. A 0.35 gram sample was treated with 35 ml of 0.1 molar nitric acid, shaken 15 minutes at 250 cycles/min, filtered, and analyzed for Cl by titration with silver nitrate using an ion specific electrode on an Orion 901 ionalyzer.

Research Findings. Plant Cl concentration was significantly increased in three harvests and in total at the lower N rate compared to the high N rate (Table 1). The effect of decreasing Cl content in bermudagrass as the N rate was increased may be a dilution effect more than a nitrate ion uptake antagonism with Cl as there was no significant difference in Cl uptake due to N rate (Table 2). The increased yield of bermudagrass with lower Cl content at the higher N rate caused Cl uptake to equal uptake at the lower N rate. The concentration of Cl generally increased as the K, Cl, and S rates were increased. Only in the fourth and fifth harvests was the Cl concentration of bermudagrass significantly increased at the 402 lb K_2O rate compared to the 268 lb/ac rate. Each successive increase in K_2O rate (Cl) significantly increased total plant Cl uptake (Table 2). Chloride was significantly lowest in plants fertilized with K_2SO_4 (Table 1). Increased yield with KCl + S caused increased Cl uptake compared to KCl in mid- to late-season harvests (Table 2).

Application. Chloride increases yields in small grain crops. Some reports indicate that the yield increase is due to disease suppression. To date, there has been little evidence of helmenthosporium in the Tifton 85 with or without increased levels of Cl application. Based on dry matter yields, both S and Cl are needed for maximizing dry matter production on this Darco

loamy fine sand. Yield from plots treated with K_2SO_4 was greater than where bermudagrass was fertilized with KCl even though the K_2SO_4-treated grass contained only 689 ppm Cl compared to 2,375 ppm Cl in bermudagrass from KCl-treated plots. Addition of S with the KCl provided an additional yield increase and a greater Cl concentration compared to the K_2SO_4 treatment.

Table 1 . Tifton 85 bermudagrass Cl conc. response to N and K rates and K and S sources in 2004.

N rate	**Plant Cl concentration**[†]					
lb/ac/harv.	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Harvest 5	Season avg.
	ppm					
80	1585	1986	1577 a	2163 a	1986 a	1859 a
160	1601	1562	1183 b	1674 b	1486 b	1501 b
K rate						
lb K_2O/ac						
0	1432	922 c	771 c	712 d	669 c	901 c
134	1513	1624 b	1267 b	1735 c	1709 b	1570 b
268	1656	2007 a	1435 ab	2096 b	1887 ab	1816 a
402	1664	1975 a	1642 a	2326 a	1966 a	1914 a
K Source						
KCl	1955 a	2568 a	1936 a	2809 a	2607 a	2375 a
K_2SO_4	1054 b	786 c	567 b	527 b	511 c	689 c
KCl + S	1823 a	2253 b	1840 a	2821 a	2445 b	2236 b
R^2	0.79	0.94	0.88	0.97	0.96	0.97
c.v.	18.2	16.3	23.5	12.2	14.7	11.3

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

Table 2. Tifton 85 bermudagrass Cl uptake response to N and K rates and K and S sources in 2004.

N rate	**Plant Cl uptake**[†]					
lb/ac/harv.	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Harvest 5	Total
	lb/ac					
80	1.68	2.85	4.09	7.59	6.56	22.77
160	1.96	2.56	3.11	7.06	6.45	21.14
K rate						
lb K_2O/ac						
0	1.34 b	1.02 c	1.41 c	1.92 d	2.07 c	7.75 d
134	1.69 a	2.37 b	3.21 b	6.40 c	6.21 b	19.89 c
268	1.96 a	3.11 a	3.88 ab	8.07 b	6.93 b	23.96 b
402	1.97 a	3.19 a	4.45 a	9.30 a	7.85 a	26.76 a
K Source						
KCl	2.20 a	3.70 a	4.48 b	10.00 b	9.16 b	29.54 b
K_2SO_4	1.22 b	1.29 b	1.64 c	2.08 c	1.86 c	8.08 c
KCl + S	2.21 a	3.69 a	5.42 a	11.69 a	9.97 a	32.98 a
R^2	0.72	0.88	0.83	0.94	0.94	0.95
c.v.	27.0	23.4	30.0	19.3	18.7	16.1

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