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A free-choice intake of mineral blocks in beef cows during the grazing season and in winter

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Abstract

A herd of 25 beef cows were offered four types of mineral blocks (A, B, C, D) with a different Ca to P ratio (A 0.6:1, B 0.8:1, C 2:1 and D 3.6:1). The Mg content was identical in all blocks whereas the Na content was equal in B, C and D, while the Na content in A block was double. The mineral block intake was monitored for 1 year, which was broken down to the grazing period (Pa) and the winter period (Wi). The intake of pasture grass and winter forage was assessed and the feed chemical composition was analysed; based on the obtained values, a macroelement balance (for Ca, P, Mg, Na and K) was calculated.

The results showed the forage diet met requirements for all the observed macroelements (except in Na). The macroelement intake from forage was considerably higher than from mineral blocks. There were significant seasonal (Pa versus Wi) differences in B and C blocks intake. The consumption of D block was relatively invariable all year round; block A was refused in both seasons though it contained the highest amount of highly deficient Na.

It can be concluded that mineral content in forage meets beef cattle requirements for Ca, Mg and K, P content is just satisfactory, and Na content is insufficient. It appears that cows control, to some extent, the Ca to P ratio in their diet by choosing the appropriate type of mineral block. However, the preference or refusal of some types of mineral blocks regardless of the season suggests the influence of other factors affecting mineral block intake which were not the subject of our observation.

Keywords: Mineral blocks; Free-choice intake; Beef cows; Ca; P; Mg; Na; K

1. Introduction

For many classes of livestock, including swine, poultry, feedlot cattle and dairy cows, mineral supplements are incorporated into concentrate diets, which generally insures that animals are receiving required minerals. However, for grazing cattle to which concentrate feeds cannot be economically fed, it is necessary to rely on both indirect and direct methods of providing minerals. Self-feeding of 'free-choice' mineral supplements is widely used for grazing cattle (McDowell, 1996). Grazing animals pose a problem and the provision of minerals and other supplements on a free-choice or free access basis is often the only practical method. The practice of supplying minerals free choice has been used for many years (Tait and Fisher, 1996).

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Valk and Kogut (1998) studied the effect of different NaCl contents in the rations for dairy cows on salt lick block (99% NaCl) intake; the consumption of five different commercial blocks was evaluated. Their results suggested a nutritional need for NaCl when dairy cows were fed rations containing from just enough (1.0 g/kg DM) to an adequate (1.7 g/kg DM) supply of Na. They also observed significant differences in lick block intake related to hardness and/or palatability. Similarly, Cockwill et al. (2000) observed attendance of beef cows and their calves at the feeder and their mineral intake. Sodium chloride was included in the mineral supplement at the proportion of 9.8% (LS) or 22.5% (HS). Number of visits and daily mineral intake were significantly reduced in cows fed HS as compared with LS.

McDowell (1992) found that, in grazing livestock, phosphorus deficiency has been described as the most widespread mineral deficiency throughout the world. Another experiment (S'Thiago et al., 2000) was designed to observe and quantify the effect of two mineral mixtures, as free-choice feeding, one without and the other with phosphorus supplement, on the productive and reproductive performance of Nellore beef cows grazing *Brachiaria humidicola* in Brazil. The authors concluded that beef cattle are not responsive to phosphorus supplementation.

In addition to the total amount of Ca and P in feed ration, a mutual Ca to P ratio is also important; it should be greater than 1:1 but smaller than 7:1 (e.g. Wise et al., 1963; Ricketts et al., 1970; Alfaro et al., 1988). According to Andrade et al. (2002) the Ca to P ratio that provided better apparent absorption for the two mineral elements was 1.9:1. Richter et al. (1989) found out that increase of the Ca/P ratio from 1.2:1 to 4.2:1 improved bull performance and reduced the incidence of signs of rickets.

The factors influencing consumption of mineral mixtures include: soil fertility and forage type, season, available energy and protein, individual requirements, salt content of the water, palatability of mineral mixture, availability of fresh minerals and physical form of minerals (McDowell, 1996). Recommendations regarding mineral requirements are available to beef cattle breeders. The regulation on nutrient requirements by Petrikovič and Sommer (2002) is applied in the Czech Republic. There are differences in some macroelement requirements compared to the worldwide used regulation NRC (1996).

The aim of this experiment was to observe intake preferences among four free-choice mineral blocks differing in the Ca/P ratio in beef cows during both the grazing season and in winter.

2. Materials and methods

2.1. Cows, treatments and measurements

A suckler herd of 25 beef cows and calves (Limousine, Blonde d'Aquitaine, Aberdeen Angus, Piemontese, Charolais, Simmental beef and Hereford) was under observation from May 2002 to June 2003. The experiment was located at the University farm (of Mendel University of Agriculture and Forestry in Brno) in Zabcice, South Moravia, Czech Republic. During the grazing season (pasture—Pa), the cows and calves were kept on pasture (clay fluvial soil; 184 m of altitude; 553 mm of precipitation per year, 9.0 °C mean temperature per year) with access to a cowshed. The animals fed on pasture grass and they had ad libitum access to water and free-choice mineral blocks. During the winter (Wi), the cattle were kept in the cowshed with access to an outdoor pen. Their feed ration consisted of meadow hay (50%), alfalfa haylage (30%), maize silage (20%) and ad libitum water and mineral blocks.

Table 1
Composition of the four hardened mineral blocks

Block	A	B	C	D
Nutrient content per 1 kg				
Ca (g)	40	65	100	125
P (g)	65	80	50	35
Ca/P	0.6/1	0.8/1	2/1	3.6/1
Mg (g)	70	70	70	70
Na (g)	90	50	50	50
Cu (mg)	1200	1200	1200	1200
Fe (mg)	7000	7000	7000	7000
Zn (mg)	7000	7000	7000	7000
Mn (mg)	7000	7000	7000	7000
Co (mg)	20	20	20	20
J (mg)	110	110	110	110
Se (mg)	20	20	20	20
Proportion of mineral sources (%)				
$CaCO_3$	0.000	0.000	16.700	30.500
$CaHPO_4$	17.700	32.500	22.600	8.800
Na_2HPO_4	15.700	13.800	0.000	0.000
$(NH_4)_2HPO_4$	6.400	6.400	6.400	6.400
NaCl	28.500	15.600	22.600	22.600
MgO	24.600	24.600	24.600	24.600
$MgCl_2$	2.800	2.800	2.800	2.800
$CuSO_4$	0.303	0.303	0.303	0.303
$FeSO_4$	1.900	1.900	1.900	1.900
ZnO	0.872	0.872	0.872	0.872
MnO	1.032	1.032	1.032	1.032
$CoSO_4$	0.005	0.005	0.005	0.005
$Ca(IO_3)_2$	0.017	0.017	0.017	0.017
Na_2SeO_3	0.004	0.004	0.004	0.004
Starch	0.167	0.167	0.167	0.167