

Clover Makes Fescue Better for Goats

by Michael Flythe

Goats give us a lot of flexibility in terms of forage that can be utilized. They can thrive on the most carefully established summer annuals and also do a good job with the honeysuckle in the fence row. However, most herds rely partly or entirely on grass. In Kentucky, our predominant cool season grass is tall fescue. Unless you renovate your pastures to establish other grasses, they will ordinarily have fescue, which has some advantages. Tall fescue is resilient and recovers from over grazing. It begins growing early in the spring and stays green through this time of year, which makes it popular for winter stockpiling. However, there is a problem with fescue. The common variety has a fungal endophyte, a symbiotic fungus that lives inside the tissues of the plant. The endophyte makes the grass hearty and resistant to pests, but it also produces a toxin that can harm the animals that graze on the common variety of tall fescue. The resulting condition is called fescue toxicosis.

Fescue toxicosis is a major subject of study at the Forage-Animal Production Research Unit (FAPRU; <https://www.ars.usda.gov/midwest-area/lexington-ky/fapru/>). FAPRU is a USDA-Agricultural Research Service laboratory at the University of Kentucky, College of Agriculture, Food & the Environment. Our interdisciplinary team of researchers works with research faculty and cooperative extension at UK to understand the basic biology of forages and the animals that rely on forages. We then use that basic knowledge to develop solutions for forage-animal producers. We have learned the major aspects of how fescue toxicosis works. We have also learned that goats and sheep are indeed susceptible, just like cattle and horses. Our team has also developed some management strategies to help with fescue toxicosis.

The main toxin in tall fescue is ergovaline. It is in the alkaloid family of plant compounds. Many plants make alkaloids and most of them are harmless, for example, flavors in kitchen spices. On the other hand, some are acutely toxic, like alkaloids in the poisonous yew plant. Ergovaline, at natural levels, will not cause acute toxicity from a single exposure, like yew. Instead, it is toxic over prolonged exposure as it accumulates in the animal. When the animal consumes toxic tall fescue, ergovaline builds up in the animal and causes a number of problems. The major problem is vasoconstriction, a decrease in the size of diameter of blood vessels. Blood flow decreases in the constricted vessels. In warm weather, the animals have difficulty dissipating heat and can become heat stressed. In the cold, the lack of blood flow to the extremities can lead to frostbite and gangrene in tail switches, ear tips and hooves (called fescue foot). Additionally, vasoconstriction of blood vessels in the gut causes animals to absorb fewer nutrients from the diet. FAPRU scientist, Dr. Jimmy Klotz, with researchers at Clemson University, recently showed that fescue toxicosis in pregnant ewes led to constriction of the umbilical blood vessels and lower lamb birth weights. Even marginal problems



with toxic tall fescue can impact your animals, contributing to what has sometimes been called the “summer slump” in production.

There are a number of management strategies to deal with fescue toxicosis. Alternative forages can be maintained for pregnant ewes and does or animals in summer slump. Annual forages like sorghum-sudangrass, as explored at Kentucky State University,

are a possibility (<https://core.ac.uk/download/pdf/232573341.pdf>). Warm season perennials, like bermudagrass, can also be established in our area. Alternative cool season grasses include orchardgrass, Kentucky bluegrass and novel endophyte fescue varieties. Novel endophyte fescue varieties have had the toxic endophyte replaced with one that makes little or no ergovaline. UK Forage Extension conducts extensive trials to show us which novel endophyte tall fescue varieties do well in our region (<http://www2.ca.uky.edu/agcomm/pubs/PR/PR784/PR784.pdf>).

Another solution worth considering is clover. It has long been observed that animals perform better on tall fescue when there is also clover in the pasture. The improvement has been attributed to “dilution”, in other words, giving the animals something to select other than fescue so that they get less ergovaline. Research at FAPRU has shown that clover actually reverses vasoconstriction. Clovers and other legumes make a family of plant compounds called isoflavones that act as vasodilators; they open up blood vessels and increase blood flow. We showed the effect of isoflavones in an experiment with Spanish goat wethers. Carotid and forelimb arteries were monitored with an ultrasound to measure the diameter of the blood vessels. When the goats were given toxic fescue, the arteries constricted to as little as half their natural diameter. Red clover isoflavones restored the arteries to their natural diameter in less than 48 hours. Beyond the scientific measurements that we made, I was impressed by the appearance and behavior of the goats. When they went into fescue toxicosis, the goats became lethargic. They went off feed and became less responsive, less curious. I was amazed at how they bounced back on red clover isoflavones, even though they were still getting fescue alkaloids. They were back on feed, moving around and interested in interacting with people and other goats.


In further experiments, we determined that both red and white clover reversed vasodilation. There is not currently an isoflavone supplement on the market that is cost effective. However, the benefits can be achieved by feeding clover hay or grazing red or white clover. Red clover has about 5 times the isoflavone concentration of white clover, but it does not take much to work. FAPRU scientist, Dr. Brittany Harlow, was able to reverse vasoconstriction in steers with only 1 ounce of dry, ground red clover. In practical terms, as long as your goats are getting some clover every day, then their blood flow will be improved. Because such low levels of isoflavones are effective, it makes sense to focus on the agronomic concerns of clover. You want to have enough clover in the pasture so that it will not be grazed out before they rotate to a new

pasture. Goats can be very selective grazers. If there is less than a 20% stand, then it might all be gone before you are ready to move them.

Another point to consider is that white clovers are perennial while red clovers need reestablishment every few years. The simplest way to establish clover in grass pastures is frost planting, broadcasting late in the winter when freeze/thaw will ensure good contact between the seed and the ground. Clovers are well known for their ability to fix nitrogen, but they do require medium to high levels of K and P and a soil pH of 6.1 to 6.7. Please see UK Forage Extension for more tips on establishing and managing clover: <http://www2.ca.uky.edu/agcomm/pubs/agr/agr33/agr33.pdf>

Clovers are not a magic bullet and there are some drawbacks. If a pasture has more clover than grass, then bloat is a possibility. Keep an eye out for bloat and be prepared to move the animals or put out supplements that treat bloat. The same isoflavones that reverse fescue toxicosis are also estrogenic. Sheep are particularly sensitive to estrogens. At this point we cannot recommend a safe level for developing ewes. Goats and cattle are less reproductively sensitive to estrogens than sheep. This is an area of research we are still working on, but it is still recommended to pull does and cows off of clover a month before breeding. In spite of these challenges, clover is a high-protein, highly-digestible forage that fixes its own nitrogen. The newly understood benefits of isoflavones makes clover a potentially useful tool for goat producers in Kentucky.

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