Mineral Composition of Southern Forages

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INTRODUCTION

Forage production is an important component of agriculture and is evidenced by the fact that 32.2% of land use in the United States is devoted to grazing lands and/or hay production. In Texas, 67.1% of the total acreage is devoted to pastureland and rangeland. An advantage of forage crops over other harvested crops is the cost of harvest. Beef cattle, dairy cattle, sheep and goats, and horses derive 85, 59, 94 and 73% of their diet intake from forages, respectively. Using livestock as harvesters of this feedstuff is cost effective but not without problems. Forages used for grazing are harvested by animals throughout their growth cycle, which results in a tremendous variation of forage quality. These variations are due to time of growing season, live or dead vegetation, and many other environmental factors. These variations results in significant fluctuations in nutrient supply. As a consequence, nutrient supplementation of grazing livestock is a challenge to maintain optimum production efficiency. This paper will present the mineral composition of predominately Southern forages and discuss the variations observed.

FACTORS AFFECTING MINERAL COMPOSITION

Forage mineral composition is dependent upon many factors including soil characteristics, stage of plant growth, climatic conditions, and fertilization practices. Soils are very different with respect to the minerals found in the soil matrix. Sandy soils often allow specific minerals to leach more easily from the growing surface than heavier clay soils. Soil acidity will also impact the availability of soil minerals for uptake by roots and subsequent translocation to plant tissues. The controlling factor that can potentially alter forage mineral composition more than any other practice is fertilization. Application of fertilizer to optimize plant growth and productivity also changes plant mineral composition. Most improved forages in the South have been maintained through extensive fertilization programs. The demand for minerals such as P is often higher than supplied by the soil and application of this mineral in fertilizers has increased the amount of P available for livestock consumption. This is proven due to the fact that most native, non fertilized forages, are often deficient in P. Our research (Greene et al., 1987) shows that actively growing plant tissue has much higher concentrations of P, Mg, and K compared to non-actively growing plant tissue. Any environmental factor that affects plant growth will alter the ability of the plant to translocate minerals from the soil to plant tissues and thereby alter mineral composition.

The ability of forage minerals to meet grazing livestock mineral requirements depends upon the concentration of minerals in the plant and the bioavailability of those minerals. Mineral bioavailability depends upon various digestive tract interactions, mineral solubilities and digestive tract pH. The digestive tract interactions are extremely important when defining animal requirements and formulating mineral supplements for grazing livestock. Many forages contain antagonists that reduce the availability of minerals. There are many mineral-mineral interactions that increase requirements such as high Mo-S diets increase the requirement for Cu and as dietary K increases Mg requirement increases. In addition to mineral-mineral interactions, there are significant interactions between minerals and organic constituents found in plants. Many organic acids may be present that have been shown to reduce the bioavailabilty of forage minerals. Many of these interactions are not clearly understood and, therefore, often makes the evaluation of forage mineral supply confusing.