Forage News

MISSISSIPPI STATE UNIVERSITY EXTENSION SERVICE

Managing Nitrogen in Hay Production

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The cattle industry in Mississippi is highly dependent on hay to maintain steady livestock production during the winter months until annual ryegrass is available for grazing. Nitrogen is the main nutrient utilized by hay producers in the state to increase production. Yield, quality, and seasonal distribution can be influenced by the source, rate and timing of nitrogen applications. It is critical that producers identify the production potential of the site and fertilize according to that potential. Having a soil test analysis will provide the necessary information on nutrient availability.

Nitrogen Sources

Optimum N fertilizer management requires an understanding of the different N fertilizers that are commonly available for hay production.

Ammonium nitrate (AN, 34-0-0) has been the standard for summer applications for many years. The nitrate half is mobile in the soil and can move to roots for rapid uptake. The ammonium half attaches to clay particles and releases nitrogen over time. One of the advantages of using AN is that it is not usually subject to volatilization. One of the disadvantages is the high cost per pound of nitrogen.

Figure 1. Effect of fertilizer source (AN = ammonium nitrate; U = urea; UAS = urea-ammonium sulfate) on seasonal biomass production of bermudagrass. Nitrogen applied at an annual rate of 200 lb N/ac in split applications of 50 lb N/ac per cut of hay. Source: Lemus et al., unpublished data.

Urea (U, 46-0-0) has been used extensively in forage production and its use has increased due to the decrease in AN availability. Advantages of urea are its high N content (46%), relatively low cost per lb of N, and rapid conversion to plant-available N. The biggest disadvantage is the potential for volatilization. Although estimates vary, up to 50% of the nitrogen may be lost. The amount of volatilization depends on soil pH, soil moisture, air temperature, humidity and wind speed. In forage production, urea could be used in early spring applications or late fall when cooler temperatures might decrease losses. One way to reduce losses is to apply urea ahead of a possible rain within a 24-hr period to incorporate the nitrogen.

Urea-ammonium nitrate (UAN) is a combination of the above materials. It is a liquid formulation that can vary from 28 to 32% nitrogen. The liquid formulation of this product allows the blending of herbicides for spring applications which reduces labor. Like urea, this product can be used in the spring and fall. Most liquid nitrogen sources have urea as part of their make-up and are volatile on the soil surface in the presence of moisture. The combination of high humidity and temperatures during the summer can make this product the least desirable N source because it has the potential for foliar burn, which can set back plant growth and affect the timing of harvest. Amine herbicide formulations are generally not compatible with liquid N as a carrier as 'salt out' occurs. Like urea, UAN will lower the pH because of conversion of ammonium to nitrate and subsequent release of hydrogen. The benefits of this product are its uniformity, ease of storage, handling and application.

Urea-ammonium sulfate (UAS) is usually a 50/50 blend of urea and ammonium sulfate (33-0-0-18S). Ammonium sulfate is a good source of sulfur when it is needed. This blend could help reduce some of the issues associated with

urea volatilization. Keep in mind that sulfur is also an acidifying agent which can react with water and lower soil pH. Monitoring applications of ammonium sulfate based fertilizers is recommended.

What fertilizer source is ideal for me and when is the optimum application time?

Ammonium nitrate has long been an affordable and efficient inorganic N-fertilizer used in forage production. However, the availability of AN has declined because of national security and public safety concerns regarding the fertilizer's explosive characteristics. Alternative nitrogen sources were evaluated at Mississippi State University over a three year period to provide sound recommendations to forage growers to produce high yields. The seasonal distribution of forage can also be managed with nitrogen applications but choosing the right nitrogen source and the timing of application are key components of the overall nutrient management approach. Data indicated that application of urea and urea-ammonium sulfate had a 12% and 10% decrease in average seasonal biomass production of six hybrid bermudagrasses when compared to ammonium nitrate, respectively (***Fig. 1***). Research on common bermudgrass also indicated that N application at green up (when there is 3 inches of new growth) also had a significant impact on seasonal yield production (***Fig. 2***). Nitrogen applications of 50 lb N/ac should be sufficient to generate optimum forage biomass per cut of hay. Nitrogen should be applied when plants have at least 3 inches of growth to optimize uptake and utilization.

