



Trace Minerals in Saskatchewan Pastures

Black Soil Zone



The Saskatchewan Forage Council recently conducted a project which sampled tame and native forage species in Saskatchewan pastures for trace mineral content. This factsheet explores:

- *trace mineral variations in Saskatchewan pastures by season and type of forage*
- *how these variations can affect livestock production*
- *where to find additional information about trace minerals for beef cattle in Saskatchewan*



What are trace minerals?

Trace minerals are those minerals essential for animal growth, maintenance and reproduction, but are required in small quantities in the diet relative to macro minerals. Generally, trace minerals are required at concentrations less than 100 ppm (parts per million) in an animal's diet. Copper (Cu), zinc (Zn), selenium (Se), manganese (Mn), and molybdenum (Mo) are examples of trace minerals.

Trace minerals are vital for:

- *General animal health and growth*
- *Proper immune function*
- *Feed efficiency*
- *Reproduction and productivity*



Trace minerals can impact your bottom line

Even when clinical signs are not evident, animals deficient in trace minerals may be converting feed less efficiently, growing more slowly or displaying poor reproductive performance. For these reasons, trace mineral deficiency can have a significant economic impact on livestock operations.

What can affect the trace mineral status of my herd?

- *Trace mineral levels in*
 - *Feeds*
 - *Water sources*
 - *Supplements you provide to the animals*
- *Health, age and pregnancy status of the cattle*
- *Interactions between macro-minerals, trace minerals and other dietary components*



Results

Table 1: Summary of average mineral concentrations by soil zone and season, dry matter basis Black Soil Zone 2012 and 2013

Values	Black		NRC Requirements*		
	Spring	Fall	750 lb growing calf	Gestating beef cow	Lactating beef cow
Calcium %	0.57	0.73	0.32	0.15	0.32
Phosphorus %	0.23	0.11	0.18	0.11	0.20
Magnesium %	0.18	0.21	0.1	0.12	0.20
Potassium %	2.16	1.19	0.6	0.6	0.7
Sulphur %	0.19	0.17	0.15	0.15	0.15
Sodium %	0.01	0.01	0.06	0.06	0.1
Iron mg/kg	102	202	50	50	50
Manganese mg/kg	44	72	20	40	40
Zinc mg/kg	25	19	30	30	30
Copper mg/kg	6.8	5.3	10	10	10
Molybdenum mg/kg	2.1	2.9	<5	<5	<5
Selenium mg/kg	0.25	0.24	0.1	0.1	0.1

* Samples with values greater than or equal to the listed requirements were classified as meeting National Research Council requirements for beef cattle

While iron, manganese and selenium appear to be adequate, zinc and copper appear to be lacking (Table 1). These results can be used as a guide to forage trace mineral content in the black soil zone, but to be certain of levels in your own forages, testing is recommended.

Table 2 shows the proportion of pasture forage samples with adequate mineral concentrations to meet the requirements of a lactating beef cow based on forage samples collected across Saskatchewan during 2012 and 2013. For example, molybdenum levels from forage samples in the black zone were adequate in 88% of samples taken in fall.



Table 2: Average percentage of pasture forage samples with adequate mineral levels to meet the requirements of a lactating beef cow (1 to 2 months post-calving) summarized by soil zone and season.

Values	Black		Brown		Dark Brown		Gray	
	Spring	Fall	Spring	Fall	Spring	Fall	Fall	Spring
Calcium	69%	94%	80%	97%	52%	95%	82%	100%
Phosphorus	62%	11%	60%	2%	71%	4%	66%	12%
Magnesium	26%	51%	19%	44%	23%	38%	33%	68%
Potassium	100%	64%	100%	81%	100%	74%	100%	99%
Sulfur	84%	48%	87%	41%	89%	45%	51%	37%
Sodium	0%	0%	0%	1%	1%	6%	0%	0%
Iron	100%	100%	100%	100%	100%	100%	100%	100%
Manganese	50%	69%	70%	81%	59%	81%	53%	77%
Zinc	20%	11%	12%	8%	18%	6%	11%	1%
Copper	10%	6%	13%	7%	17%	5%	16%	11%
Molybdenum	99%	88%	98%	81%	100%	96%	83%	44%
Selenium	86%	82%	100%	100%	96%	99%	92%	96%
Average Cu:Mo Ratio*	4.37	2.49	4.12	2.01	8.41	4.18	2.43	1.40
Cu:Mo>3*	64%	31%	66%	19%	95%	52%	20%	9%
Cu:Mo>5*	27%	6%	29%	5%	78%	23%	6%	1%

*Copper (Cu); Molybdenum (Mo)

