

Identifying Site Specific Trace Mineral Needs for the Cow Herd

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Applying science-based concepts to the ranch or farm should improve management and reduce production costs. Areas of concern for this case study were forage quality and concentration and supplementation of macro-minerals and micro-minerals on a specific rangeland.

Livestock mineral needs vary with feedstuffs and region (McDowell, 1992). Supplying minerals to meet animal requirements will improve animal growth and health (NRC, 1996). North Dakota grasses change in nutritional quality dependent on harvest date (Sedivec and Lardy, 2003). Phosphorous supplementation is needed in grasses in North Dakota (Ward and Lardy, 2005).

A cooperating beef cattle producer (Jack Dahl, Dahl Land and Cattle, Gackle, ND) from south central North Dakota provided rangeland and cattle to evaluate forage quality and mineral content. Forage samples were collected once monthly during May through October of 2002, 2003 and 2004. An observation and sampling technique was used that harvested only the forage the cows were observed consuming during the sampling period.

The samples were analyzed for concentration of the following nutritional components: Dry matter content, ash, crude protein, in vitro dry matter digestibility, acid detergent fiber, neutral detergent fiber, calcium, phosphorous, potassium, magnesium, sodium, sulfur, copper, zinc, molybdenum, iron, manganese and selenium.

Average concentrations of nutritional components in forage samples collected during the grazing season are listed in Table 1. Crude protein averaged 8.91% (SE=1.773) on a dry matter basis. Energy content was estimated by acid detergent fiber concentration (37.37%, SE=1.971) and averaged 60.5% total digestible nutrients (TDN). Calcium and phosphorous content was 0.368% (SE=0.070) and 0.163% (SE=0.036) respectively. The micro-mineral concentration of copper and zinc averaged 15.5 (SE=0.10) parts per million (ppm) and 23.9 (SE=0.07) ppm respectively.

Table 1. Comparing range forages and beef cow nutritional requirements (lactating mature cow 15# milk)

Nutritional Content	Forage Concentration	Cow Requirements	Nutritional Status
Dry Matter, %	94.86	--	
Crude Protein, %	8.91	10.5	supplementation indicated
Total Digestible Nutrients,%		58.8	adequate
In vitro Dry Matter Digestibility, %	59.16		
Calcium, %	0.368	0.29	adequate
Phosphorous, %	0.163	0.18	supplementation indicated
Magnesium, %	0.159	0.2	supplementation indicated
Potassium, %	1.086	0.7	adequate
Sodium, %	0.013	0.1	supplementation indicated
Sulfur, %	0.15	0.15	adequate
Copper, ppm	15.53	10	adequate
Zinc, ppm	23.99	30	supplementation indicated
Iron, ppm	130.59	50	adequate
Manganese, ppm	78.33	40	adequate
Selenium, ppm	0.37	0.1	adequate

The concentration of nutrients and minerals in the forage sample were affected by year ($P < .01$). Micro-mineral concentration in sampled forages was not different between upland or lowland ($P > .05$).

Forage quality tends to decrease as the grazing season progresses. Crude protein, calcium, phosphorous, and potassium concentrations decrease from May to October. Magnesium concentration tends to be lower in May and September than other months.

Nutritional content of rangeland forages tends to decrease during the growing season. In this study, the concentration of various nutrients in the rangeland forages did not meet or exceed NRC requirements for lactating beef cows. Also, during early and late summer months, the concentrations of certain trace minerals were periodically below NRC recommendations. Consequently, in this case study, additional macro-mineral and micro-mineral supplementation is warranted.

A management practice to provide additional macro-mineral and micro-mineral supplementation can aid in prevention of subclinical deficiencies. Nutritional deficiencies were indicated in the following nutrients across years: crude protein, phosphorous, magnesium, sodium and zinc. Copper concentrations were below NRC recommendations in 2002 but not in 2003 or 2004.

Mineral supplementation on rangeland can help prevent clinical and subclinical deficiencies in lactating beef cattle. While developing site specific mineral supplementation and related cost saving is desirable, this study supports that a mineral supplement with multiple ingredients to provide part of the mineral requirements may be beneficial since variation in year to year and month to month concentrations of macro-mineral and micro-mineral does occur.