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Forage Mineral Concentrations in Grazed, Warm-Season Bahiagrass Pastures in Florida[1]

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Minerals make up a small portion of an animal's diet; however, they play an important role in health, growth, and reproduction.

While free-choice mineral supplementation is common for beef cattle on pasture, pasture forage is still the main source of nutritionally essential minerals. In the lower Gulf Coast region of the Southern U.S., the predominant pasture forage for grazing by beef cattle during the warm season is bahiagrass (*Paspalum notatum*), which provides forage from May through October. Bahiagrass pastures are usually adequate in energy and protein to sustain mature beef cattle. There is limited information, however, on forage concentrations of various nutritionally important minerals of grazed bahiagrass pastures.

Florida Pasture Sampling

A two-year study was conducted to measure the mineral concentrations of continuously grazed bahiagrass pasture on a 1,620-ac North Central Florida beef cattle farm. The macro minerals calcium (Ca), phosphorus (P), sodium (Na), potassium (K), and magnesium (Mg), and the trace minerals copper (Cu), iron (Fe), zinc (Zn), manganese (Mn), cobalt (Co), and selenium (Se) were measured monthly from June through October.

Soil series that exist at the farm are Millhopper sand, Bonneau fine sand, and Gainesville sand—all typically found in Central Florida. Forage samples were collected from three pastures. Pastures were representative of the pastures grazed on the farm and typical of the majority of bahiagrass pastures grazed in Florida. The pastures were fertilized with 245 lb of ammonium nitrate per acre during May of each year. Further information about the study can be found in a publication by Tiffany et al. 2005.

Mineral Concentrations

The overall average concentrations of the minerals measured from the two-year study are presented in Tables 1 and 2. Some year-to-year variation was noted for all minerals except sodium. However, these variations were small. Therefore, each mineral concentration reported in the tables is an average of samples collected and analyzed from

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three pastures and over the five months of June through October for two years.

Results of previous studies measuring minerals in fresh bahiagrass forage are limited. Overall average concentrations from our study were within the ranges of concentrations previously published, except possibly calcium and selenium (Tables 1 and 2; Ensminger et al. 1990; Cuesta et al. 2001; NRC 2000; Dennis Hancock, unpublished data). Calcium and selenium concentrations were lower in our study than previously reported. Much more information on mineral concentrations in bahiagrass hay has been reported. Overall, average mineral concentrations from pasture forage samples from our study were similar to concentrations reported for bahiagrass hay samples (NRC 2000; Dennis Hancock, unpublished data).

Month of grazing season had a great influence on concentrations of minerals evaluated, and therefore each month is presented separately averaged over the two years (see Figures 1, 1a, and 2). There was a large month-to-month variation in concentrations of potassium, phosphorus, iron, and manganese; little variation for calcium, magnesium, copper, and cobalt; and essentially no variation for sodium and selenium. Forage concentrations of phosphorus and potassium were greatest in June, declined as the season went on, and were lowest in October. Calcium and magnesium initially declined and then increased as the season progressed from June through October. Concentrations of iron and manganese increased as the grazing season progressed while zinc and cobalt tended to decrease. Please note that two important essential minerals—iodine and chlorine—were not measured. Iodine (iodized salt) and chlorine (ordinary salt) are present in typical beef cattle free-choice mineral mixes.

Implications of Findings

From the above findings and compared to beef cattle requirements, sodium is very deficient; copper, selenium, and cobalt are deficient; calcium and zinc are slightly deficient; phosphorus is marginally deficient to marginally adequate; magnesium and iron are adequate; and potassium and manganese are in excess for beef cattle grazing bahiagrass in the Southeastern U.S. (Tables 1 and 2). Fortunately, most free-choice cattle mineral supplements will more than make up for the deficiencies provided that the mineral supplements are present and that the cattle are consuming them.

Due to the high cost of phosphorus supplements, it is tempting to buy a mineral mix that is low or even devoid of phosphorus to save a little money. Care should be taken to ensure that adequate phosphorus is present in a mineral mix. From the Florida study, phosphorus inclusion in the mineral mix is desirable for cattle grazing warm-season pastures such as bahiagrass. The exception would be for pastures grown on naturally occurring phosphatic soils (parts of peninsular Florida) where forage might better match cattle phosphorus requirements.

