



Factsheet BC Ministry of Agriculture, Food and Fisheries

Trace Minerals...for Beef Cattle

Also see "Minerals...for Beef Cattle"

Most of the forage grown in BC is deficient in several trace minerals. These minerals are so named because they are required in minute or trace amounts.

Table 1 shows the average trace mineral content in some common BC grown feedstuffs and indicates the range of values obtained.

Approximately 90% of the forages we grow will not contain enough copper and zinc, and 80% will be too low in selenium to meet the requirements of beef cattle. Although the table indicates that the average manganese content of our feeds is adequate, the wide range of values indicates that a significant amount of forage will not meet the animals' needs.

Trace Elements of Most Concern in BC

Essential trace elements are necessary for the well being of the animal. These are needed in sufficient quantities to promote health and to optimize production. All trace elements are toxic when fed in excessive quantities. Table 2 is a summary of suggested minimum target levels of dietary trace minerals. The levels are approximations, as requirements are affected by many factors.

Copper/Molybdenum

More than 90% of the feed produced in BC is low in copper. Cases of copper deficiency are common. Symptoms of a deficiency include anemia, impaired

reproduction in cows, bleaching of the hair coat, scours, unthriftiness, stunted growth and sudden death. A greater incidence of internal and external parasites has been noted in copper deficient animals. There is also an increased tendency for bones to fracture in calves and an increased incidence of lameness.

The suggested requirement for copper in cattle rations is 10 ppm. High molybdenum levels in the ration will increase the requirement for copper. The ratio of copper to molybdenum should be at least 4:1. Although most of the BC feed analyzed by feed testing laboratories is fairly low in molybdenum, a significant number do have levels of molybdenum that will result in increased copper needs.

Zinc

Most of the feed grown in BC is considerably lower in zinc than the 50 ppm suggested minimum. Symptoms of deficiencies include reduced growth rate, and may contribute to an increased incidence of foot rot and other foot infections and reduced fertility in bulls. Zinc deficiency inhibits utilization of Vitamin A. Reports of clinical cases of zinc deficiency are rare in BC as diagnosis is difficult. Routine supplementation is warranted.

Manganese

Most of the feed produced in BC is adequate in manganese. However, a significant proportion of the forage is lower than the 50 ppm suggested minimum for breeding females. Impaired reproductive performance in the cow is among the first symptoms of a deficiency. An adequate amount for growing stock is 40 ppm.

Selenium

The selenium content of feeds grown in the province is quite variable and ranges from levels as low as one-tenth of that required by cattle to levels that are 15 times what animals require. Even in areas which are generally considered to be selenium deficient, isolated cases of high levels of selenium can occur. This emphasizes the need for producers to have their feed analyzed. Ask your lab about selenium analysis. There can be a marked difference in selenium content of forage from field to field and even two areas in the same field. Approximately 78% of BC feed analyzed is below 0.1 ppm and 88% below 0.2 ppm.

Selenium deficiency is a significant problem in BC. Deficiency symptoms include white muscle disease, reduced resistance to infectious diseases, birth of dead or weak calves, increased incidence of retained after-births, lowered cow fertility and growth reduced rates. The minimum requirement for selenium is 0.2 ppm (NRC Nutrient Requirements of Beef Cattle, 1984). Experience in BC over the past years indicates that this may not be enough. Levels of 0.3 to 0.5 ppm of selenium in the diet should be adequate under most circumstances. The role of Vitamin E is similar to that of selenium and a deficiency can produce similar effects. Vitamin E should also be given when selenium supplementation is warranted.

Trace mineralized salt products can be purchased with selenium levels up to 120 ppm for free-choice feeding to cattle. Trace mineralized salt with 50 to 120 ppm of selenium should be adequate when fed at 40

grams/cow/day. Current regulations allow only 30 ppm of selenium to be added to mineral mixes designed for free-choice feeding. Under many conditions, this does not appear to be an adequate level. Feeding some trace mineralized salt with selenium mixed with the mineral will raise the overall selenium level.

Iodine and Cobalt

The level of iodine in forages in BC is low and supplementation is necessary. Symptoms such as a goiter, decreased milk yield, impaired fertility and increased incidence of retained placenta have been reported.

Cobalt deficiencies have not been reported in BC. The few feed analyses that have been done indicate that feeds grown in this province appear to supply adequate levels of this element. Since cobalt status of our feeds and livestock have not been widely studied, it would be prudent to continue to supplement for this mineral.

The usual source of supplemental cobalt and iodine is cobalt-iodized salt (blue) and trace mineralized salt. Most calcium phosphorus mineral supplements also contain these elements. Blood serum analyses in BC herds indicates that iodine levels in salt are not always adequate as deficiencies have arisen in herds fed iodized salt.

