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RESPONSE OF ALFALFA IN COASTAL BERMUDAGRASS TO APPLIED POTASSIUM, MAGNESIUM, AND SULFUR

V. A. Haby, A. T. Leonard, and J. V. Davis

Background. Introduction of alfalfa to grow as a companion forage with bermudagrass has the potential to produce a higher quality forage for pasture or hay. Previously, alfalfa production on acid, humid region soils has been limited due to lack of management information.

We initiated studies of the feasibility of growing alfalfa concurrently with Coastal bermudagrass in 1990. Studies include alfalfa response to potentially soil deficient nutrients and to limestone. This report contains results from one year of our study on the response of alfalfa to fertilization with potassium (K), magnesium (Mg), and sulfur (S).

Limestone was applied and incorporated into a Darco loamy sand by disking in spring 1992 to raise soil pH to 7. Alfagraze alfalfa was seeded at 7 lb/ac 19 Oct. 1993 at a 27 in. row spacing. Plots were sprayed with Furadan at 1 pt/ac on 29 Nov. 1993 and 10 Mar. 1994 to eliminate harmful insects. Rates of K_2O as KCl, Mg as $MgCl_2 \cdot 6H_2O$, and S as Disper-Sul 90% S (Table 1a, 1b, and 1c) were divided into thirds and applied three times during the growing season. These nutrients were applied in 15 treatment combinations replicated four times to fit a central-composite, rotatable design. Plots were treated with Pursuit at 6 oz/ac on 10 Mar. 1995 for weed control. All plots were fertilized with 75 lb P_2O_5, 2 lb boron, and 0.5 lb of Zn and Cu/ac on 9 Aug. 1993 and on 6 Mar. 1994. Harvests were made approximately every 30 days.

Research Findings. Application of 360 lb K_2O/ac to the Darco soil doubled alfalfa yield in 1994 (Table 1a) at the 45 lb/ac rates of Mg and S. This response to potash was not statistically significant. Alfalfa yield increase due to potash in 1995 was statistically significant, but yield level was low due to the prolonged summer drought (Table 2). Application of potash had no effect on bermudagrass yield.

Alfalfa yields were not increased by Mg in 1994 (Table 1b). Yields affected by Mg in 1995 were about one t/ac lower than in 1994 (Table 2). The yield increases were not sufficiently large to be statistically significant. Magnesium application had no effect on increasing yield of bermudagrass either year.

Sulfur at rates up to 68 lb/ac increased alfalfa yield, though not at levels adequate for statistical significance in this study either year (Table 1c and Table 2). Sulfur application had no effect on bermudagrass yield.

Application. Yield results are preliminary. They provide an indication that alfalfa is

responding to potash (Table 1a) with very little response to S or Mg the first year. Second year yield response was limited due to the prolonged drought that began in early summer. Coastal bermudagrass is not responding to these treatments, but yields are generally low.

Table 1. Response of Alfagraze alfalfa to applied potash, magnesium, and sulfur on a Coastal Plain Ultisol in 1994.

Rate	Cut 1	Cut 2	Cut 3	Cut 4	Cut 5	Total
			lb/ac			t/ac
a. Potash (K_2O) and alfalfa						
0	832	654	414	318	205	1.21
90	1111	913	610	435	330	1.68
180	1307	1105	743	535	446	2.04
270	1421	1231	813	619	552	2.29
360	1425	1290	820	686	648	2.43
b. Magnesium and alfalfa						
0	1215	1084	765	563	528	2.08
22.5	1252	1080	740	531	459	2.01
45	1307	1105	743	535	446	2.04
67.5	1379	1158	776	574	488	2.16
90	1467	1240	838	650	584	2.38
c. Sulfur and alfalfa						
0	634	805	500	282	230	1.22
22.5	1047	959	649	441	360	1.72
45	1307	1105	743	535	446	2.04
67.5	1413	1245	782	564	488	2.18
90	1366	1378	767	528	485	2.14

Table 2. Predicted response of Alfagraze alfalfa to applied potassium, magnesium, and sulfur on a Coastal Plain soil in 1995.

						Statistical significance level
K rate, lb/ac	0	90	180	270	360	
Alfalfa DM, t/ac[1]	0.68	1.23	1.69	2.08	2.38	p = 0.05
Mg rate, lb/ac	0	22.3	44.6	66.9	89.2	
Alfalfa DM, t/ac[2]	1.26	1.23	1.33	1.57	1.95	NS
S rate, lb/ac	0	22.3	44.6	66.9	89.2	
Alfalfa DM, t/ac[3]	0.76	1.12	1.33	1.37	1.26	NS

[1]Mg and S rates constant at 22 lb Mg and 45 lb S/acre.
[2]K and S rates constant at 90 lb K and 45 lb S/acre.
[3]K and Mg rates constant at 90 lb K and 45 lb Mg/acre.