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Mineral supplementation aids grazing distribution

Low-moisture blocks may be a good alternative for supplementing minerals if livestock grazing distribution is a potential concern.

By **DEREK W. BAILEY***

WESTERN rangelands are a very dynamic forage resource with nutrient levels that generally meet animal demands during the growing season, but they usually do not meet animal requirements during fall and winter, when forage is dormant.

Crude protein levels are often lacking in dormant forage, and feeding supplemental protein may increase forage digestibility and animal intake. Cattle diets may also be deficient in vitamins and trace minerals such as copper and zinc.

Supplementation of trace minerals may be as critical as protein supplementation, especially when forages first go into dormancy and crude protein levels are only marginally deficient. Presence of antagonists such as molybdenum, iron and sulfur in the soil or water may tie up copper and zinc and dramatically reduce the availability of these essential trace minerals.

As a result, rangeland nutritionists often recommend supplementation of trace minerals such as copper and zinc during most of the year and protein during fall and winter, when forage quality is low.

Another concern for rangeland managers is livestock grazing distribution. On many western rangelands, areas with steep slopes, high elevations and long distances from water receive very little grazing. My department's studies in Montana suggested that as much as one-third of foothill rangeland pastures are left essentially unused if cattle are simply turned out and no distribution management practices are implemented.

Most problems occur in the rough terrain in the western U.S., but grazing distribution can be an issue in diverse management systems, from arid rangeland with low stocking rates to productive pastures with high stocking rates (Irving et al., 1995) more typical of the East and Midwest.

Although the management practices for resolving grazing distribution have been discussed for more than 50 years (Williams, 1954; Bailey, 2005), the application and underlying behaviors and processes that determine the success of these practices are not well understood. However, development of global positioning system (GPS) technology has allowed us to study cattle movement patterns on rangelands with the precision and extent that were previously unavailable.

Two cooperative studies supported by Ridley Block Operations (manufacturer of CRYSTALYX Brand Supplements), Montana State University and New Mexico State University examined these issues (Bailey and Welling, 2007). Studies were conducted at the Thackeray Ranch and the Northern Agricultural Research Center, both of which are part of Montana State University.

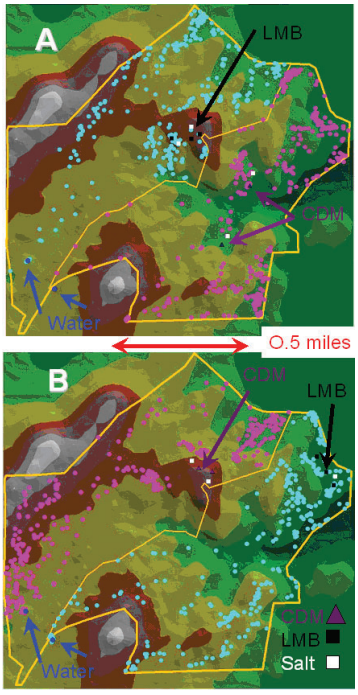
The Thackeray Ranch is foothill rangeland used for summer, fall and early-winter grazing. The Northern Agricultural Research Center is located in short-grass prairie and is where cattle are fed hay during mid- to late winter.

The objectives of these studies were to evaluate two methods of supplementing trace minerals to non-lactating cows and to determine if these supplementation schemes could also be used to attract cattle to underutilized rangeland.

Study 1

Treatments. In the first study, low-moisture blocks (LMB) and a conventional dry mineral (CDM) were compared on moderate and difficult rangeland terrain at the Thackeray Ranch. The study included four treatments: CDM placed in moderate terrain, CDM placed in difficult terrain, LMB placed in moderate terrain and LMB placed in difficult terrain. Each treatment was evaluated in a pasture for one week, and the study was replicated in four pastures.

1. Locations of cows supplemented with conventional dry mineral (CDM) and low-moisture blocks (LMB) during study 1



Plots show locations of one cow in each pasture recorded every 10 minutes for four days. Cow locations identified by pink dots represent animals supplemented with CDM and cyan dots with LMB.

Within a pasture, two open feeders were used to supply CDM (▲), and LMB was available in three 250 lb. black steel barrels (■). Two salt blocks were available in each pasture (□). Conventional dry mineral was placed in moderate terrain in Figure 1A and in difficult terrain in Figure 1B. LMBs were placed in difficult terrain in 1A and moderate terrain in 1B. In 1B, the collared cow fed CDM did not visit the supplement feeders or salt.

LMB was offered in 250 lb. black steel barrels and contained 30% crude protein. The manufacturer recommended varying intake rates between 0.5 and 1.5 lb. per day. A typical intake of 0.75 lb. per day provides 100% of National Research Council (NRC) recommended levels of trace minerals.

CDM contained 12% salt, 12% calcium and 12% phosphorus and, at the recommended intake rates of 2-4 oz. per day,

*Derek W. Bailey is with the animal and range sciences department at New Mexico State University.

provided more than 100% of NRC-recommended levels of trace minerals. Based on manufacturer recommendations, free-choice salt was fed with both supplements.

