Agricultural Experiment Station U. S. Department of Agriculture

Department of Animal and Range Sciences
CLAYTON LIVESTOCK RESEARCH CENTER

PROGRESS REPORT

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Progress Report No. 91 (May, 1994)

A Mineral Supplement for Cattle Grazing Dormant Blue Grama Rangeland: Composition and Consumption

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Limited information is available concerning the mineral composition of diets consumed by cattle grazing native rangelands. When the amount of a mineral consumed daily is unknown, it has been recommended that a free-choice mineral mixture should supply 25 to 50% of the daily requirement (McDowell et al., 1993). Furthermore, in areas where there are known mineral deficiencies, 100% of the deficient mineral should be provided. The two minerals most likely to be of greatest concern for cattle grazing dormant native rangeland are phosphorous (P) and potassium (K).

Inadequate intake of P can result in fragile bones, general weakness, weight loss, stiffness, decreased milk production, and the chewing of wood, rocks, and bones; however, the chewing of unusual non-food items (pica) is associated with many other mineral deficiencies (McDowell et al., 1993). For the greater part of the year, mature forages contain less than .10% P (Waller et al., 1972). A 600-lb steer gaining 1.5 lb/day and consuming blue grama rangeland forage at 2.5% of its body weight (Krysl et al., 1989) would consume less than 7 grams of P/day. The P requirement for this steer would be 14 grams/day (NRC, 1984). The additional P that the steer requires to optimize gain can easily be included in a mineral supplement.

The K concentration of dormant, weathered forage is normally low because K is highly water soluble. Potassium deficiency in cattle results in non-specific signs such as slow growth, decreased feed and water intake, nervous disorders, and malnutrtion (McDowell et al., 1993). It has been suggested that when protein meals (e.g., soybean or cottonseed meals) are used as supplements, supplemental K is not needed in the mineral supplement. Assuming that a rancher provides approximately 1 lb of a 40% crude protein range cube daily to stocker cattle grazing dormant rangeland, and that this supplement is mostly soybean meal (2.14% K), total K intake would be 27 grams/day (assuming that dormant, weathered forage contains .28% K; Karn and Clanton, 1977). This would translate into a 16-gram deficiency of K daily (NRC, 1984). Thus, in many situations, if a mineral supplement is consumed at a rate of .25 lb/day, it would need to contain 14% K to supply the required supplemental K for optimal animal performance.

Table 1. Composition of blue grama rangeland mineral supplement

Ingredient	% of dry matter	% As-fed[a]
Dicalcium phosphate	39.170	38.962
Limestone	3.250	3.333
Magnesium oxide	8.590	8.633
Potassium chloride	17.379	17.822
Salt	18.755	19.233
Cobalt carbonate	.001	.001
Potassium iodide	.005	.005
Manganous oxide	.125	.127
Zinc sulfate	.250	.254
Copper sulfate	.100	.103
Vitamin A[b]	.375	.350
Soybean meal	10.000	9.147
Fat	2.000	2.030

[a]Actual dry matter of ingredients will vary depending on supplier.
[b]Contained 13,620,000 IU/pound.

Table 2. Mineral supplement intake by beef steers grazing blue grama rangeland

Date	Intake, lb/day[a]	Grams of P/day[b]	Grams of K/day[b]
3/25 to 3/31	.53	18	21
4/1 to 4/7	.45	15	18
4/8 to 4/14	.38	13	15
4/15 to 4/21	.35	12	14
Average	.43	15	17

[a]As-fed basis (97% dry matter).
[b]Dry matter basis.

We formulated a mineral supplement (Table 1) to supply between 25 and 50% of the daily requirements of 600-lb beef steers and heifers gaining 1.5 lb/day grazing dormant native rangeland and measured weight gain by five steers (initial body weight = 542 lb) grazing dormant blue grama rangeland (30 acres, herbage mass = 1,193 lb of dry matter/acre) for 41 days beginning on March 15, 1994. Cattle were supplemented with a high-protein supplement (97% soybean meal, 5% molasses; 1.26 lb of dry matter/day). The calculated nutrient composition of the mineral supplement was 7.6% phosphorus, 10.2% calcium (Ca), 9.0% potassium, 5.1% magnesium, .58% iron, .10% zinc, .11% manganese, .03% copper, .001% cobalt, and .003% iodine. ***This mineral contains copper and is not recommended for sheep.*** Mineral supplement intake was measured from March 25 to April 24, 1994.

The steers gained an average of 75 lb of body weight over the 41-day grazing period (1.8 lb/day). Free-choice consumption of the minerals ranged from .35 to .53 lb/day (Table 2). The cattle tended to consume more mineral supplement during the early part of the gazing season, which may have partially resulted from an initial craving for salt by the cattle, even though there was a 1-week adaptation to the mineral supplement before intake was measured. Overall, mineral supplement intake was 72% greater than our target consumption of .25 lb/day. When feeding supplements similar to this one, ranchers may find it necessary to limit supplement availability to prevent over consumption and wasting of the supplement. This higher intake estimate than targeted suggests that this mineral supplement is palatable and readily consumed by the cattle. Furthermore, mineral supplements have limited usefulness if they are unpalatable and cattle consume insufficient quantities to meet their nutrient requirements. In each period that consumption was measured, the steers consumed a sufficient amount of K to meet their daily requirement. Karn and Clanton (1977) demonstrated that adding K to a corn gluten meal supplement fed to steers grazing a sandhill range site in Nebraska increased daily body weight gain compared with a corn gluten meal control.

Supplemental P intake (soybean meal [.71% P] plus mineral supplement) was 136% of the NRC (1984) recommendation, which should maintain a Ca-to-P ratio of > 1.0 necessary to avoid metabolic and absorptive problems (Kincaid, 1988). If the forage consumed contained approximately .03% P and .25% Ca (Waller et al., 1972), total P and Ca intake (forage plus soybean meal [.33% Ca] plus mineral supplement) was 21 and 35 grams/day. Hence, the total dietary Ca:P ratio would have been 1.7:1, which was within the optimal range (1 to 7) suggested by Kincaid (1988) and McDowell et al. (1993).

In conclusion, intake of this mineral supplement by cattle was sufficient to provide adequate mineral nutrition at moderate levels of performance. Because free-choice mineral consumption was greater than targeted, the quantity offered for a convenient time period should most likely be limited to levels that match the desired mineral intake.

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