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RESPONSE OF 'TIFLEAF' MILLET TO LIMESTONE, NITROGEN, AND POTASSIUM

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Background. Efficient warm-season livestock production is sometimes limited by the lack of adequate amounts of high-quality pasture. During the hot summer months, most perennial, cool-season forages become semi-dormant and quality of perennial, warm-season forages is poor. Millets are valuable in the development of year-round forage systems, particularly where quality is important, as with lactating or rapidly growing animals. The more productive cultivars are characterized by rapid growth of nutritious forage in late spring and summer and can be used for grazing, green chop, silage, and hay.

Millets grow well under conditions considered stressful to other warm-season species including sorghum. Millets are adapted to highly weathered, acidic soils and to drought prone environments. Acid tolerance is a desirable characteristic for a species that is to be grown in regions where liming is not feasible or where subsoils are acidic and contain toxic levels of aluminum. We established this experiment in 1989 to evaluate the acidity tolerance of the new millet variety 'Tifleaf'. The response of Tifleaf millet to nitrogen and potassium was included as part of the experiment.

Research Findings. The Bowie fine sandy loam soil at this site was acidified by application of elemental sulfur during the winter of 1988-1989. In mid-spring, we configured the 13.33 x 20 ft plots to receive treatments according to the requirements for a central-composite, rotatable design that would allow evaluation of 3 variables at 5 rates each. Variables selected were limestone, nitrogen, and potassium. Limestone (ECCE 62%) rates applied to selected plots were 0, 1000, 2000, 3000, and 4000 lb/ac. Nitrogen rates were 0, 30, 60, 90, and 120 lb/ac. Potassium was applied as muriate of potash at rates of 0, 50, 100, 150, and 200 lb K_2O/ac. Plots were fertilized with adequate rates of phosphorus for millet production. Two cuttings of millet were made that summer. Forage dry matter was determined from fresh weight and percent water.

At the zero rates of N and K_2O, limestone treatment increased soil pH as shown here.

	Limestone rate, lb/ac				
	0	1000	2000	3000	4000
Soil pH	5.15	5.45	5.58	5.55	5.36

Normally, the 2 ton/ac rate of limestone incorporated into sandy loam would have raised soil pH beyond 5.36. At the time these samples were collected, the sulfur was probably still oxidizing and creating additional acidity. The ECCE 62 limestone was not sufficiently reactive to overcome the acidifying effect of the sulfur.

Increasing the N rate from zero to 120 lb/ac caused a striking rise in yield of millet. Yield increased from 1750 to 6100 lb/ac when the soil pH was at a low of 5.15 (Figure 1). Millet response at the zero rate of N was minimal at the 1000 lb/ac limestone rate, and increased only 1100 lb/ac at the 2 ton/ac limestone rate. At the high rate of applied nitrogen, increasing the limestone rate lowered millet yield.

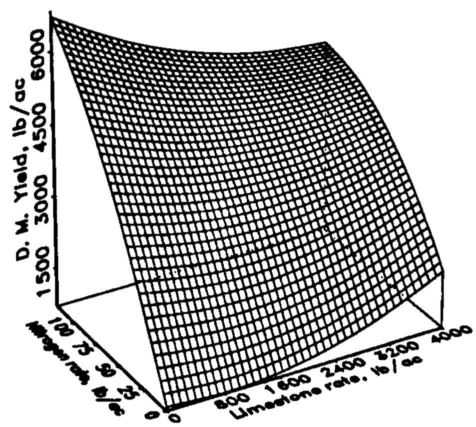

Fig. 1. Millet response to limestone and N.

Millet responded significantly to the interaction of nitrogen and potassium (Figure 2). At the zero nitrogen rate, millet yield increased from 760 to 2260 lb/ac as the potash rate was increased from zero to 200 lb/ac. At the zero rate of potash, millet yield increased from 769 to 6688 lb dry matter/ac as the nitrogen rate was increased from zero to 120 lb/ac. At the high rate of potash, millet yield decreased as the nitrogen rate was increased. Nitrogen was more limiting than potassium in this soil.

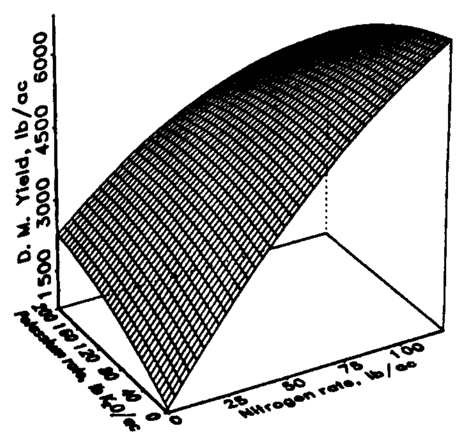

Fig. 2. Millet response to N and K.

Application. Tifleaf millet is tolerant to low soil pH. Increasing the nitrogen rate caused the largest increase in millet dry matter yield regardless of the limestone or potash treatments. The largest response of millet occurred at the lowest rates of limestone and potash. As the limestone and potash rates were increased, response of millet to increasing rates of nitrogen decreased. Several years of cropping to lower the soil potassium supply and to increase soil acidity, would change the response curve.