Moderate and difficult terrain categories were established before the study by distinguishing the steeper and higher (difficult) sections of a pasture from intermediate (moderate) areas after the gentle terrain near water (easy) and inaccessible areas (greater than 50% slope) were excluded. Moderate and difficult terrain contained approximately the same acreage. Supplement placement sites were randomly selected within each terrain category.

Measurements. Supplement intake of the herd was measured weekly, and variation in individual animal intake was estimated by recording visits to supplement by cows wearing GPS tracking collars. Visits to supplements were defined as a GPS location fix by a collar that was within 10 m of the supplement. It is unlikely that animals with functional GPS collars consumed supplement when they were not observed within 10 m of the feeder. Because supplements were placed away from water in foothill rangeland (moderate or difficult terrain), it is likely, but not certain, that animals consumed supplement when they were within 10 m of LMB barrels or CDM feeders.

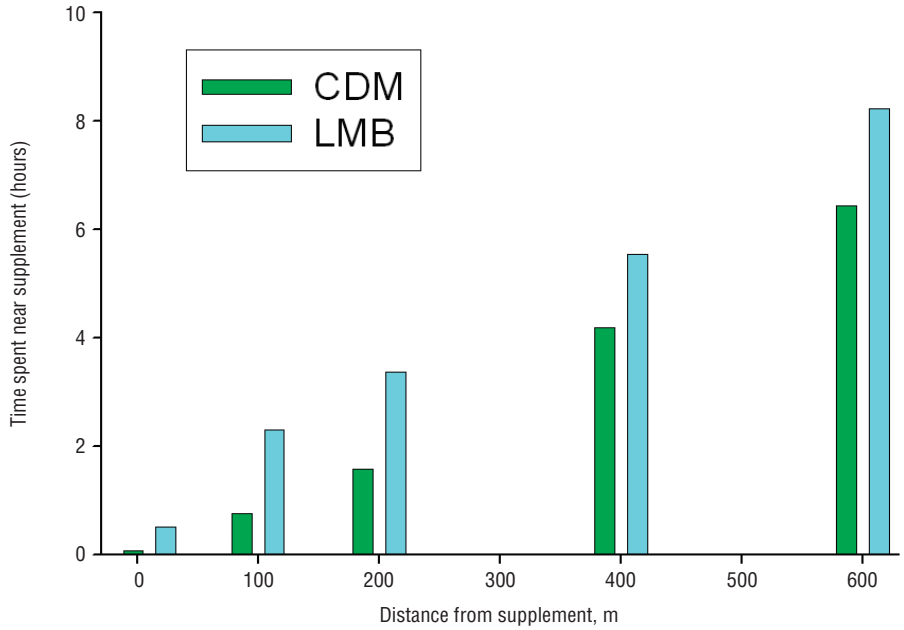
Intake. CDM intake in moderate terrain was 4.5 oz. per day and above manufacturer recommendations, while intake in difficult terrain intake was 1.9 oz. per day and slightly less than manufacturer recommendations. In contrast, LMB intake was similar in both terrain types at 0.47 lb. per day and also slightly less than manufacturer recommendations.

LMB and CDM as attractants. LMB was more effective than CDM as an attractant to lure cattle to graze nearby rangeland (Figure 1). Collared cows spent more than twice as much time within 200 m of LMB than they did CDM feeders (Figure 2). These differences were not simply the result of spending more time during visits to supplement (within 10 m). Cows spent only 21 minutes per day more during visits to LMB than to CDM, while time spent within 200 m of supplements was 108 minutes per day greater for LMB.

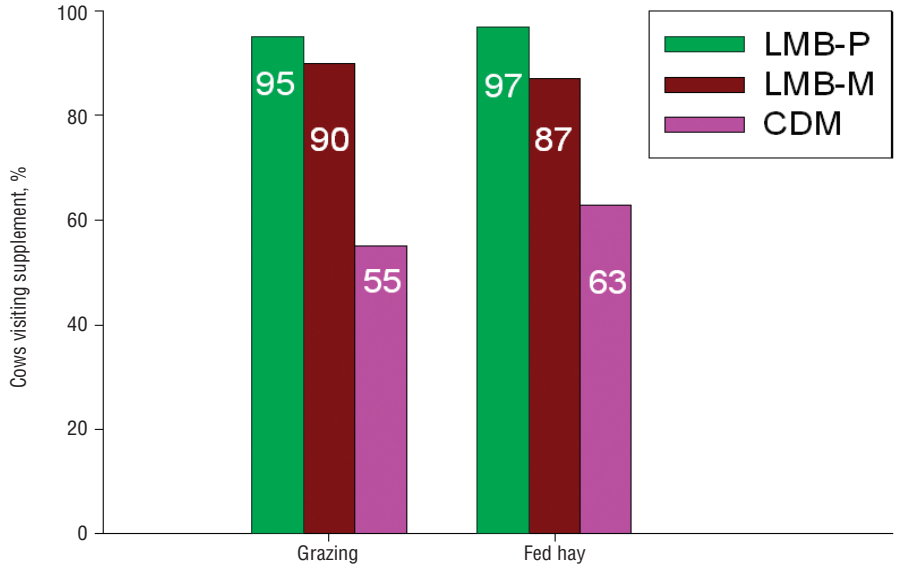
In a previous study at the Thackeray Ranch (Bailey and Welling, 1999), LMB was more effective in modifying cattle distribution patterns than salt. Forage utilization increased 17% near LMB and did not change (0%) near salt.

