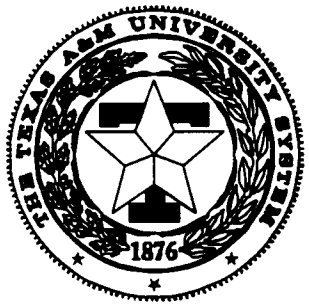
PUBLICATIONS

1998

FORAGE-LIVESTOCK FIELD DAY REPORT - 1998

TEXAS A&M UNIVERSITY AGRICULTURAL RESEARCH and EXTENSION CENTER at OVERTON

Texas Agricultural Experiment Station
Texas Agricultural Extension Service



April 16, 1998

Research Center Technical Report 98-1

EFFECT OF BORON AND SOIL ACIDITY LEVELS ON BERMUDAGRASS AND RYEGRASS YIELDS AND ELEMENT CONCENTRATIONS IN THE SOIL

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Background. This research project is designed to evaluate the effect of applied boron on production of TAM 90 annual ryegrass and Coastal bermudagrass. Various plots have been treated with zero, one, and two tons of ECCE 62 and 100% limestone per acre three times from 1989 to 1992. Boron rates were zero, one, and two lbs/acre for three years of clover, one year of clover and alfalfa, and one year of alfalfa. Boron rates were raised to two and four lb/acre for the final two years of alfalfa. Boron rates have been lowered to one and two lb/acre for forage grasses and continue to be applied each fall. Ryegrass is overseeded into soil established to Coastal bermudagrass. Grasses are fertilized and harvested throughout their respective growing seasons. Soil and plant samples are collected from these studies for chemical analysis.

Research Findings. Data in Table 1 indicate that boron and limestone ECCE had no significant effect on ryegrass yield. Yields of TAM 90 ryegrass were significantly increased by the effect of earlier limestone treatments on soil pH in 1996 and 1997. Yield data for Coastal bermudagrass in 1996 appear to indicate that this forage is negatively affected by increasing limestone rates but these data are deceiving. A drought occurred in 1996. Approximately 800-lb/ac additional ryegrass dry matter was produced during spring rains on plots with soil pH above 6.0. Increased ryegrass forage removed more soil water than did the lower-yielding ryegrass in plots that averaged soil pH 5.3. In addition, the increased growth of ryegrass in the well-limed plots provided shade that delayed soil warming and depressed the photosynthetic activity in the bermudagrass. In 1997, ryegrass responded significantly to lime rate but the yield increase was only about 450 lb/acre. Bermudagrass yield was not affected by surface soil acidity at a soil pH of 4.33 and 20 ppm exchangeable aluminum.

Bermudagrass yield was significantly decreased by 2 lb of boron/ac in 1996. A trend shows increasing boron rates appeared to lower bermudagrass yield in 1997. These results could be related to an accumulation of boron in soil depths not analyzed in this study.

Increasing lime rate and ECCE increased soil pH. The 2-lb/ac-boron rate significantly lowered soil pH in 1997. This may be due to an increased level of residual, mineralizable organic nitrogen left for nitrification due to greater alfalfa yields in response to boron fertilization in an earlier study. Increasing boron rate in 1996 significantly increased soil boron level. After several years of boron fertilization on this Darco site, soil boron levels are significantly higher at elevated soil pH.

Application. Data from 1996 and 1997 indicate that boron fertilization has no significant effect on ryegrass production when the soil level of boron is in the range of 0.45 to 0.60 ppm. Ryegrass yield was increased at soil pH above 5.3 with exchangeable aluminum at 8.8 ppm in 1996 and above 5.1 with aluminum at 20 ppm in 1997.

Table 1. Effects of boron and limestone treatments on TAM 90 ryegrass and Coastal bermudagrass dry matter yield and on soil pH and selected element concentrations in a Darco loamy fine sand at Overton, 1996 and 1997.

	1996 Yields			Element concentrations in soil†				
Treatment Lime rate‡	Rye-grass	Bermu-dagrass	Soil pH	Boron	Calcium	Mag-nesium	Alum-inum	Man-ganese
tons/acre	----------lb/ac---------			----------ppm----------				
0	1599 b	7004 a§	5.29 c	0.49 b	157 c	42 a	8.8 a	22 a
1	2468 a	5643 b	6.27 b	0.52 ab	864 b	98 b	0.3 b	19 b
2	2313 a	5301 b	6.68 a	0.58 a	1767 a	127 a	0.1 b	14 c
Lime ECCE %								
62	2231 a	5654 ns	6.27 b	0.55 ns	1338 ns	108 ns	0.2 ns	18 a
100	2551 a	5290	6.68 a	0.55	1293	117	0.1	15 b
Boron rate lb/ac								
0	2179 ns	6300 a	6.24 ns	0.45 b	1132 ns	105 a	1.7 ns	17 ns
1	2187	6055 a	6.24	0.57 a	1133	104 a	2.0	18
2	2332	4979 b	6.23	0.59 a	986	86 a	1.9	17
Lime rate tons/acre	1997 Yields ----------lb/ac---------							
0	3650 b	7080 ns	4.33 c	0.53 b	229 c	41 c	20.1 a	21
1	4099 a	7174	5.16 b	0.54 b	728 b	60 b	0.3 b	22 a
2	4077 a	7181	5.99 a	0.65 a	1421 a	80 a	0.1 b	14 b
Lime ECCE %								
62	4065 ns	7330 ns	5.36 b	0.59 ns	1173 ns	62 a	0.2 ns	19 ns
100	4111	7025	5.78 a	0.60	976	78 a	0.3 ns	18
Boron rate lb/ac								
0	4064 ns	7492 ns	5.41 a	0.56 ns	874 ns	63 ns	4.07 ns	19 ns
1	4059	7084	5.33 ab	0.59	845	69	4.10	18
2	3878	6898	5.24 b	0.59	997	60	4.46	20

†pH (1:2, soil:water); hot water soluble boron; NH_4OAc Ca and Mg; KCl extractable aluminum; DTPA extractableMn.

‡Lime rates applied three times from 1988-1992. Lime last applied in fall 1992.

§Within a column, treatment, and year, numbers followed a different letter are statistically different.