

Hot Days . . . Cool Cows: Potassium Helps Make the Difference

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Research shows that potassium (K) has an important role in helping cattle cope with hot weather and maintain milk production. Studies show that K is the primary nutrient lost by cattle during sweating and needs to be replaced to help animals cope with heat stress.

LACTATING BEEF and dairy cattle suffering from heat stress produce less milk, affecting seasonal profits. Summer pastures frequently have inadequate levels of K to meet the demands of lactating cattle during heat stress periods. For example, Coastal bermudagrass, especially on sandy, low K soils, contains 1.3 percent or less K on a dry weight basis during summer heat stress periods. Heat stress symptoms in cattle include lower weaning weight of calves, lower production and lower net returns.

Beating the Heat with Potassium

Florida researchers studied the effects of K nutrition in lactating, heat-stressed cows. These cows required more K due to the increased loss of K in sweat and saliva. In one study, there was a measured five-fold increase in relative K loss from the skin during peak heat stress. One example occurred in cows where temperatures exceeded 85° F. These cows dissipated about 75 percent of their body heat load by way of their lungs and skin through evaporative cooling. At 60° F, only about 25 percent of their heat load was lost in this manner. Studies showed that K is the primary nutrient secreted by sweating, indicating the need for higher K to replace that lost by cattle during heat stress. It is interesting to compare that sodium (Na) instead of K is the dominant mineral secreted through sweating by horses and humans during heat stress.

Research also indicates that milk yields of heat-stressed cows have been increased

with supplemental dietary K. In addition, favorable responses have been reported by Texas researchers when supplemental K was added to the diet during hot weather.

There is also a relationship between K and Na that should be noted. High K and high Na diets produced greater milk yields than diets containing low K and high Na. For best management, it is important to note that K is not stored to any great extent within an animal's body. Combining this information with the fact that large amounts of K are lost through saliva, sweat and urine, it's imperative that a constant quantity of high K feeds and/or forages be supplied to replenish that lost from the animal's body, especially during heat stress periods.

When they're hot, cows need more K. The results of heat stress on cattle are easily recognized, but too many producers are often unaware of the roles of K and its deficiency symptoms.

Potassium deficiency symptoms exhibited by dairy and beef cattle include:

- Decreased feed intake
- Pica (hair licking and wood chewing)
- Rough hair coat
- General weakness
- Poor coordination
- Wobbling of the hind quarters
- Decreased pliability of hide
- Lower blood and milk K levels
- Poor heat tolerance

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These conditions may be intensified under situations where there is a combination of limited dietary K and heat stress.

intake of 30 lb/day and a forage intake of 20 lb/day, minus the K loss in milk, sweat, urine and feces.

The Proof Is in the Balance

Experience in east Texas has shown that for enhanced milk production during heat stress periods of the year, bermudagrass K content should be 2.0 percent or higher on a dry weight basis. Remember, the K content of bermudagrass on many dairy and beef operations is often lower than 1.3 percent.

Table 1 shows an estimation of K intake and output of a 1,500 lb lactating dairy cow under heat stress (over 85° F) conditions assuming an average concentrate

Summary

Under certain environmental conditions such as heat stress and physiological conditions such as lactation, cattle nutritional requirements for K may vary dramatically. Researchers have noted that K requirements for dairy and beef cattle are higher under these conditions than previously reported. One way to off-set high K loss during heat stress is to provide forages higher in K (i.e., bermudagrass with 2 percent K). That requires adequate amounts of K fertilization. Adequate K in forage will help dairy and beef cattle tolerate heat and stave off declining milk production. ■

Table 1. Estimated daily K balance for a 1,500 lb lactating dairy cow.

Estimated daily K balance (based on 1.3 percent K forage)						
K Intake, lb		K Output, lb				K Balance
Concentrate	Forage	Milk	Sweat	Urine	Feces	(±)
0.15	0.26	0.10	0.10	0.30	0.05	-0.14

Estimated daily K balance (based on 2 percent K forage)						
K Intake, lb		K Output, lb				K Balance
Concentrate	Forage	Milk	Sweat	Urine	Feces	(±)
0.15	0.40	0.10	0.10	0.30	0.05	0.0

Proceedings of North Central Extension-Industry Soil Fertility Conference Available

PROCEEDINGS of the 23rd North Central Extension-Industry Soil Fertility Conference, October 27-28, 1993 in St. Louis, MO are available through the Potash & Phosphate Institute (PPI). This Conference annually brings together researchers, Extension personnel, consultants, fertilizer dealers and ag industry representatives to be updated on the latest developments in soil fertility research and education. Reports from North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, Illinois, Kentucky, Michigan, Indiana, Ohio and Ontario are included along with special invited topics. Some specific items of interest in the ninth volume of this publication include: variable-rate fertilizer application; update and economics; regionalizing nutrient recommendations; field scale fertility recommendations and spatial variability; the state-of-the-art of starters; residue management effects on fertilizer use efficiency and other interesting topics.

To order a copy of this publication contact PPI, 2805 Claflin Road, Suite 200, Manhattan, KS 66502. Copies are \$15 each. Copies of earlier editions of this Conference proceedings are also available on request, \$15 per copy. ■