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Abstract
To determine the trace mineral content of Kansas native grasses, samples were collected from four locations of tall or intermediate grasses and four locations of short grasses. Copper (Cu) and zinc (Zn) levels tended to be lower during dormancy than in the growing season; however, manganese (Mg) and iron (Fe) levels were essentially the same throughout the year. In terms of meeting the dietary requirements of grazing cattle, Cu was adequate in June but marginal in February, whereas Zn was marginal to deficient at both collection times. In addition, the impact of grazing selectivity on the validity of trace mineral analysis of hand-clipped pasture samples was evaluated. Although samples collected via rumen cannulae from grazing steers contained higher ($P<.01$) levels of protein, calcium, and phosphorus than comparable hand-clipped samples, no differences occurred in the trace mineral contents.

Keywords
Cattlemen's Day, 1994; Kansas Agricultural Experiment Station contribution; no. 94-373-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 704; Beef; Trace mineral; Grazing selectivity; Native grass

EFFECT OF STAGE OF GROWTH AND SAMPLING PROCEDURE ON THE TRACE MINERAL CONTENT OF KANSAS NATIVE GRASS

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Summary

To determine the trace mineral content of Kansas native grasses, samples were collected from four locations of tall or intermediate grasses and four locations of short grasses. Copper (Cu) and zinc (Zn) levels tended to be lower during dormancy than in the growing season; however, manganese (Mg) and iron (Fe) levels were essentially the same throughout the year. In terms of meeting the dietary requirements of grazing cattle, Cu was adequate in June but marginal in February, whereas Zn was marginal to deficient at both collection times.

In addition, the impact of grazing selectivity on the validity of trace mineral analysis of hand-clipped pasture samples was evaluated. Although samples collected via rumen cannulae from grazing steers contained higher ($P<.01$) levels of protein, calcium, and phosphorus than comparable hand-clipped samples, no differences occurred in the trace mineral contents.

(Key Words: Trace Mineral, Forage, Grazing Selectivity, Native Grass.)

Introduction

The evaluation of trace mineral content of forage is important when attempting to identify deficiencies. Because the crude protein, calcium, and phosphorus contents of Kansas native grasses vary greatly depending on the stage of growth, it seemed logical that the trace mineral content also might vary during the year. Another important consideration when attempting to utilize forage tests in ration balancing is the influence of animal selectivity. Given the opportunity, animals will selectively graze forages of greater palatability and higher nutritional value than the average forage in the pasture. Depending on the amount of forage available, selectivity can be a major factor in the quality of forage consumed. This research was conducted to determine seasonal variations in trace mineral content and to assess the accuracy of clipped samples in predicting animal consumption of trace minerals.

Experimental Procedures

Clipped, native grass samples from four tall or intermediate grass and four short grass range sites in central and western Kansas were collected in both early June and late February to represent two extremes in the plant life cycle. Clipped samples were taken from the same pasture location on each collection date. Trace mineral analysis was conducted using inductively coupled plasma (ICP) spectrometry (Peterson Laboratories; Hutchinson, KS).

To evaluate the impact of grazing selectivity on trace mineral intake, four ruminally cannulated steers were evacuated and allowed to graze controlled areas. At the same time, hand-clipped samples were obtained. The rumen of each steer was then evacuated, and the contents were rinsed with water until it ran clear. These collections were repeated four times.

Results and Discussion

No differences occurred in the trace mineral content of short vs tall or intermediate native grasses at similar stages of growth (Table 1). For both grass types, Cu and Zn concentrations tended to be lower during dormancy than during the growing season. Iron and Mg concentrations did not show that trend. The level of Cu in both forage types was adequate in June but marginal in February in terms of meeting a grazing animal's dietary requirements. The Zn levels were marginal to deficient in both forage types at both forage sampling times. The Fe content was adequate in both forage types in June and was very high in the short grass samples in February.

The steers consistently selected forage higher ($P<.01$) in crude protein, calcium, and phosphorus than comparable hand-clipped samples. Increases from selectivity were 30.0% for crude protein, 52.6% for calcium, and 36.8% for phosphorus. However, no differences occurred in the trace mineral contents of selected vs clipped grasses (Table 2).

This research indicates that Zn may be marginally deficient in Kansas native range forages. More research is planned to determine the importance of this potential deficiency. In addition, clipped pasture samples appear to be reliable indicators of the trace mineral content of the grass consumed by a grazing animal.

Table 1. Trace Mineral Content of Kansas Native Grasses [a]

Grass Type	Sampling Time	Iron	Copper	Zinc	Manganese
Tall/intermediate	June	314 ± 97	10.02 ± 1.16	19.78 ± 2.04	32.90 ± 4.18
	February	352 ± 58	5.43 ± .45	14.10 ± 2.04	22.15 ± 3.19
Short	June	347 ± 52	8.78 ± .84	16.30 ± 1.55	35.90 ± 2.04
	February	795 ± 128	4.40 ± .39	13.04 ± 1.25	41.90 ± 2.87

[a]Results are expressed as the mean mineral content ± SE; all results are expressed as mg/kg.

Table 2. A Comparison of the Trace Mineral Content of Hand-Clipped vs Grazed Forage Samples [a]

Collection Method	Iron	Copper	Zinc	Manganese
Steer selection	152.7 ± 16.8	10.65 ± .56	20.42 ± .54	11.32 ± .59
Hand-clipped	154.8 ± 23.7	11.49 ± .79	19.50 ± .76	12.84 ± .84

[a]Results are expressed as the mean mineral content ± SE; all results are expressed as mg/kg.