Getting the Most Out of Bahiagrass Pasture Fertilization

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Bahiagrass is the workhorse of pasture forages in Florida. Some of its popularity is attributable to its ability to survive and even thrive where other grasses might fail. However, even workhorses need fuel and this is true for bahiagrass, whether it is used for hay, sod, or pasture. As with other forages, bahiagrass can remove considerable quantities of nutrients from the soil (Table 1), which need to be replenished.

The IFAS recommendations for N, P, and K bahiagrass fertilization are available in Kidder et al. (2000) and can be viewed on-line (see Recommended Reading). Bahiagrass fertilization requirements are dependent upon its end use and soil characteristics. This publication provides supplemental information and supports recommendations contained in the UF/IFAS (name document---give hot link) specific to bahiagrass, including secondary and trace element requirements.

Sufficiency Ranges

Plant available soil nutrients are determined using various acid extracting solutions, such as Mehlich-1 or Mehlich-3. The soil fertilization recommendations provided by IFAS are based on Mehlich-1 extractable nutrients (Tables 2 and 3). Use only the soil-test interpretation that coincides with your soil extraction method. The University of Florida Extension Soil Testing Lab (ESTL) does not provide soil N analysis. Nitrogen fertilization recommendations are based on end use. Soil micronutrients rarely reach toxic levels for bahiagrass. Table 3 provides critical soil micronutrient values for Florida agricultural lands.

At times there may be a need to analyze plant tissue along with soils to help diagnose or dismiss a nutritional concern. When sampling bahiagrass for tissue analysis, cut only actively growing plants (do not sample when dormant). Cut from 3 to 4 inches above the ground and from several places in your pasture. Be sure not to include any dirt in your sample and avoid manure piles. Consult your county extension agent as to sampling technique, and especially, tissue-test interpretations. Table 4 provides nutrient composition sufficiency ranges for oven-dried bahiagrass tissue. Revisions to this table may occur from time to time, as we improve our understanding of bahiagrass nutrient requirements.

Soil pH

Regardless of soil type or bahiagrass use, maintaining a proper soil pH (5.5 to 6.5) is essential for adequate nutrient availability and uptake. If the soil is too alkaline, several trace element deficiencies may occur. If the soil is too acidic, sulfur and molybdenum (Mo) deficiencies may occur and manganese (Mn) may become toxic. Bahiagrass can tolerate moderately acidic (pH 5.0 – 5.5) soils but the pH of some southern flatwood soils can be highly acidic, thereby reducing yields. Additionally, if these highly acidic soils receive only N, bahiagrass stand persistence may be compromised. In addition, low pH soils in North Florida may have been a contributing factor to a dollar spot (*Sclerotinia homoeocarpa*) outbreak in 2001 (Blount et al., 2002).

Soil amendments other than lime can influence soil pH. Inorganic fertilizers containing ammonium (NH_4N) will have some acidifying effect, while 'lime stabilized' organic fertilizers, i.e., biosolids and litters, will provide a liming effect. Untreated manures and litters tend to have a slight to moderate acidifying effect. Let your soil analysis report be your guide to liming rates. In general, sandy soils (associated with flatwoods and the Central Florida Ridge) require less lime to impart a pH change and the change will be short-lived, compared to liming a more loamy soil. Lime applied to pastures rarely penetrates the soil more than a couple of inches in a year or two. If you are frequently

adding lime, be sure that every few years you check the soil pH at the top 2 inches and compare with the lower 6 to 8 inches. If the uppermost soil is above pH 7.0, hold off on liming.

Establishment

Preplant fertilization of a clean-tilled seed bed is not encouraged since the risk of fertilizer loss is greater than it is to wait until after emergence, when the roots can take up the fertilizer. After emergence, apply 30 lb/A of N, all the recommended P_2O_5, and 50% of the recommended K_2O. After another month, apply the remaining K_2O and 70 lb/A of N.

Grazing

The current IFAS fertilization recommendations for Florida pastures vary between North (above Interstate-4) and South (below Interstate-4) Florida. This demarcation is being reviewed in regards to soil type as well as location. North Florida recommendations are given for low, medium, or high N input system, whereas Central and South Florida have recommendations for a low N input option only (Table 5). With a low N input option, the bahiagrass does not remove much P or K and the manure supplies these and other nutrients. Therefore P_2O_5 and K_2O may not need to be reapplied for several years. Fertilizer applications (if required) should be in the spring to get the forage off to a good start, which is especially important for cattle coming off winter pastures. The low N option prevails under a stocking density of about 3 acres per cow. If higher stocking densities are used then higher forage production (i.e. fertilization) may be needed to sustain the livestock. If making a single hay cutting at the end of the growing season, do not apply any additional fertilizer after August. This helps ensure complete use of the applied fertilizer. In North Florida, do not cut any hay if using the low input option. If you cut hay once per season using the medium input option then you should follow this cutting with 60 lb/A of N.

