PUBLICATIONS
2006

TIFTON 85 BERMUDAGRASS RESPONSE TO THE INTERACTION OF NITROGEN AND POTASH ON DARCO LOAMY FINE SAND

Vincent Haby, Allen Leonard, and Mike Stewart

Background. Tifton 85, the last of Dr. Glen Burton's hybrid bermudagrass variety releases (1993), is reported to produce greater yields of higher nutritive value forage. However, data on response of Tifton 85 to soil and applied plant nutrients is limiting. Site preparation included surface application of three tons of ECCE 100% limestone/acre that contained about 4% magnesium to this Darco soil several years earlier. Two additional tons of ECCE 72% limestone and 180 pounds of P_2O_5/ac were applied in early April 2001. Limestone and phosphorus were incorporated by disking and the soil was packed with a roller to conserve water. Tifton 85 was sprigged in 3 x 3 foot rows in April 2001 to evaluate its response to potassium (K), sulfur (S), and chloride (Cl) at two nitrogen (N) rates applied for each regrowth of bermudagrass. Potassium sources were potassium chloride (KCl, 0-0-62-47% Cl), potassium sulfate (K_2SO_4, 0-0-50-17% S), and KCl plus elemental sulfur (S). Potassium rates were 0, 134, 269, and 402 lb/acre as K_2O split-applied one-third at growth initiation and one-third each following two in-season harvests to 10 x 18-ft plots that received 80 or 160 lb of N/ac for each bermudagrass regrowth during the 2004 growing season. The N rates are main plots and K rates, K sources, Cl, and S are subplots in a split-plot in time experimental design. Yield estimates and a dry matter and chemical analysis sample were collected using a Swift Machine Company self-propelled forage plot harvester.

Research Findings. A significant quadratic interaction occurred between N and K rates relative to total yields (Fig. 1). At the low N rate bermudagrass yield peaked near the 268 lb/acre rate of K_2O. At the high N rate, dry matter yield continued to increase to 402 lb K_2O/ac at a rate that indicates that yield is nearing a peak, probably related to water availability or the lack thereof. These data indicate that sufficient applied potassium was available at the higher rates for additional yield response, but N became deficient for Tifton 85 at the lower N rate, even though this rate applied for five harvests totaled 400 lb of N/acre. Extractable soil K, initially about 40 ppm (Mehlich III) in the 0 to 6-in soil depth, ranged from 17 to 19, 30, and 39 ppm as prior year's potash treatments were increased from 0, 134, 268, and 402 lb of K_2O/acre, respectively.

Application. The 268 and 402 lb/ac K_2O rates provided sufficient potassium for Tifton 85 bermudagrass at the 80 lb/ac per cutting N rate that appears to have been deficient for maximizing dry matter yield. Doubling the N rate produced additional dry matter at each rate of applied potash. At the highest N and K_2O rates, the added potash increased dry matter yield 13.4 lb/lb of applied K_2O compared to the check treatment that received no potash. Doubling the N rate at the highest rate of potash predicted an additional 3,287 lb of dry forage production/ac, or 8.2 lb of dry matter/lb of increased N beyond the first 400 lb N/ac rate. Tifton 85 is no exception to requirement of hybrid bermudagrass for high N and K nutrition. At the highest N rate, the average of the increased yields at the two higher K_2O rates is 2,739 lb DM/ac compared to the lower N rate or the equivalent of 2.75 additional 1000 lb round bales of 12% moisture hay.

Comparing the check *vs* the 402 lb/ac K_2O rates at the higher N/ac rate, each pound of applied K_2O increased 12% moisture hay production by 15 lb. At $291/ton of 0-0-62 or $0.235/lb of K_2O, each pound of hay increase due to application of potash cost $0.016, or $32/ton of increased hay production. At the 268 lb/ac K_2O rate, this cost of K_2O per ton of increase hay production is lowered to $26.64/ton, or $13.32 for the potash in each 1,000 lb bale. However, rates of K_2O lower than 400 lb/acre (334 lb K/ac) appear to be inadequate to maintain the soil test K level in high intensity Tifton 85 bermudagrass production on Darco loamy fine sand. More importantly, insufficient residual soil K levels are causing bermudagrass stand decline that leads to slower recovery in spring and early summer, and lower dry matter production as seen in Fig. 1.

$$DM = 9848 + 9.8 \times K_2O - 0.03178 \times K_2O^2 + 0.10223 \times N \times K_2O$$

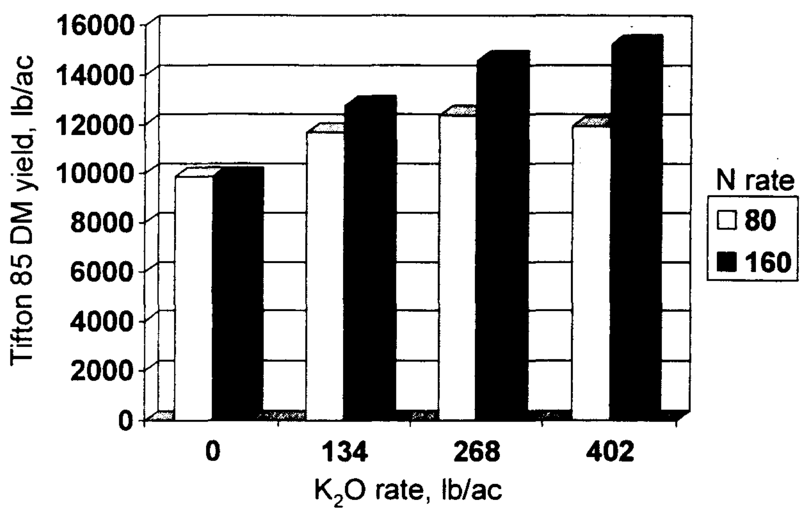

Figure 1. Effect of increasing N rate (applied for each cutting) on Tifton 85 bermudagrass response to potassium (total K_2O applied over three harvests.) 2004.

Texas Agricultural Experiment Station, Overton