

Table 2. Mineral content recommended in rations for high-producing dairy cattle (DM)*. NRC (1989).

Mineral	Heat stress conditions (%)	NRC (%)
Calcium	0.65 - 1.00	.66
Phosphorus	0.42 - 0.45	.41
Magnesium	0.30 - 0.40	.25
Potassium	1.20 - 1.50	1.00
Sulfur	0.20 - 0.25	.20
Sodium	0.40 - 0.60	.18
Chlorine	0.25 - 0.40	.25

*DM = dry matter

Dairy Cattle. Cows receiving higher levels of potassium (1.5% dry matter) and sodium (0.5% to 0.6% dry matter) produced two more pounds of milk and appeared less heat stressed on hot days.

Most rations appear to meet minimum potassium requirements. Some ingredients, however, such as brewers' grain, are notably low in potassium. Dairies using large quantities of wet brewers' grain or other feeds low in potassium should consider supplementation. Most forages are quite high in potassium.

Potassium has been linked to milk fever. High levels of potassium in the diet of dry cows has been related to increased incidence of milk fever. It is recommended to limit the intake of these minerals during the dry period.

Non-specific deficiency symptoms, including slow growth, reduced consumption and efficiency, stiffness and emaciation, have been reported.

Sulfur

Sulfur is an important element in the synthesis of protein because two important amino acids, methionine and cysteine, contain sulfur. These two amino acids are prominent in protein structure and proteins are involved in practically all body processes. In ruminants, sulfur makes up about 0.15% of the body tissue and about 0.03% of milk.

Sulfur is directly related to protein and nitrogen utilization in the ruminant. It is now generally agreed among researchers that the dietary N:S ration should

be about 10:1 for dairy cattle. However, basing sulfur supplementation on nitrogen:sulfur ration alone is not enough. Diets high in fiber and low in nitrogen should balance sulfur according to total sulfur content of the ration. To meet this requirement, a complete feed (90% dry matter) containing 13% crude protein should contain about 0.2% sulfur. Sources such as sodium sulfate, potassium sulfate, magnesium sulfate, ammonium sulfate and calcium sulfate are effective in meeting the requirements. Ruminant animals have an advantage over other animals as they have the ability to also utilize inorganic sulfur because of microbial reduction in the rumen. Methionine and sodium sulfate are utilized more efficiently than elemental sulfur. Retention studies show that elemental sulfur and sodium sulfate are retained about 38% and 80% as well as sulfur from methionine.

Sulfur is an important anion for close-up dry cows in the prevention of milk fever. Maximum sulfur allowance during the dry period should be between 0.40 and 0.50% of the ration dry matter.

A number of indicators of sulfur deficiencies have been reported. These symptoms are reduced feed intake, slower gains, dullness, lower digestibility, and reduced milk production.

Sodium Chloride (Salt)

Supplemental salt is needed in all current dairy cattle rations fed in Florida. It is usually added as trace mineral (TM) salt or as a packaged, complete mineral in the ration rather than feeding free-choice. A concentrate should contain about 1% TM salt (up to 1.5% with high silage rations) and a complete feed 0.5 to 1.0%. Mixing salt with the other ration components takes advantage of its condiment qualities and assures adequate intake of salt. Dry cows and heifers should have free access to salt and other needed minerals when grain consumption is limited. Salt intake to heavy springers should be limited or blended with the ration to prevent udder edema. If udder edema is a problem, reduce the sodium and potassium content of the ration. Since pasture forages are high in potassium, prepartum cows may need pasture restricted.

Sodium functions in maintaining body fluid balance, osmotic pressure regulation, and acid-base glucose and for amino acid transport and is a controlling factor in nerve transmission. Chlorine is a factor in extracellular fluid. It functions in maintaining the acid-base balance, in osmotic