MISSOURI

Phosphorus Fertilization of Tall Fescue May Prevent Grass Tetany

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Tall fescue (*Festuca arundinaceae* Shreb.) pastures cover nearly 35 million acres and provide feed for more than 80 percent of the beef cattle in the Midwest. The cool season grass is popular because it persists well on infertile, steeply sloped, and/or unmanaged soils common to pastures. In addition, it responds well to nitrogen (N) inputs and, if kept vegetative, is nutritious for livestock.

These attributes aside, producers can encounter problems with tall fescue. One common problem is that in early spring it is often low in Mg. Low Mg levels in the diet of lactating beef cows have been linked to a disease known as grass tetany. Cows suffering from grass tetany show symptoms such as nervousness and staggering in the early stages of the disease, but often become comatose and die within 24 hours after the initial symptoms are noticed. The disease costs cattle producers an estimated $300 million dollars annually in the U.S.

Grass tetany is a difficult disease to control. Many producers feed supplements containing elevated levels of Mg during the grass tetany season. In theory, this practice elevates the blood serum Mg status of the animal enough to prevent grass tetany. However, it is unreliable. A common ingredient in supplements is magnesium oxide (MgO). It is unpalatable to cattle, and intake among individual animals is variable. In addition, mineral supplements containing MgO are expensive and difficult to administer evenly to all animals grazing in a pasture.

Preliminary results from Missouri research show that phosphorus (P) fertilization of tall fescue pastures growing on a soil low in P prevents blood serum magnesium (Mg) from decreasing in grazing cows.

Perhaps the most sensible way to prevent grass tetany would be to increase the Mg concentration of the grass in the pasture. Previous studies at the University of Missouri showed that soil P regulates Mg uptake in tall fescue. Greenhouse and small plot trials have consistently shown that plants growing on soils low in available P have a lower concentration of Mg in leaf tissue than plants that receive at least 57 lb P_2O_5/A. The greatest increase in leaf Mg usually occurs when P is applied to soils testing less than 16 lb Bray P-1/A. Interestingly, plants given Mg fertilizers often show no increase in leaf Mg unless P is applied with the Mg fertilizer.

Currently, no information exists to suggest that fertilizing tall fescue with P will increase the Mg enough to decrease the risk of grass tetany.

We conducted an experiment to determine if 1) applying P to tall fescue pasture can raise blood serum Mg in lactating beef cows, and 2) compare P fertilization to Mg mineral supplementation as a

Tall fescue pastures are important for beef cattle production on millions of acres.

TABLE 1. Blood serum Mg, Ca, K, and P concentrations at two dates in cows grazing tall fescue fertilized with P, cows receiving Mg mineral supplement while grazing, or cows grazing unfertilized tall fescue and receiving no Mg mineral supplement.

	2/15/00				3/28/00			
Treatment	Mg	Ca	K	P	Mg	Ca	K	P
	mg/dl[1]							
P fertilizer	1.84	6.05	25.3	5.59	1.72	7.35	26.9	6.24
Mg supplement	1.90	6.85	24.3	4.38	1.72	7.63	26.6	6.05
Control	1.89	6.06	25.6	4.99	1.47	7.52	26.4	4.90
$LSD_{0.10}$	NS	NS	NS	0.78	0.19	NS	NS	NS

[1]One mg/dl is equal to 10 parts per million (ppm).

means to protect against grass tetany.

Twenty-seven mature Angus cross cows in their third trimester of pregnancy grazed nine, two-acre tall fescue pastures from February 15 until April 11, 2000. Animals were assigned to one of three treatments. The treatments were:

1) Tall fescue fertilized with 100 lb P_2O_5/A
2) Magnesium mineral block supplied free choice, but with no P fertilizer
3) Control (no P fertilizer and no Mg mineral block).

The site was located in southwest Missouri, near Mt. Vernon. Soil tests at the end of the study showed 6 lb Bray P-1/A in unfertilized pastures and 29 lb P/A in pastures fertilized with P. All pastures were fertilized with 120 lb N/A and 300 lb K_2O/A in early spring. Blood samples were collected from each cow on February 15 and at 2-week intervals thereafter.

Blood Mineral Concentrations

All cattle had equal levels of blood serum Mg, potassium (K), and calcium (Ca) at the beginning of the study (February 15), and these levels were adequate for mature beef cows (**Table 1**). However, cows in the control treatment showed a 21 percent decrease in blood serum Mg level between February 15 and March 28. By contrast, there was no decrease in blood serum Mg when cows were supplemented with a Mg mineral block or were allowed to graze P fertilized pastures. This is significant because by March 28, most cows had reached peak lactation. Once cows reach peak lactation, their Mg requirement is approximately 22 grams per day, nearly double that before calving. Our preliminary data indicate that fertilizing tall fescue with P prevents blood Mg from falling during spring grazing and can protect against grass tetany. In fact, it may be more reliable than feeding Mg supplement free choice because differences in palatability and animal behavior could be eliminated as aggravating factors.

Although blood serum P was initially higher for the cows assigned to the P fertilized pastures, by the end of the study, blood serum K, Ca, and P were equal across the treatments. A preliminary analysis of the forage shows that P and Ca were higher when pastures were fertilized with P, but it appears that elevated levels of these minerals were not needed by the animals and likely were excreted.

Conclusion

In this study, adding 100 lb P_2O_5/A provided the same protection against grass tetany as supplying an expensive mineral supplement. This is important for producers because not only is grass tetany risk lowered, but adding P may also increase pasture productivity and livestock carrying capacity. BC

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