Forage News

MISSISSIPPI STATE UNIVERSITY EXTENSION SERVICE

Fertilizer Use Efficiency on Bermudagrass Production

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Forages are the cheapest source of feed for cattle and play an important role in livestock production in the southern U.S. A strong, productive forage stand that will last for several many years is the desired objective of most producers. Despite the importance of forage crops for livestock production and the on-going maintenance of the agricultural soil resource, forage crops are often managed poorly. Forages are generally grown on low fertility soils and their production can be increased markedly with fertilization. In order to maintain strong annual crop production, fertilizer nutrients must be applied regularly. However, surveys have shown that less than 70% of producers do not soil test, but over 50% apply fertilizer in blanket applications. It appears that there is considerable room for improvement in forage production with the effective use of fertilizer nutrients. The effectiveness of fertilizers on forages in increasing dry matter yield and economic returns is dependent upon the levels of nutrients in soil, climatic conditions, soil type and forage type.

It is particularly difficult to economically justify reducing fertilization of any field that is to be cut for hay. Warm-season perennial grasses such as bermudagrass and bahiagrass respond very well to nitrogen (N) and potassium (K) fertilizers on most soils in Mississippi and dry matter yield increases from N application are much greater in moist areas than dry areas. Protein content in grass forage can be improved with N application. A large initial one-time application of N produces less sustained production of forage than the equivalent amount of N applied annually over a period of several years. Splitting annual application into two, three or four increments may not necessarily increase dry matter yield, but tends to distribute forage production over a longer portion of the growing season and allow more timely harvest helping to maintain forage quality. Urea is usually less effective in increasing dry matter yield than ammonium nitrate or urea ammonium sulfate, but its efficiency can be improved by using this type of fertilizer early in the season when volatilization rates are lower due to cooler temperatures and lower humidity levels.

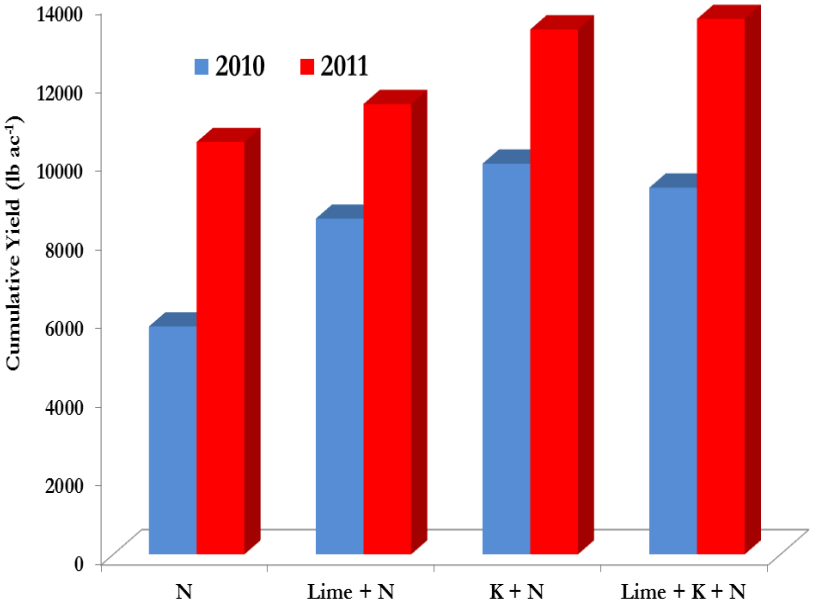

Figure 1. Effect of lime, potash and nitrogen applications on hybrid bermudagrass production. Total yields are from 4 harvests in 2010 and 5 harvests in 2011.

Long-term fertilizer applications have effects on soil properties and chemical composition forage grasses. The rate of acidification in soil increases with the use of N fertilizer. Soil acidification effects from applied N are generally limited to the surface 6 inches depth. Storage of organic carbon (C) in soil increases with N fertilizer application and is affected by source of N, with ammonium nitrate providing larger increase than urea. On soils deficient in available sulfur and N, storage of C increased only when both N and S were applied together. Organic N levels closely follow organic C level in soil.

Improved production of forage crops through better use of fertilizers requires a greater understanding of some basic interactions between soil, climate, and the forage crop. Two ongoing studies at Mississippi State University has shown that properly fertilized bermudagrass will produce higher yields of more nutritious forage than unfertilized or improperly fertilized bermudagrass will. A two-year study simulating nutrient management practices where most producers only

apply nitrogen without soil testing is in progress. In this study, six hybrid bermudagrass received four treatments: (1) Ammonium nitrate (AN) only, (2) Lime (2 ton/ac) + AN, (3) Potassium (120 lb K/ac) + AN, and (4) Lime + Potassium + AN. In this study, AN was applied in four split applications of 50 lb N/ac at each application while potassium was applied in a 50:50 application at green up and after the first harvest. Plots were harvested in a 28 to 30 days harvest interval. Preliminary data indicates that cumulative yields were higher in 2010 and 2011 with the nitrogen + potassium combination followed by the lime + nitrogen application (**Fig. 1**). Economic analysis indicates that the price for each pound of dry matter forage produced was not significant from the N application since yields were considerably increased.