Further information about free-choice mineral supplements for beef cattle can be found in the UF-IFAS Extension publication AN245, titled *Understanding Commercial Free-Choice Mineral Mixes for Beef Cattle*, which can be found on the EDIS website (edis.ifas.ufl.edu).

Other related EDIS publications

Mackowiak, C. L., A. R. Blount, E. A. Hanlon, M. L. Silveira, M. B. Adjei, and R. O. Myer. 2008. *Getting the most out of bahiagrass pasture fertilization*. UF-IFAS, EDIS, SL249. 6 p.

Myer, Bob, G. Chelliah, Lee McDowell, Ann Blount, and Cheryl Mackowiak. 2009. *Mineral concentrations in cool-season annual grass pastures in north Florida*. UF-IFAS, EDIS, AN224. 3p.

References

Cuesta, P., L. McDowell, B. Kunkle, F. Bullock, A. Drew, N. Wilkinson, and F. Martin. 2001. Seasonal variation of soil and forage mineral concentrations in north Florida. *2001 Florida Beef Report*, Dept. of Animal Sciences, University of Florida, Gainesville.

Ensminger, M. E., J. E. Oldfield, and W. W. Heinemann. 1990. *Feeds and Nutrition* (*7th ed.*). The Ensminger Publishing Co., Clovis, CA.

NRC. 2000. *Nutrient Requirements of Beef Cattle* (*7th rev ed., 2000 ed.*) National Academy of Sciences, Nat'l Academy Press, Washington, DC.

Tiffany, Mark, Lee McDowell, George O'Connor, Nancy Wilkinson, and Frank Martin. 2005. Minerals in bahiagrass in north Florida. *2005 Florida Beef Report*, Dept. of Animal Sciences, University of Florida, Gainesville.

Table 1. Forage macro-mineral concentrations of grazed bahiagrass pastures in Florida (dry matter basis).

Mineral	Concentration, %	Requirement[a], %	Reported[b], %
Calcium	0.27 ± 0.06	0.3 to 0.4	0.3–0.6
Phosphorus	0.23 ± 0.05	0.2 to 0.3	0.10–0.25
Sodium	0.02 ± 0.01	0.1	0.02–0.04
Potassium	1.3 ± 0.3	0.6	0.8–1.5
Magnesium	0.29 ± 0.6	0.1 to 0.2	0.22–0.30

[a]Taken from NRC 2000; the lower numbers for Ca and P are for mature cattle and the higher numbers for growing cattle; for Mg, the higher number is for lactating beef cows only. [b]Previously reported concentrations in fresh bahiagrass on a dry matter basis from four different sources: (1) Ensminger et al. 1990, (2) NRC 2000, (3) averages of analyses of bahiagrass samples conducted by the University of Georgia from 2006 to 2009 (data provided by Dr. Dennis Hancock, Univ. of Georgia), and (4) average analyses of bahiagrass pasture samples from an earlier survey (Cuesta et al. 2001).

Table 2. Forage trace mineral concentrations of grazed bahiagrass pastures in Florida (dry matter basis).

Mineral	Concentration, ppm	Requirement[a], ppm	Reported[b]
Copper	4.2 ± 0.5	10	3.0–6.0
Iron	70 ± 19	50	70–170
Zinc	22 ± 3	30	20–28
Manganese	102 ± 35	40	80–150
Cobalt	0.06 ± 0.01	0.1	0.03–0.08
Selenium	0.03 ± 0.01	0.1	0.04–0.08

[a]Taken from NRC 2000. [b]Previously reported concentrations in fresh bahiagrass on a dry matter basis from four different sources: (1) Ensminger et al. 1990, (2) NRC 2000, (3) averages of analyses of bahiagrass samples conducted by the University of Georgia from 2006 to 2009 (data provided by Dr. Dennis Hancock, Univ. of Georgia), and (4) average analyses of bahiagrass pasture samples from an earlier survey (Cuesta et al. 2001).