Dickinson Research Extension Center
1089 State Avenue
Dickinson, ND 58601

Mineral Concentrations and Availability of Forages for Grazing Livestock in the Northern Great Plains

Woodrow W. Poland[1], Elaine Grings[2], James Karn[3] and Llewellyn Manske[1]

[1]Dickinson R/E Center, NDSU, Dickinson, ND
[2]Fort Keogh LARRL, USDA-ARS, Miles City, MT
[3]Northern Great Plains Research Laboratory, USDA-ARS, Mandan, ND

Research Summary

A two-year project was submitted to the ND State Board of Agricultural Research in the fall of 1998 and subsequently received first year's funding. Additional matching funding will be provided by the ND Agricultural Experiment Station and NDSU Extension Service. Funding will be available in early 1999. The purpose of the project is to provide funding for chemical analysis of samples collected from 3 separate experiments that address various aspects of the mineral nutrition of grazing livestock. Collectively, these studies address seasonal/maturity changes in nutritive quality of native range/pasture plants in western ND, the effect of forage intake on mineral bioavailability and, the effects of water stress, soil fertility, genotype and grazing management on forage chemical composition.

Introduction

All forms of life require inorganic elements, or minerals, to support normal life processes. Furthermore, all animal tissues and all feedstuffs contain minerals in widely varying amounts and proportions. Unlike other nutrients, minerals can not be synthesized by living organisms, therefore animals must acquire adequate amounts of required elements from their environment if survival and production goals are to be maintained. Livestock usually derive most of their dietary nutrients from the feed they eat, however significant quantities of minerals may be obtained from water, soil consumption and nonfeed contamination. Feed sources of minerals are typically divided into base feedstuffs (e.g. range or pasture plants, harvested forages, concentrates) and mineral supplements. Efforts to reduce the cost of mineral supplementation in livestock production requires a thorough understanding of the supply and availability of mineral nutrients in typical feedstuffs.

Voluntary intake and mineral concentrations of base feedstuffs determines the level of mineral consumption. Adequate intake of forages by grazing animals is essential in meeting mineral requirements. Factors that reduce forage intake (e.g. low protein, high degree of lignification) also reduce total mineral consumption. The concentration of minerals in plants is dependent upon interactions among a number of factors including soil type, plant species, stage of maturity, dry matter yield, grazing management and climate. Although total concentration of a mineral in a feedstuff is important, the biological availability of the mineral is equally important. Biological availability (absorption and utilization) of minerals varies substantially among animal species and breeds within a species, as well as among feedstuffs. The combination of all of these factors makes it extremely difficult for livestock producers to determine the actual mineral status of their herd, whether or not mineral supplementation is necessary and the degree of supplementation that may be needed to meet production goals.

Three experiments have been previously conducted that address various aspects of mineral nutrition of grazing cattle. Collectively these studies address seasonal/maturity changes in nutritive quality of native range/pasture plants in western North Dakota, the effect of forage intake on mineral bioavailability, and the effects of water stress, soil fertility, genotype and grazing management on forage chemical composition. The limiting factor in each of these experiments is the high cost of nutrient, particularly mineral, analyses.

Materials and Methods

The first experiment was conducted at the Manning ranch of the Dickinson Research Extension Center (L. Manske). Forage samples have been collected since 1983 from replicated pastures maintained under two different grazing management schemes (4.5 m season-long system and 4.5 m rotational grazing system). Nutrient analyses of the forages from this experiment will help describe seasonal changes in nutrient content of native range plants. Combined with other data collected throughout the region, quantifying seasonal variations in nutrient concentrations should help producers identify periods during the grazing season when nutrient supplementation may be necessary to maintain optimum performance. Additionally, if grazing management can be altered so that adequate nutrient concentrations are maintained for longer periods of times, yearly supplemental needs may be reduced while overall production is increased.

In the second experiment (E. Grings), two trials focused on determining the effect of dry matter intake on mineral bioavailability from forages. Mineral balance and retention will be determined in steers fed two forages at two levels of intake (1.8 and 2.3% of BW). Establishing the effect of dry matter intake on mineral bioavailability of forages will help producers refine estimates of available mineral supply, and subsequently, need for mineral supplementation.

In the third experiment (J. Karn), diploid and tetraploid Russian wildrye plots were established in a rainout shelter. In three years, forage samples were collected at four stages of maturity beginning in May and ending in June. After collection, samples were separated into leaf, stem and head portions. Chemical composition data from this experiment will help define possible relationships between soil water and nitrogen levels and forage quality**.** Data will also be used to assess if the grass tetany potential of Russian wildrye is affected by ploidy level, water and nitrogen. This study is very unique because in most studies it is impossible to grow plants outside and still control water levels.

Results and Discussion

Sample processing and analysis from experiments 2 and 3 will not begin until the spring of 1999. Preliminary reports should be complete by the fall of 1999. Samples from experiment 1 will be processed in 1999 and analyzed in the spring of 2000 (pending additional funding). Final reports will be available in January, 2001.

Literature cited

None

[Back to 2001 Annual Report Index] [Back to Beef Reports]

[DREC Home] [Contact DREC] [Top of Page]