Dr. Dave Ganskopp also found that salt had only a limited effect on cattle grazing patterns in a study conducted in eastern Oregon (Ganskopp, 2001). The 12% salt content in the CDM used in this study likely served both as attractant and as a limiter of intake. Cattle appeared to be attracted to CDM to a degree similar to what has been observed with salt alone in other grazing distribution studies.

2. Time spent by cows within 10-600 m of CDM and LMB while grazing foothill rangeland during study 1



3. Percent of collared cows visiting supplement (within 10 m) during study 2



More cows were observed visiting LMB than CDM. When supplements were placed in moderate terrain, 14% of the cows did not visit LMB, and 26% did not visit CDM. When supplements were in difficult terrain, 38% of collared cows did not visit LMB, and 62% did not visit CDM.

Study 2

Treatments. Some LMB formulations have lower concentrations of minerals, and an additional mineral supplement is often recommended in such cases. In study 2, cows were fed an LMB containing protein (LMB-P) but lower macromineral concentrations than the product used in study 1.

Also, two additional supplements were formulated to provide supplemental minerals and were the basis of the two treatments in the study: (1) the CDM used in study 1 and (2) an LMB designed to provide macro and trace minerals (LMB-M). Comparisons of these two supplements were made under two different scenarios: (1) while cows grazed foothill rangeland and (2) while they were fed hay.

LMB-P was placed in a rectangular pattern around the mineral supplements. CDM or LMB-M was placed inside the rectangle during two-week periods, one week with

CDM and one week with LMB-M. In addition to LMB-P and mineral supplement (CDM or LMB-M), salt blocks were fed based on recommendations of the manufacturers of these supplements. The study was replicated in six locations: three rangeland sites and three sites where cows were fed hay.

Measurements. Supplement intake of the herd was measured weekly. Cows were tracked with GPS collars for the two-week periods, one week with CDM and one week with LMB-M. Visits to all supplements were recorded by the collars so that treatments could be compared on individual cows.

Intake. Intake of LMB-P was well within the manufacturer recommendations of 0.5-1.5 lb. per day at both locations, but cows consumed 0.11 lb. per day more LMB-P when they were fed hay (0.65 lb. per day) than when they were grazing foothill rangeland (0.54 lb. per day).

Providing additional mineral as LMB-M rather than as CDM can reduce the consumption and, correspondingly, the cost of LMB-P. Intake of LMB-P was lower when LMB-M (0.52 lb. per day) was available than when CDM (0.67 lb. per day) was available.

Consumption of LMB-M (0.24 lb. per day) and salt (0.6 oz. per day) did not change when cows were moved from rangeland to the smaller pasture where they were fed hay. However, intake of CDM when cows were grazing (1.2 oz. per day) was less than half of the levels consumed when they were fed hay (3.0 oz. per day).

Visits to supplements. Cows visited LMB-M more frequently than CDM. Cows visited LMB-M about once every 2.5 days and visited CDM about once every 6.7 days. In addition, cows spent more time at LMB-M barrels than CDM feeders. Only two of 50 cows did not visit LMB-P during the study, while 12% of collared cows did not visit salt blocks. Twelve percent of collared cows did not visit LMB-M barrels, but 40% of the collared cows did not visit CDM feeders. This difference in supplemental mineral use was not only apparent on rangeland but also when cows were fed hay (Figure 3).

Conclusions

In both studies, a greater proportion of cows visited LMB than CDM supplements. In study 2, almost every cow (96%) visited LMB-P at least once, while in study 1, about 74% of the cows visited LMB.

In a review, Bowman and Sowell (1997) found that the proportion of non-users of various types of supplement blocks averaged 14% over eight studies (range 0-50%). However, only one of the supplement block studies they reviewed were conducted with cattle, and no studies used LMB.

Terrain and feeding regimes appear to have a greater effect on CDM consumption than LMB consumption. The majority of the cows visited a CDM feeder when placed in moderate terrain on rangeland or when fed hay in a smaller pasture. In contrast, most cows (62%) did not visit CDM when it was placed in difficult terrain on rangeland in study 1.

Both CDM and LMB can provide cattle with sufficient supplemental trace minerals to meet estimated deficits during fall and winter, when cows are fed hay or if supplements are placed near water or in rangeland with relatively gentle topography. However, cows visit LMB more consistently than CDM, especially when cattle are grazing rugged rangeland and supplements are placed in higher terrain away from water.

LMB appears to be more attractive than CDM and, consequently, more effective for modifying cattle grazing patterns. LMB is a good alternative for supplementing macro and trace minerals if livestock grazing distribution is a potential concern.

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