extension
ALABAMA A&M & AUBURN UNIVERSITIES

# Mineral Requirements for Beef Cattle in Alabama

► **Minerals provide an important source of nutrients to beef cattle. Learn about the daily requirements for macro- and microminerals.**

Minerals needed in amounts greater than 100 parts per million (ppm) are considered macrominerals. Those required in amounts less than 100 ppm are microminerals, or trace minerals. The daily requirements for macro- and microminerals are discussed below.

## Macrominerals

### Calcium (Ca)

- Used in formation and development of bones and teeth
- Important for nervous system and muscle tissue function
- Mobilized from bone and used by animal for various body functions
- Found in adequate levels in most Alabama forages, especially if legumes are incorporated into the forage base
- Usually provided in free-choice supplements due to negative interactions during absorption and increasing requirements during lactation

### Phosphorus (P)

- Works with calcium in bone formation
- Major component of cells
- Concentration decreases and can be a limitation as forages become more mature
- Usually adequate when cattle graze P-fertilized grasses (with commercial fertilizer or broiler litter)

### Ca:P Ratio

Because calcium and phosphorus work closely together in the body, the correct ratio of calcium to phosphorous is important for growth and reproduction. A high calcium level lowers the Ca:P ratio, decreases P absorption, and results in reduced growth and bone mineralization. A minimum ratio of 1:1 is needed. When the ratio is less than 1:1, metabolic issues such as grass tetany and milk fever may occur in grazing cattle. Many by-product feeds can be high in either Ca or P and create mineral imbalances. Request a feed analysis when purchasing by-product feeds so you can accurately adjust your mineral program, if needed.

### Magnesium (Mg)

- Needed for nervous system function and metabolism
- Deficiency may occur in cattle grazing young, lush forage growth during late winter and early spring shortly after calving
- Deficiency can cause grass tetany; refer to Extension publication ANR-0495, “Management Practices to Reduce Grass Tetany.”

### Potassium (K)

- Regulates cell pressure and water retention; involved in cell function
- Usually adequate in fresh forages but may be low in weathered forages (i.e., hay stored outside) or stockpiled grasses
- Not usually provided in salt supplements

### Sodium (Na) and Chlorine (Cl)

- Combine to form salt (NaCl)
- Used for nervous system and muscle function, water retention, and maintenance of body pH
- Consumption generally greater on young forages; decreases with increasing forage maturity
- Must be provided daily; cattle crave salt and consume it in excess when provided free-choice
- Forms the base ingredient for free-choice minerals

### Sulfur (S)

- An essential element in amino acids—the "building blocks" of protein
- Deficiency not commonly observed in southeastern forage systems
- Excess can interfere with copper metabolism
- Maximum tolerable level is 0.4% before toxicity occurs
- Concentration in forages may become elevated when continuously using ammonium sulfate fertilizer

## Microminerals/Trace Minerals

### Cobalt (Co)

- A key component of vitamin $B_{12}$, an important vitamin for metabolism
- More required in grain- than forage-based diets and should be included in a mineral mix
- Commonly found in commercial mixes at 10 ppm to ensure no deficiencies

### Copper (Cu)

- Most common micromineral deficiency in grazing cattle
- Dietary deficiencies due mostly to consumption of other minerals (e.g., sulfur, iron, zinc) that reduce copper availability
- Copper oxide not recommended; copper sulfate, chelated copper, or copper chloride are absorbed better

### Iodine (I)

- Needed for thyroid function and energy metabolism
- Rarely deficient in southeastern grazing systems
- A valued source is ethylenediaminedihydriodide (EDDI) for prevention of foot rot in grazing livestock

### Iron (Fe)

- Required for hemoglobin formation, the carrying mechanism for oxygen in blood
- Deficiencies not commonly seen in grazing beef cattle
- Iron salts often added to free-choice mineral supplements as a coloring agent; not very absorbable but may further limit copper status in cattle

### Manganese (Mn)

- Plays a role in fetal development, udder development, and reproduction
- Supplementation may be required for corn-based diets; rarely deficient in grazed systems

### Selenium (Se)

- Important for immune system function and health
- May be deficient in some areas of Alabama depending on soil and forage type
- Strict FDA limitations apply; may be provided in a free-choice mineral up to 20 ppm if consumed at 4 ounces of supplement per day

### Zinc (Zn)

- An important component for male reproduction and immune system health
- Supplementation often needed in Alabama forage systems
- Absorption optimized when zinc-to-copper ratio is 3:1

## Table 1. Macro- and Micromineral Requirements of Beef Cattle

| Mineral | Units | Gestating cows | Early lactating cows | Growing/finishing cattle | Maximum tolerable level |
|---|---|---|---|---|---|
| Calcium | % | 0.20 | 0.30 | 0.30–0.60 | — |
| Cobalt | ppm | 0.10 | 0.10 | 0.10 | 10 |
| Copper | ppm | 10 | 10 | 10 | 100 |
| Iodine | ppm | 0.5 | 0.5 | 0.50 | 50 |
| Iron | ppm | 50 | 50 | 50 | 1000 |
| Magnesium | % | 0.12 | 0.2 | 0.1 | 0.4 |
| Manganese | ppm | 40 | 40 | 20 | 1000 |
| Phosphorous | % | 0.17 | 0.2 | 0.15–0.30 | — |
| Potassium | % | 0.6 | 0.7 | 0.60 | 3.0 |
| Selenium | ppm | 0.10 | 0.1 | 0.10 | 2.0 |
| Sodium | % | 0.06–0.08 | 0.1 | 0.06–0.08 | — |
| Sulfur | % | 0.15 | 0.15 | 0.15 | 0.40 |
| Zinc | ppm | 30 | 30 | 30 | 500 |

**Adapted from the Nutrient Requirements of Beef Cattle, 1996, 7th edition.**

## Table 2. Mineral Composition of Various Forages

| Forage type | Ca % | P % | Mg % | K % | Cu ppm | Zn ppm | Mn ppm | Se ppm | Fe % | S % |
|---|---|---|---|---|---|---|---|---|---|---|
| Bahiagrass | 0.40 | 0.28 | 0.32 | 1.6 | 8.5 | 29.4 | 140 | 0.09 | 217 | 0.15 |
| Bermudagrass | 0.43 | 0.21 | 0.17 | 1.5 | 6.3 | 24.3 | 839 | 0.16 | 115 | 0.33 |
| Tall fescue | 0.38 | 0.32 | 0.27 | 2.3 | 5.0 | 17.8 | 122 | 0.06 | 100 | 0.22 |
| Annual ryegrass | 0.52 | 0.35 | 0.23 | 3.6 | 6.8 | 24.9 | 94 | 0.10 | 193 | 0.18 |

**Adapted from Greene, J. Anim. Sci. 77:1-9, 2000; NRC, 7th edition, 1996.**

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