Trace Mineral Supplementation

Producers who have upgraded the trace mineral status of their herds through provision of the appropriate supplement have observed improvements in general health of the animals and in reproductive performance. This is not surprising when one considers that herds not receiving mineral supplements are deficient in at least two trace elements and can be deficient in as many as five. The benefits of trace mineral supplementation outweigh the relatively small cost. The most common and convenient way employed to overcome these problems is by feeding a mineral supplement that contains

adequate levels of these elements. Feed testing is the easiest way to confirm which minerals are low in the feed and what levels are required in a supplement to overcome these shortages. Some cattle minerals sold in BC are not high enough in several of the trace elements to overcome the shortages we experience.

Mineral Supplements

Calcium/Phosphorus Mineral Mixes – Most of these kinds of mineral mixes contain trace elements with the exception of selenium, however the trace element levels may not be in high enough concentrations to overcome shortages. Agriculture Canada regulations allow selenium to be added only to range minerals at a level not to exceed 30 ppm and to trace mineralized salt at a level not to exceed 120 ppm. If higher levels of selenium are needed, a veterinarian’s prescription is required.

Trace Mineralized Sale (TM Salt)

Some TM salt products on the market are suitable for feeding to sheep. As a rule, such products are too low in copper for cattle. High copper/high zinc trace mineralized salts are available that are a much better source of copper and zinc for cattle.

Table 3 should help in deciding if a mineral mix is suitable as a source of supplementary trace elements. Compare your mineral mix to this table and if your mineral falls within the range shown, chances are it will meet the needs of the cattle. It is best, of course, not to guess. Feed testing is a quick and inexpensive way to determine what your situation is. Private feed labs offer analysis for most of these trace elements.

Table 1: Mineral Content of Common Feedstuffs

	<i>Grass Hay</i>	<i>Grass-Legume Hay</i>	<i>Alfalfa Hay</i>	<i>Cereal Silage</i>	<i>Corn Silage</i>
Copper (mg/kg) <i>Average</i> <i>Range</i>	8.1 1-33	8.2 1-56	9.6 5-42	6.9 1-19	7.9 2-88
Manganese (mg/kg) <i>Average</i> <i>Range</i>	115.3 7-868	63.9 8-515	37.2 10-94	70.0 15-189	53.1 4-304
Zinc (mg/kg) <i>Average</i> <i>Range</i>	24.0 2-61	23.0 7-191	22.9 10-54	31.2 11.91	33.4 9-348
Selenium (mg/kg) <i>Average</i> <i>Range</i>	0.09 0.001 – 0.94	0.13 0.003-0.92	0.07 0.005-0.44	0.05 0.015-0.20	0.05 0.005-0.63

Table 2: Suggested Minimum Target Levels for Trace Minerals in the Diets for Beef Cows in BC

Concentration in the Diet

Copper	10.0 mg/kg
Zinc	50.0 mg/kg
Manganese*	60.0 mg/kg
Iodine	0.8 mg/kg
Cobalt	0.1 mg/kg
Iron	50.0 mg/kg
Molybdenum	<0.5 mg/kg
Selenium	0.3 mg/kg

*Manganese at 40 mg/kg is probably adequate for backgrounding and feedlot cattle.

Table 3: Guides to Selecting Minerals of Suitable Trace Element

Content for British Columbia Conditions

Mineral	Range
Copper	2,500 – 5,000 mg/kg
Zinc	7,500 – 10,000 mg/kg
Manganese	5,000 – 10,000 mg/kg
Iodine	300 – 700 mg/kg
Cobalt	40 – 100 mg/kg
Selenium*	50 – 125 mg/kg

*Supplements containing this level of selenium require a veterinarian's prescription, and would be recommended only where selenium deficiency is a problem.

Levels may be expressed in g/kg or parts per million. The conversion for these different measurements is as follows:

$$1 \text{ mg/kg} = 1 \text{ part per million} = 0.0001\%$$

The percent salt in a salt mineral mix may be indicated by % salt (sodium chloride) or % sodium. To convert % sodium to % salt, use the following conversion:

$$\% \text{ sodium divided by } \% \text{ sodium in sodium chloride} = \% \text{ sodium divided by } 39\%$$

e.g. if the label indicated 20% sodium (Na), the % salt is 20% divided by 39% = 51%

This publication was originally prepared by Rick Corbett, then nutritionist with the BC Ministry of Agriculture and Fisheries, and was updated by M. Malmberg, G. Strachan, and R. France of the BC Ministry of Agriculture, Fisheries and Food in consultation with R. Corbett of Alberta Agriculture.