RESPONSE OF TAM 90 RYEGRASS TO THE RESIDUAL EFFECTS OF LIMESTONE RATES AND ECCE AND TO BORON RATES

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Background. Compared to the deep-rooted hybrid bermudagrasses, cool-season annual ryegrass is relatively shallow rooting, to approximately 15-inches deep. Ryegrass is more sensitive to acidity in the surface soil than are the deeper-rooting perennial hybrid bermudagrasses. This report relates the residual effects of limestone rates and effective calcium carbonate equivalence (ECCE %) and boron (B) rates on ryegrass. Field plots were treated with lime rates of one and two tons/acre using 64 and 100% ECCE limestone in 1988, 1991, and 1992. Limestone was left on the soil surface until after the 1992 application when the soil was disked about two inches deep. Boron as Granubor™ (15% B) was applied annually from 1989 at rates of one and two lb/acre except in 1994 - 1996 when these rates were increased to 2 and 4 lb/acre. Check plots of zero lime and B were included in these studies. Ryegrass was seeded at the rate of 30 lb/acre in fall proceeding each harvest year. Varying numbers of ryegrass cuttings were made from year to year.

Research Findings. Yield data in Table 1 show that ryegrass dry matter (DM) was significantly increased by the effects of residual limestone. Dry matter production was increased approximately 450 lb/acre in 1997 by the residual effect of three 1.0 ton/acre limestone applications. In 1998, ryegrass DM yields in the zero limestone treatment plots had declined dramatically. Yield differences between the three, one ton/acre treated plots and the zero lime plots was about 1400 lb of DM/acre in favor of the limed plots. In 1999, similar yield differences occurred between the zero-lime plots and the plots that had received the one ton/acre applications, but this year, dry matter yield was significantly increased by the highest limestone rate applied three times compared to the multiple one-ton/acre treatment. The annual increase in ryegrass dry matter yield averaged over four years was approximately 1000 lb/acre due to limestone treatment compared to the check plots that received no limestone.

Limestone ECCE had no significant effect on ryegrass production five or more years after the third treatment had been applied. Data in Table 1 show that boron treatment of the limed or unlimed soils had no effect on dry matter yields. There was a statistically significant interaction between limestone ECCE and boron treatments in 1998 and in the four-year total yield data.

Analysis of soil samples from previous years indicated that the ECCE 100% limestone maintained soil pH 0.34 unit above the pH level from the ECCE 64% limestone treatment.

Application. The residual effect of limestone applied at the rate of one ton/acre each year in 1988, 1991, and 1992 significantly increased ryegrass dry matter yield above the unlimed check plots at least eight years after the final application. Seven years after the last treatment, the effectiveness of the one ton/acre rate was overshadowed by significantly increased yields due to the two ton/acre rate.

Table 1. Effect of boron[1] rates, limestone rates[2], and ECCE on yield of TAM 90 annual ryegrass.

Treatment	Ryegrass dry matter yield by years				
	1997	1998	1999	2000	Four-yr. total
Lime, t/ac	lb/acre				
0	3,650 b[†]	1,851 b	1,803 c	2,303 c	9,607 c
1	4,099 a	3,261 a	3,253 b	3,013 b	13,626 b
2	4,077 a	3,631 a	3,783 a	3,197 a	14,689 a
Lime ECCE%					
64	4,065 ns	3,513 ns	3,467 ns	3,150 ns	14,195 ns
100	4,111 ns	3,379 ns	3,570 ns	3,060 ns	14,119 ns
Boron, lb/ac					
0	4,064 ns	3,157 ns	3,230 ns	2,898 ns	13,348 ns
1	4,059 ns	3,177 ns	3,071 ns	2,966 ns	13,273 ns
2	3,878 ns	3,048 ns	3,224 ns	2,970 ns	13,120 ns
R^2	0.40	0.67	0.75	0.71	0.84
CV	11.1	20.3	18.2	9.2	7.7

[1]Boron rates applied annually since 1988. In 1994, 1995 and 1996, B rates were doubled.
[2]Limestone rates were applied in 1988 and repeated applications were made in 1991 and 1992. Only following the 1992 application was the lime mixed about two inches deep.
[†] Values followed by a different letter within a column are statistically different at the .05 confidence level.