There are other nutritional considerations when using bahiagrass in pastures, as it relates to animal nutrition and health. It is recommended that bahiagrass tissue sulfur (S) be kept at or below 0.35%. High forage S can affect copper (Cu) availability for cattle. For example, it was found that the S in ammonium sulfate fertilizer reduced the effectiveness of Cu supplementation for beef cattle grazing bahiagrass pastures (Arthington, 2002). In some grain crops, for example wheat and barley, higher tissue Cu provides some resistance to ergot infection. Studies to look at the role Cu nutrition in ergot disease in bahiagrass has not yet been done, but it may be an area for future research.

Hay/Seed

For multiple hay cuts, apply 80 lb N/A, and recommended rates (based on soil test report) of P_2O_5 and K_2O in spring. Apply additional N (80 lb/A), 40 lb/A of K_2O, and 20 lb/A of P_2O_5 (if soil P_2O_5 test was low or medium) following each cutting. Do not apply any fertilizer after mid-August.

As mentioned in the beginning of this article, bahiagrass removes large quantities of nutrients per ton of forage (Table 1). The removed forage nutrients must be replaced. Knowing what the fertility is of your subsoil (below 8 inches) as well as your topsoil (0 – 8 inches), may help refine your fertilization program. Nitrogen, P, and K tend to be in the greatest concentration near the soil surface but other nutrients, such as S and Mg and some trace elements may be greater in the subsoil. Established perennial forages, such as bahiagrass, tend to have deep root systems (> 4 feet). Bahiagrass also has a great mass of stoloniferous tissue to store nutrients. Therefore, bahiagrass tends to be more tolerant of low fertility soils. However, fertilizing bahiagrass hay fields, particularly with N, may improve yields by over 50% from fields that are rarely fertilized.

Sod

In Florida, many bahiagrass pastures are harvested for sod or utility turf. As with any sod operation, fertilizer and seeding rates are generally higher compared to a pasture situation. Most of the following recommendations are taken from McCarty (1994). Apply N at 40 to 45 lb/A following the first cutting. A fertilizer with a N:K_2O ratio of 2:1 or 1:1 should be used to increase the turf's stress tolerance

and promote better rooting. A subsequent fertilizer application should be made following the second mowing. Continue fertilizing every 4 to 6 weeks until the grass develops a complete groundcover. Total seasonal N inputs should be on the order of 100 to 200 lb/A. Economics and desired sod turn-around time dictate which range is used. At 100 lb/A of N, the applications are split equally between early spring and summer. At 200 lb/A of N, additional split applications are recommended.

Bahiagrass is prone to leaf yellowing in spring and whenever leaf growth is rapid. This is likely due to the roots not keeping pace with plant micronutrient, particularly iron (Fe) demands. There have been no reports to show leaf yellowing reduces sod of forage yields but this may be a cosmetic concern for sod production. Iron and other micronutrients may be spray applied to alleviate the chlorosis. A chelated iron source, plus a manganese (e.g. manganese sulfate) source, should be applied in spring and again in fall to correct any observed deficiencies (e.g., excessive yellowing).

Silvopasture

Bahiagrass is often a component of silvopasture systems. The following recommendations are adapted from Tyree and Kunkle (2003). In general, current fertilizer recommendations for silvopasture are based on those for an open pasture. Bahiagrass establishment should follow the establishment recommendations mentioned above. In many cases, N at 30 lb/A, P_2O_5 at 13 lb/A, and K_2O at 25 lb/A give good results. After establishment, N and K_2O fertilizers are split applied per North Florida pasture recommendations in spring and summer. Annual application rates of 100 lb/A of N, 50 lb/A of P_2O_5, and 65 lb/A of K_2O provided the highest net returns from the system as a whole (forage, cattle, and pines) (Tyree and Kunkle, 2003).

Crop Rotation

Bahiagrass is typically used in a crop rotation to break disease cycles and improve soil quality in cash crop systems. Establishment fertilization recommendations are the same as provided above. Additionally, if grazing is to occur during the bahiagrass portion of the rotation, then the grazing fertility guidelines should be followed. If the bahiagrass is going to be used for hay then the hay/seed recommendations should be followed. A well managed (including good fertility) bahiagrass rotation can provide the disease and soil quality benefits to the succeeding cash crop in only two years. The benefits of bahiagrass might take longer if the grass is not properly managed or if managed under the low N input system.