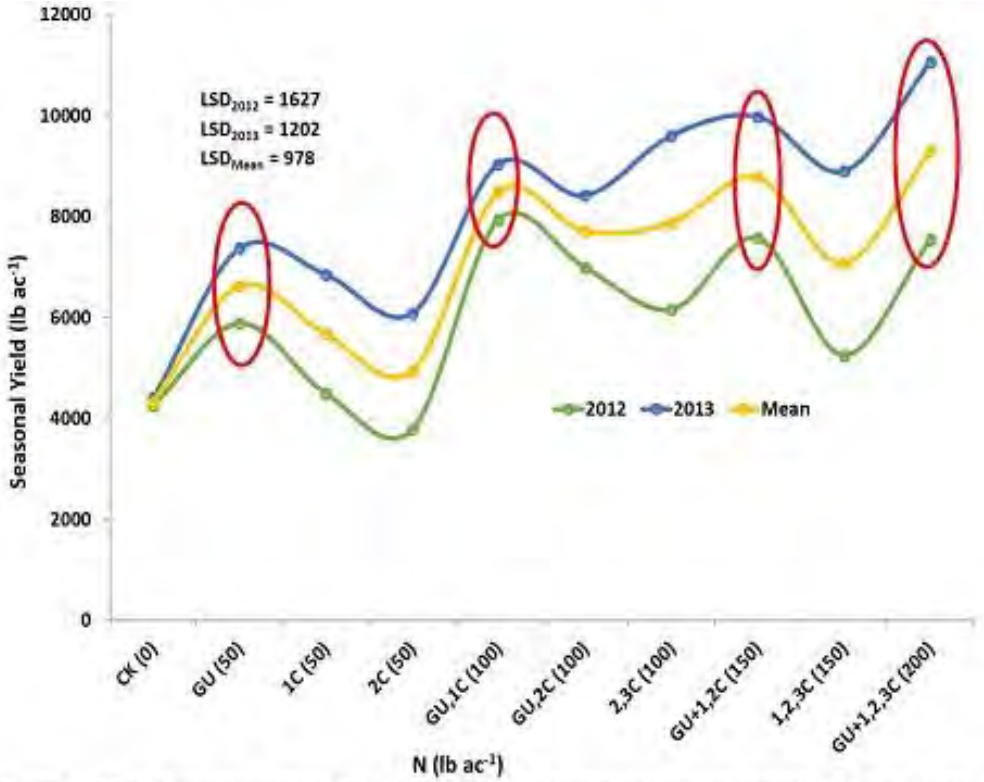

Figure 2. Effect of nitrogen rate (0, 50, 100 and 200 lb N/ac) and timing of application (GU = green up, 1C = after first cut, 2C = after second cut, 3C = after third cut) in seasonal biomass production of bermudgrass. Source: Lemus et al., unpublished data.

Most hay fields in Mississippi are also low in pH and deficient in potassium (K). Soil testing and adjusting those two components are also an important part of a good hay nutrient management program. Potassium has a synergistic effect in nitrogen uptake and utilization. If your soil is low in potassium, there is a possibility that your forage crop in not utilizing nitrogen to its optimal potential. Also, keep in mind that potassium is removed in very large quantities (approximately 60 lbs of K per ton of hay produced). If your soil report indicates K deficiencies and calls for more than 80 lb K/ac, it is recommended to split the application in a 50/50 ratio. Apply 40 lb K/ac at green up and apply the rest after the second cut of hay to balance K availability throughout the growing season. A three-year study at Mississippi State University utilizing six hybrid bermduagrasses has indicated significant yield responses when lime and K were applied with uniform nitrogen rates throughout the growing season (***Fig. 3***).

How much hay do I need for next feeding season? Can I decrease hay production?

An efficient use of N in hay production systems will also depend on producers planning ahead for the feeding season. Producers should not have hay sitting in their barn for more than 18 months. To accomplish this, a producer should develop a hay inventory. This could be achieved by knowing the seasonal average forage production of the hay crop that they are working with, the number of animals that they will be feeding and their daily hay requirement (based on percent of body weight), storage losses, length of the feeding season, and percent of feeding losses. Based on this gathered information, the producer should plan on stockpiling 30% more hay in the inventory for emergencies related to weather or annual cool-season crop failure. Using this approach will help producers put the resources in the number of acres needed to produce good quality forage instead of trying to fertilize an excessive number of acres.