Trace Mineral Take Home Notes

- Mineral levels vary depending on season. For example, Molybdenum was adequate in 99% of samples taken in spring but only adequate in 88% of samples taken in fall
- Zinc and copper were deficient in 80% or more of the samples taken, in both spring and fall
- A Cu:Mo ratio of greater than 5:1 was observed in less than one third of samples in the black soil zone
- As compared with other soil zones, selenium levels were more often deficient in the black soil zone

Interactions between minerals can cause deficiencies. For example, even when copper in forage appears adequate the copper may not be available to the animals if high levels of molybdenum are present. A copper: molybdenum ratio of over 5:1 is desirable, and a ratio under 2:1 is considered toxic. Additionally, high sulfate levels in water may cause secondary deficiencies of copper, zinc and/or manganese in cattle. It is very important to test both feed and water and consult an expert who can help you understand these complex mineral interaction.

Table 3: Average percentage of pasture forage samples with adequate mineral levels to meet the requirements of a growing beef calf (750 lb) summarized by soil zone and season

Values	Black		Brown		Dark Brown		Gray	
	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Calcium	69%	94%	80%	97%	52%	95%	82%	100%
Phosphorus	75%	14%	72%	5%	87%	6%	76%	20%
Magnesium	87%	93%	98%	100%	94%	95%	100%	100%
Potassium	100%	70%	100%	86%	100%	81%	100%	99%
Sulfur	84%	48%	87%	41%	89%	45%	51%	37%
Sodium	1%	0%	1%	2%	4%	7%	0%	0%
Iron	100%	100%	100%	100%	100%	100%	100%	100%
Manganese	99%	100%	100%	99%	100%	97%	97%	99%
Zinc	20%	11%	12%	8%	18%	6%	11%	1%
Copper	10%	6%	13%	7%	17%	5%	16%	11%
Molybdenum	99%	88%	98%	81%	100%	96%	83%	44%
Selenium	86%	82%	100%	100%	96%	99%	92%	96%
Average Cu:Mo Ratio*	4.37	2.49	4.12	2.01	8.41	4.18	2.43	1.40
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Take Note

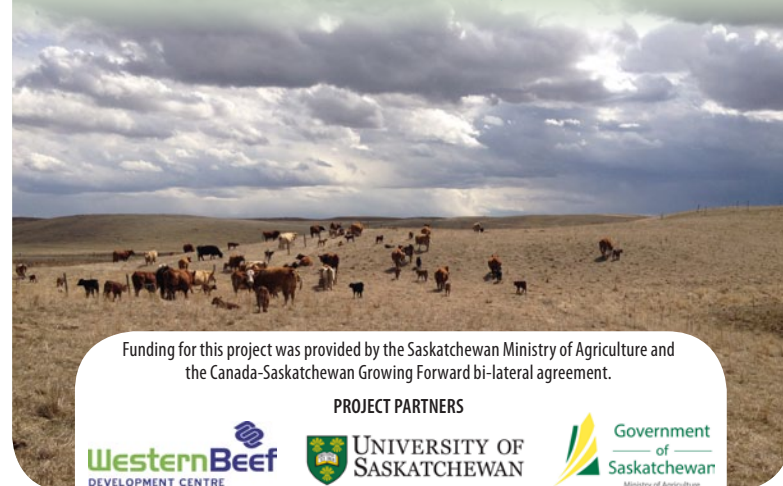
- Requirements differ but trends remain the same for adequacy of minerals to meet the needs of grazing beef cattle as compared to lactating cows in Saskatchewan
- Many of the macro and micro minerals may be deficient in your forages for grazing beef cattle and as a result, supplementation will be required
- Copper and zinc were deficient in most forage tested
- Trace mineral levels varied significantly from spring to fall
- Look at the copper: molybdenum ratio keeping in mind that a 5:1 ratio is recommended
- Be sure to test both feed and water sources to be aware of mineral interactions
- Take a careful look at the calcium and phosphorus levels in your feed, particularly in fall

Have your feed tested to find out what is missing!

Based on these results, varying your mineral supplementation program from spring to fall and matching the program to stage of production or gestation of your herd is recommended. There are mineral programs that take this into account or work with a nutritionist to develop a mineral program that will meet the needs of your herd.

Where can I go for help?

- Saskatchewan Forage Council: www.saskforage.ca or office@saskforage.ca
- The Saskatchewan Ministry of Agriculture website has information and Livestock and Nutrition Specialists that can help: www.agriculture.gov.sk.ca/
- Agriculture Knowledge Centre: 1-866-457-2377
- Western Beef Development Centre: www.wbdc.sk.ca
For emergencies or immediate help, phone your local veterinarian



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PROJECT PARTNERS

