Forage Fact # 14

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Potassium - A Role in Root Carbohydrates & Winter Hardiness

Potassium's importance:

* improves winter hardiness
* increases water uptake, & improves drought tolerance
* strengthens stems and improves flowering
* increases tolerance to fungal and insect attacks
* maintains healthy nervous system & heart / blood circulation in animals

Why do plants and animals need potassium?

Potassium plays a vital role in plant growth in a number of ways. It is an activator for many enzymes. It is essential for a number of processes such as photosynthesis, N fixation, protein synthesis and starch formation. Enhanced flower quality, colour, flavour, and strengthened stems are benefits of adequate potassium nutrition for the plant.

Potassium is critical in helping forage crops adapt to unfavorable environmental conditions. It plays an important role in increasing water uptake and reducing water loss. It helps plants adapt to drought. Potassium improves winter hardiness. It builds up the crop's tolerance to fungal and pest attacks.
In animals and humans, potassium plays several important roles. It helps regulate the nervous system, maintain healthy blood vessels, and muscle contractions including the heart. Potassium works with sodium to regulate the body's waste balance and normalize heart rhythms. Potassium also aids in clear thinking by sending oxygen to the brain. It preserves proper alkalinity of body fluids; stimulates the kidneys to eliminate poisonous body wastes; assists in reducing high blood pressure; and promotes healthy skin.

A deficiency of potassium may result in poor reflexes, nervous disorders, respiratory failure, cardiac arrest, and/or muscle damage.

To determine if your soil is deficient in any important nutrients, you will need to sample your soils. Plant indicator such as poor growth or plant health can be used; but to definitively determine what is causing the poor plant health, samples are necessary.

How are deficiencies detected?

Symptoms of potassium deficiency occur first in the older leaves. The tips of the leaves turn yellow and die. Potassium is easily moved within the plant, so when its availability in soils is low, potassium is moved from older leaves to newer ones. Small, white dots may also appear along leaf margins, especially in forage crops. Reduced drought tolerance, increased lodging and a decrease in quantity and quality are also signs of deficiencies.

Potassium deficiency symptoms on alfalfa are white spots on the edges of lower, older leaves.

For more information call :

* Brian Clarke, Sunrise (250) 789 9254 .
* Chuck Sutherland, Ground-birch (250) 780 2221
* Judy Madden & Mike McConnell, Dawson Creek (250) 782 7875
* Sandra Burton, Farmington (250) 789 6885

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P.O. Box 908

Dawson Creek, B.C.

V1G 1L6

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Crop removal of potassium by different crops:

(in lbs/ac)

* alfalfa	175
* barley grain	20
* barley straw	65
* oats grain	15
* oats straw	120
* wheat grain	20
* wheat straw	60

"I was impressed by how visible the differences were in my plots in the first year. And we have another 2 years to see what happens."

Chuck Sutherland

Correcting a deficiency

Commercial fertilizers are available. Using the chloride form of potassium fertilizer (KCl) may further reduce disease and winterkill. Fertilizer should be placed near the seed where it can be easily taken up by roots. Green manure and animal manure can also be used as a source of potassium. Perennial forages remove large amounts of potassium and therefore have high requirements, especially alfalfa.

Spreading potassium chloride (KCl) at Clarkes' plot in the fall of 2001 by Agricore United, FSJ.

Crop requirements for K

There is generally quite a lot of potassium in the soil at any given time, however it is in a form which is not available to plants. The application of 10 pounds of K_2O per acre will only increase the potassium soil test by 1. However, potassium is removed in very large amounts with the crop, often 5 to 10 times as much as phosphorous and in equal amounts to the nitrogen removed.

Can there be excess potassium?

Like nitrogen, potassium can be lost by leaching. If excess potassium is available, plants will absorb it without an increase in yield. Placing too much potassium with the seed when planting may cause a "salt effect" on the emerging seedlings. Excess potassium can aggravate the uptake of magnesium, manganese, zinc and iron.

Steve Hartnell working for Agro Source Ltd. helped forage members spread potassium alone and as part of a fertilizer blend.

Summary comments

Potassium is removed from fields in high quantities when harvesting alfalfa and oat straw. Potassium levels should be monitored and supplemented when necessary in order to maintain health of crop, soil, and animals consuming the feed. Sandra Burton has been heard on numerous occasions, talking about the soil being our store-house of nutrients and how it must be replenished in order for us, the ranchers, to continue to withdraw from it. The point being that some form of nutrient additions (e.g. manure spreading, winter feeding controlled/ rotational grazing or fertilizing with commercial products) should be implemented in our management plans. By replenishing our soils' nutrient bank, we can ensure sustainable yields of our forage crops. "Healthy soils = healthy forage = healthy livestock."

Alfalfa plants: left plant is healthy; right is deficient in potassium.

Compiled by: Julie Robinson and Sandra Burton in Winter of 2001/2002.
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