Another ongoing study focuses on the efficiency of different fertilizer sources applied to six hybrid bermudagrasses. The study has four nitrogen treatments: (1) control (no N), (2) ammonium nitrate (AN), (3) urea (U), and (4) urea ammonium sulfate (UAS). Nitrogen fertilizer sources were applied at a rate of 200 lb N/ac in four split applications of 50 lb N/ac during the first four harvests. All treatments received 2 ton lime/ac and potassium applications of 120 lb K/ac in a 50:50 split application. Preliminary data indicates that AN provides higher yields increase when compared to U or UAS (**Fig. 2**). On the other hand UAS had a slight yield advantage over urea.

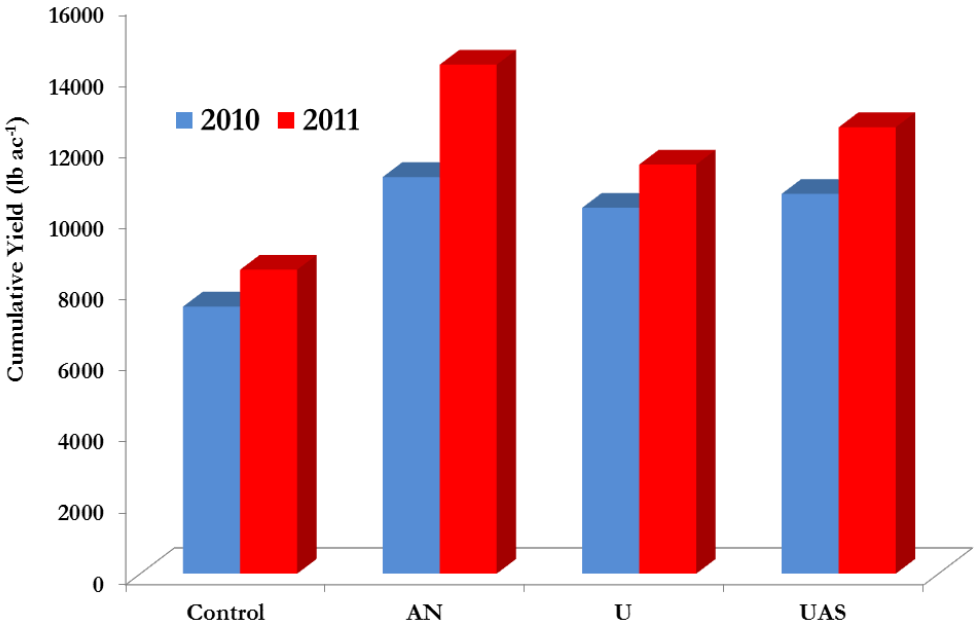

Figure 2. Efficacy of nitrogen sources on hybrid bermudagrass production. Total yields are from 4 harvests in 2010 and 5 harvests in 2011.

Nutrients contained in fertilizers are applied to make up the deficiency between the nutrients needed for optimum forage growth and the nutrients available from the soil. Although the soil can supply most of the nutrients needed for optimum growth, N and K are usually lacking. Without soil testing and adequate fertilizer, three to five years of continuous forage production can deplete soil nutrient reserves and cause a soil nutrient deficiency more quickly than continuous annual crop production. Large amounts of N are needed by forage crops to produce maximum growth. As grass forage yields increase, greater amounts of N are required. Keep in mind that the N released from the soil is small in relation to the amount of N needed for maximum forage production by warm-season grasses and that the levels of potassium might limited by lower soil pH. If the difference between plant needs and soil supply is recognized and balanced with fertilizer applications, the maximum growth potential can be achieved. As in the case of N, the needs potassium and optimum pH must be balanced with fertilizers to meet maximum crop yield when the soil supply is deficient in these nutrients.

Producers need to keep in mind that three factors must be considered when determining what rate and kind of fertilizer to use of forage crops in Mississippi. These factors include: (1) which nutrients are deficient and how severe are the deficiencies, (2) what are the yield responses when various rates of fertilizer nutrients are applied, and (3) what are the net returns from increased yield when hay prices, fertilizer and application costs are taken into consideration. The more accurately these three factors can be determined, the greater is the potential for profitable returns from forage fertilization. Keep in mind that fertilizers account for at least 40% of the fixed costs in a hay production system. So as yields increase there are more tons of hay over which to spread these costs. Therefore, while it pays to strive for high yields from any field devoted to hay production, fertilization may be reduced by soil testing and allowing nutrient imbalances to be corrected.

Upcoming Event: North Mississippi Grazing School, Verona, MS. June 29, 2012. Visit http://msucares.com/crops/forages/grazingschool/index.html for registration information.