Winter Overseeding

Overseeding bahiagrass pastures is a common practice for livestock operations, particularly in North Florida. The fertilization recommendations for winter forages are provided by Kidder et al. 2000. A potential obstacle to getting good winter forage growth in a bahiagrass pasture is competition from bahiagrass for water and nutrients. Therefore, do not fertilize bahiagrass any later than late summer (around mid-August). Do not fertilize the winter forages until bahiagrass growth has stopped or slowed considerably. Overseeding with legumes can provide a source of N for the bahiagrass in the spring. This may be particularly beneficial for bahiagrass pastures receiving the low N input management option.

Recommended Reading

Arthington, J.D. 2002. Effect of sulfur-containing fertilizer on bahiagrass quality and grazing cow mineral status. EDIS publication AN112. http://edis.ifas.ufl.edu/pdffiles/AN/AN11200.pdf

Blount, A.R., W. Dankers, M.T. Momol, and T.A. Kucharek. 2002. A severe outbreak of dollar spot (*Sclerotinia homoeocarpa*) on bahiagrass pastures in North Florida. EDIS publication SS-AGR-38. http://edis.ifas.ufl.edu/pdffiles/AG/AG14500.pdf

Kidder, G., C.G. Chambliss, and R. Mylavarapu. 2000. UF/IFAS standardized fertilization recommendations for agronomic crops. EDIS publication SL129. http://edis.ifas.ufl.edu/pdffiles/SS/SS16300.pdf

McCarty, L.B. 1994. Sod production in Florida. EDIS Bulletin 260. http://edis.ifas.ufl.edu/pdffiles/LH/LH06600.pdf

Tyree, A.B. and W. E. Kunkle. 2003. Managing pine trees and bahiagrass for timber and cattle production. EDIS publication CIR1154. http://edis.ifas.ufl.edu/pdffiles/AN/AN02300.pdf

Table 1. Nutrient removal in pounds per acre by some forages grown in Florida as hay.

Nutrient	Bahiagrass (5 ton/acre)	Bermudagrass (5 ton/acre)	Per. Peanut (5 ton/acre)
Nitrogen (N)	192	240	288*
Phosphate (P_2O_5)	53	60	55
Potash (K_2O)	223	240	229
Magnesium (Mg)	24	23	54
Sulfur (S)	19	26	18
Calcium (Ca)	32	37	145
Manganese (Mn)	1.5	0.8	1.3
Iron (Fe)	0.6	0.6	0.4
Zinc (Zn)	0.31	0.27	0.23
Boron (B)	0.04	0.04	0.28
Copper (Cu)	0.07	0.06	0.04

†P. peanut = perennial peanut.
‡Perennial peanut gets nitrogen via fixation.

Table 2. Mehlich-1 soil sufficiency ranges.

Soil content	P ppm	K ppm	Mg ppm
Very low	< 10	< 20	---
Low	10 – 15	20 – 35	< 15
Medium	16 – 30	36 – 60	15 – 30
High	31 – 60	61 – 125	> 30
Very high	> 60	> 125	---

Table 3. Critical low Mehlich-1 soil-test interpretations for micronutrients.

Soil pH	Mn ppm	Cu ppm	Zn ppm
5.5 – 6.0	3 – 5	0.1 – 0.3	0.5
6.0 – 6.5	5 – 7	0.3 – 0.5	0.5 – 1.0
6.5 – 7.0	7 – 9	0.5	1 – 3

Table 4. Sufficiency ranges for bahiagrass tissue (dry mass).

	Sufficiency range
Element	%
Nitrogen (N)	2.0 – 3.0
Phosphorus (P)	0.18 – 0.50
Potassium (K)	1.2 – 4.0
Magnesium (Mg)	0.16 – 0.40
Sulfur (S)	0.18 – 0.40
Calcium (Ca)	0.3 – 1.0
	ppm
Manganese (Mn)	20 – 200
Iron (Fe)	50 – 400
Zinc (Zn)	20 – 200
Boron (B)	5 – 100
Copper (Cu)	4 – 20
Molybdenum (Mo)	0.1 – 4.0

Table 5. IFAS fertilizer recommendations for grazing.

	North Florida			South Florida	
Fertilizer	Low input	Medium input	High input	No hay cuts	Following 1 hay cut
	lb/A	lb/A	lb/A	lb/A	lb/A
N	50	100	160[†]	50	80
P_2O_5	---	25[‡]	RR[§]	---	RR
K_2O	---	50[‡]	RR	---	RR

[†]Split application (80 lb/A in early spring; 80 lb/A in early summer).
[‡]Apply only if soil test results come back as low or very low.
[§]RR = Recommended rate.

Notes: