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Seasonal trends of macro and micro minerals in 10 browse species that grow in northeastern Mexico

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Abstract

Leaves and twigs from shrub species consumed by range goats: *Bernardia myricaefolia*, *Caesalpinia mexicana*, *Celtis pallida*, *Diospyros texana*, *Eysenhardtia polystachya*, *Gymnosperma glutinosum*, *Hellieta parvifolia*, *Parkinsonia aculeata*, *Pithecellobium ebano* and *Pithecellobium pallens* were evaluated for comparative seasonal contents of Ca, Mg, Na, K, P, Cu, Fe, Mn and Zn. Plants were collected in summer (September 12, 1995), autumn (December 1, 1995), winter (February 22, 1996) and spring (May 31, 1996) in the counties: Linares, Santiago, Iturbide and Montemorelos belonging to the state of Nuevo Leon, Mexico. During summer, mineral concentrations were higher in general. Only Ca, Mg, K, Mn and Fe were in substantial amounts, in all seasons, to meet adult goat requirements. All browse plants had extremely low P and Na contents. Moreover, Cu in all and Zn in most plants resulted with low marginal levels to meet adult goat requirements. However, plants such as *B. myricaefolia*, *D. texana*, *E. polystachya*, *G. glutinosum* and *H. parvifolia* can be considered prominent components in diets of range goats because of their high mineral concentrations. It appears that ration

Abbreviations: BW, body weight; DM, dry matter; INEGI, Instituto Nacional de Estadística Geografía e Informática; NRC, nutrient Requirements of Domestic animals; SPP, Secretaría de Programación y Presupuesto

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formulation for goats should include evaluation of the dominant available plants and consideration of their probable mineral contents during certain seasons for ration formulation.
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Keywords: Browse species; Northeastern Mexico; Macrominerals; Microminerals; Potential mineral intake of Spanish goats

1. Introduction

Large number of livestock in many parts of the world consume diets that do not meet the exacting mineral requirements. In consequence nutritional disorders arise, which range from acute or severe mineral deficiency or toxicity diseases, characterized by well-marked clinical signs, pathological changes and high mortality to mild and transient conditions, difficult to diagnose with certainty and express merely an unthriftiness or unsatisfactory growth, production and fertility (McDowell, 2003). Mild deficiencies or toxicities assume great importance in the nutrition of livestock because of their extent and the ease. They can be confused with the effects of semi-starvation due to underfeeding, protein deficiency and various types of parasitic infection. In many parts of the world, animal productivity is limited primarily by shortages of available energy and protein, infections and parasitic disease and genetic inadequacies in the animal. As those limitations are increasingly rectified, local minerals deficiencies and imbalances are likely to become more apparent and more critical (Underwood and Suttle, 1999).

The incidence and severity of mineral malnutrition in Spanish goats in northeastern Mexico can be further influenced, both directly and individually, by climatic factors, such as sunlight and rainfall. For example, sunlight promotes vitamin D formation in the goat which in turn facilitates Ca and P absorption. The P concentrations in shrubs fall with increasing maturity and with the shedding of seed. In any area, the relative lengths of the dry, mature period (low browse P) and of the green, growing period (high browse P) are determined by the incidence of rainfall (Minson, 1990). The objectives of this study were to estimate and compare, seasonally, the dynamics of Ca, Mg, Na, K, P, Cu, Fe, Mn and Zn concentrations of 10 browse species that grow in northeastern Mexico. Potential mineral intake of range Spanish goats consuming the shrubs was also estimated.

2. Materials and methods

2.1. Study area

This study was carried out at four counties of the state of Nuevo Leon, México: Linares (24°47′N; 99°32′W; elevation 350 m), Iturbide (24°45′N; 99°56′W; elevation 1700 m), Santiago (25°22′N; 100°07′W, elevation 510 m) and Montemorelos (25°08′N; 99°51′W; elevation 500 m). The climate is typically subtropical and semi-arid with a warm summer. Mean monthly air temperature ranges from 14.7 °C in January to 22.3 °C in August, although daily high temperatures of 45 °C are common during the summer. Annual precipitation has a

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