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Forage And Trace Minerals

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Tall fescue is the predominant forage in the Southeastern portion of the United States. Approximately 35 million acres are grown annually. Cow-calf herds are the major livestock enterprise in this region grazing tall fescue. Usually these calves are shipped to the High Plains or Corn Belt for finishing after weaning. Because these calves are often "put-together" in small lots, feedlot managers have traditionally expected a higher incidence of health problems and death loss compared to single source cattle. Recent research suggests that prior nutrition may be a key factor affecting their susceptibility to disease when entering the feedlot. Tall fescue seems to offer unique nutritional challenges that require special emphasis be given to trace mineral nutrition.

The majority of the tall fescue grown in the Southeastern portion of the U.S. is infected with an endophyte fungus. Although the grazing disorders associated with tall fescue, known as fescue toxicosis (Steudemann and Hoveland, 1988), are well documented, recent research suggests that the fungus can also affect the trace mineral concentrations of the plant (Dennis et al., 1998). Consequently, it is difficult to differentiate those portions of trace mineral deficiency caused by the plant from those caused by the fungus.

As early as 1998, Tennessee researchers suspected they had trace mineral deficiency problems in their state. Numerous producers were reporting rough hair coats and fertility problems. Some producers who retained ownership of their cattle in High Plains feedlots reported a high incidence of health problems, even though they had been carefully vaccinated by a local veterinarian prior to shipping. When blood samples were pulled, they were found to be deficient in copper and selenium. Both of these mineral deficiencies can lead to an impaired immune system.

In 2001, a state-wide program was initiated to determine the mineral status of pasture forages in Tennessee (Gill et al., 2005). Tall fescue is the predominant forage. County extension agents collected 1,021 forage samples in the spring and fall seasons. The samples were analyzed for calcium, phosphorus, sodium, magnesium, potassium, sulfur, copper, zinc, and manganese.

Copper was considered deficient if the forage contained less than 4 ppm, and marginally deficient if it contained between 4 and 9 ppm. Copper was deficient in 92.4% of the samples analyzed. Dennis et al. (1998) showed that the presence of the fungus consistently lowered the copper concentration in tall fescue. In addition, sulfur concentrations were high enough to be at least marginally antagonistic to copper absorption in 89.3% of the forages analyzed. Sulfur levels above 0.21% were considered at least marginally antagonistic. Zinc was at least marginally deficient in 83.1% of the samples.

Zinc concentrations of less than 20 ppm were considered deficient, while marginally deficient samples were between 20 and 29 ppm. Poore (1994) reported on a study that evaluated 29 forage samples from 12 different counties in North Carolina. Copper and zinc were deficient in 45% and 52% of the samples, respectively. Tall fescue was present in the majority of the samples.

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Season of the year also had an impact. Forage copper levels were lowest in the fall of the year. This is especially important because forage sulfur concentrations were higher in the fall than in the spring. Consequently, when copper levels were lowest, sulfur was most antagonistic, which could result in a more severe deficiency in calves weaned in the fall.

Other surveys have suggested that copper and zinc may be limiting in many situations (not just in tall fescue-based diets). In a national survey (Corah et al., 1996) of 352 forage samples, only 2.5% of the samples contained adequate zinc and 36% of the samples contained adequate copper. Similar deficiencies have been observed in forage samples that Vigortone has collected. In these samples, only 8.3% provided adequate zinc and 36.2% were adequate in copper.

In a Montana study (Grings et al., 1996), the minerals found most likely to be deficient in forages in the Northern Great Plains were phosphorus, sodium, potassium, zinc, and copper. Cattle cannot perform to their genetic potential if their mineral needs are not met, even if they receive 100% of their protein and energy needs.

These data clearly suggest that there is a widespread occurrence of deficient levels of plant copper and zinc. Soil mineral level, soil pH, climatic conditions, plant species, and stage of plant maturity all factor into the trace mineral content and bioavailability for forages.

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