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# Zinc Nutrition in Grazing Cattle

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Forage is the predominate feed source for Florida's beef cows, therefore, we often are interested in the nutrient content of our pasture forage and how it may address the needs of our cows. Typically we concern ourselves with the total digestible nutrients (TDN) and crude protein content of forage; however, forage is also a primary contributor to the mineral nutrition of grazing cows. Although forage can be a source of many essential minerals, this article will focus on zinc.

Zinc is an important mineral for the proper function of many enzyme systems. In ruminant diets, the most widely reported sign of zinc deficiency is delayed or reduced growth of young animals. Cattle consuming inadequate amounts of zinc have been shown to have reduced hoof integrity, skin disorders, and poor healing of wounds. In fact, the most widely observed clinical sign of zinc deficiency in cattle is parakeratosis, a thickening and scaling of the skin. Several studies have shown that cattle may respond readily to zinc supplementation when diagnosed with these skin and hoof conditions. Other visual indicators of zinc deficiency include swelling of joints and a stiff, irregular gait. Some researchers have also reported links between zinc deficiency and poor response to vaccination. These data, in particular, are important to Florida cattle producers who depend on a calf's ability to withstand the rigors associated with weaning and transportation. In these situations, vaccination response is critical to overall calf performance.

Another widely reported role for dietary zinc in cattle relates to its support of fertility and sexual development in bulls. Research in young rams has shown that zinc deficiency results in a lowered capacity to produce testosterone, resulting in impaired testicular development. One of the most commonly reported links between dietary zinc and male

fertility is the association of dietary zinc and the functionality of sperm. In one study involving yearling Angus bulls, the use of a diet containing 90 ppm zinc resulted in 12% fewer abnormal sperm and 24% fewer bulls failing a breeding soundness exam compared to bulls receiving a diet containing 60 ppm zinc.

General guidelines for zinc requirements in beef cattle are provided in Table 1. The current beef cattle NRC (National Research Council, 7th Revised Edition, 1996) suggests a requirement of 30 ppm zinc for all classes of cattle. Much of the information used to estimate this requirement was based on growing and finishing cattle. It is logical; therefore, that Florida's beef cows and bulls may have a similar if not greater zinc requirement due to the high zinc content of milk (300 to 500 mg per liter) and the recognized influence of zinc on bull fertility. Stressed calves also have a greater dietary zinc requirement. This is likely due to at least three factors, including, 1) reduced feed intake and therefore reduced zinc intake, 2) a greater requirement of zinc-associated enzymes during instances of inflammation, and 3) increased urinary loss of zinc during stress.

**Table 1. Zinc requirements of beef cattle[1]**

| Classification | Dietary zinc, ppm[2] |
|---|---|
| Healthy growing/finishing cattle | 30 |
| Stressed calves | 75 to 100 |
| Reproducing cows and heifers | 40 to 50 |
| Growing bulls | 90 to 125 |
| Mature bulls | 50 to 90 |

[1] Dietary copper to zinc ratio must be greater than 1:2 (copper:zinc).

[2] Dry matter basis.

Much of Florida's bahiagrass is low in zinc content. Values less than 25 ppm are somewhat common, suggesting that a supplemental source of zinc is vital to ensure proper performance of cattle. The most common form of supplemental zinc is zinc sulfate. Zinc sulfate is easily obtainable, biologically available, and reasonably priced. Zinc oxide is also available to the feed industry, but is less biologically available than zinc sulfate. There are also an abundance of "organic" zinc sources available to the feed industry (i.e. zinc-methionine). Many studies have shown that these sources of zinc are more biologically available than zinc sulfate. In some situations a blend of zinc sulfate

and organic zinc may be the best option to address the zinc needs of grazing ruminants. An important consideration when considering zinc supplementation is the copper content of the diet or supplement. Copper and zinc are absorbed through similar pathways indicating a competition for absorption sites. Therefore, mineral supplements should be formulated with a copper: zinc ratio providing 2 to 3 times more zinc relative to copper. Sometimes this will require high concentrations of zinc in the supplement. Typically this is not a problem, as the maximum tolerable concentration of zinc in the diet is suggested to be 500 ppm. Nevertheless, there is probably no reason to formulate supplements that will result in a dietary zinc concentration greater than 150 ppm.

Many producers have expressed an interest in applying additional zinc to pastures through annual fertilization. Previous research has shown that although zinc content of pasture is often insufficient for meeting the needs of grazing cattle, it is sufficient to support bahiagrass growth and productivity. To date, studies investigating the addition of trace elements to established, grazed bahiagrass pastures do not reveal any advantages relative to dry matter yield.

It is difficult to assess the zinc status in grazing cattle and no single method has been proven reliable. Typically, an analysis of forage and supplement is sufficient to address the potential for a deficiency. Further investigation would involve the collection of a liver biopsy from live cattle for analysis of zinc content.

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