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RESPONSE OF TAM 90 RYEGRASS TO LIMESTONE AND POTASSIUM

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Background. Annual ryegrass has moderate tolerance to soil acidity. This forage crop will continue to produce some growth even at soil pH levels approaching 4.5. However, the quantity and quality of forage produced is quite poor. Ryegrass yields are much improved at pH levels above 5.5 and closer to 6.2. Potassium (K) is a plant-essential nutrient element. Uptake of K can exceed plant requirements when a surplus is available in the soil. The K requirement of annual ryegrass is the least researched of the macronutrient elements. In 1992, we initiated a study to quantify the effect of limestone and K on ryegrass yield. Five rates of limestone from zero to 4000 lb/ac and five rates of K from zero to 200 lb/ac were applied to experimental plots according to the requirements of a central composite rotatable design study. Limestone at these same rates had been applied to these sites once before, in 1988. Rates of K were applied each year. Ryegrass was seeded on the first of two alternating, duplicate sites beginning in fall 1992. Both experimental sites had been acidified by incorporation of elemental sulfur in spring 1988. Each plot was 13.3 x 20 feet. Three varieties, two experimentals and 'TAM 90', were evaluated in each plot but only the results of the TAM 90 variety will be discussed in this study. Nitrogen was applied three times each season at one-third of the design rate. Three harvests of ryegrass were made each season. Total yield of ryegrass dry matter is reported.

Research findings. At low limestone application rates, increasing the rate of K applied, lowered ryegrass yield (Table 1). At the high rate of K and zero limestone application, ryegrass yield was lowered by approximately 2 t/ac. As the limestone rate was increases to the medium level, ryegrass yield increased to the 100 lb/ac rate. Increasing the limestone rate toward the higher rates lowered ryegrass yield when low levels of K were applied. At the higher limestone rates, increasing rates of K increased ryegrass dry matter production. Yields appeared to reach a plateau mid-way between the medium and high rates of limestone and K, but as both variable rates continued to increase, dry matter production continued to increase again (Fig. 1).

Application. Results from this study on the interactive effects of limestone and K treatments on this acidified Bowie soil show the importance of soil acidity management by maintaining a good liming program. Without raising the soil pH by application of limestone, treatment of the soil with fertilizer K dramatically lowered yield of TAM 90 ryegrass. On the opposite end of the limestone application rate, too much limestone, or raising the soil pH to near 7.0, lowered ryegrass yield when K was not applied. To obtain the most efficient ryegrass

production on strongly acid soil, limestone to raise the soil pH above 5.5, along with K fertilization, is necessary. One without the other can have a detrimental effect on ryegrass yield.

Table 1. Effect of limestone and potassium on three-year total TAM 90 ryegrass dry matter production on a Bowie soil.

Limestone rate	Potassium rate, lb/ac				
	0	50	100	150	200
lb/ac	Dry matter, lb/ac				
0	10520	10720	10175	8886	6851
1000	12308	12988	12922	12112	10557
2000	12898	14057	14471	14140	13065
3000	12290	13928	14822	14971	14375
4000	10484	12602	13975	14603	14487

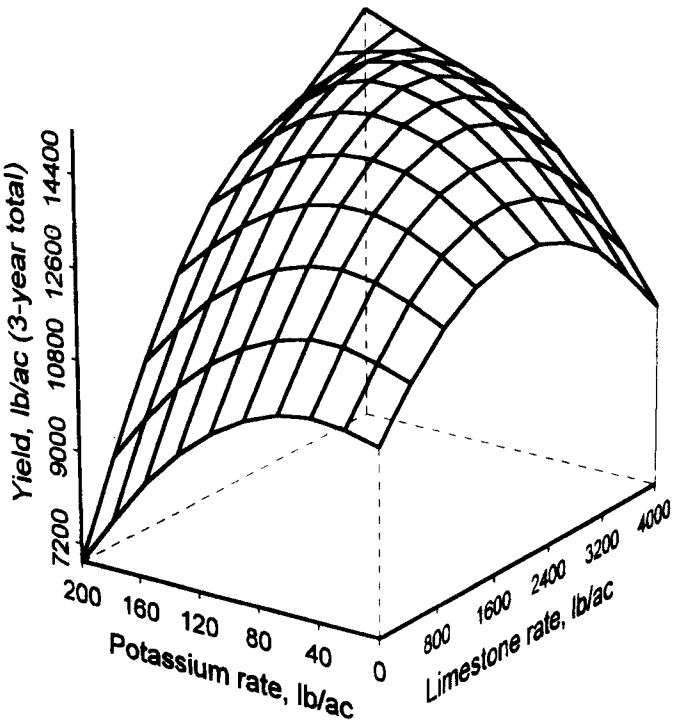

Figure 1. Three-year total TAM 90 ryegrass dry matter yield response to limestone and potassium rates.