For example, let's assume that a hybrid bermudagrass is producing 4 tons of hay per acre per year and you would like to feed a herd of 50 cows with an average body weight of 1,000 lbs per cow during the winter months. The cows will con-

sume 2.5% of their body weight which will be 25 lbs of hay per day. Keep in mind that in this example the quality of the forage (especially NDF) is not being taken into consideration for the purpose of dry matter intake. If the producer feeds hay for 112 days during the winter, this means that he will need 69 tons hay. We are aware that we do not usually store or feed hay very efficiently in the South. Now, let's assume that hay is stored outside with a possible 20% dry matter loss and a 15% dry matter loss when feeding. That means that now we need 93 tons of hay to compensate for those losses. If we need to have 30% more hay in case of an emergency, that means that the total hay inventory will be 121 tons of hay. To produce that amount of hay based on a 4 ton/ac yield, the producer will be required to have 30 acres. Using this type of planning could reduce nutrient inputs and decrease the number of acres devoted to hay production. That means more land for grazing!

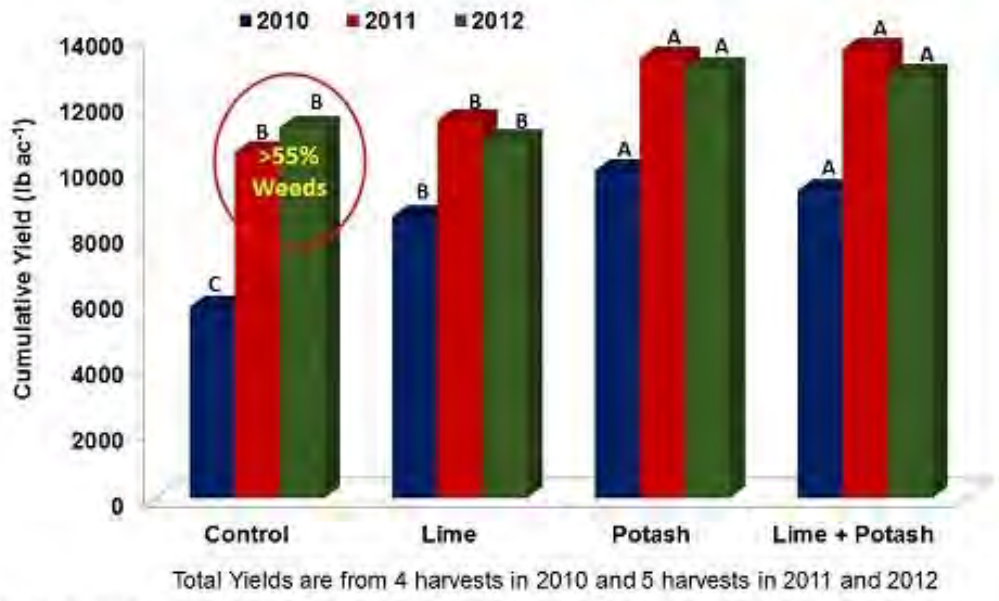

Figure 3. Effect of lime and potassium application in seasonal biomass production of bermudagrass. Lime was applied at a rate of 2 tons/ac each year of the study. Potassium was applied at a rate of 120 lb K/ac each year of the study in split applications of 60 lb K/ac at green up and 60 lb K/ac after the second cut. All treatments received 200 lb N/ac of urea-ammonium sulfate in split applications of 50 lb N/ac at green up and after each cutting. Source: Lemus et al., unpublished data.

Let's Hay!

As we prepare for the 2014 hay season, keep in mind that fertilizer prices are still high and that these added nutrients are required by bermudagrass and bahiagrass to meet your desired yield goal. Applying the right source of N fertilizer at the right rate, time, and place is critical to proper N management. To achieve those goals it is important to soil test, use the proper nitrogen source, and apply it at the right time to avoid losses. Splitting your nitrogen applications throughout the growing season will provide uniform yield distribution along with cutting the hay at the right stage of maturity to maintain forage quality. For the best results, apply N only when needed, calibrate application equipment to ensure proper placement, and adjust source, rate, and timing to meet N needs. This information will aid you in choosing the right nitrogen fertilizer source for the right time of year.

For upcoming forage related events visit:
http://forages.pss.msstate.edu/events.html

April 25, 2014— North Mississippi Forage Field Day, Holly Springs
July 10, 2014—Warm-season Forage Tour, Starkville, MS