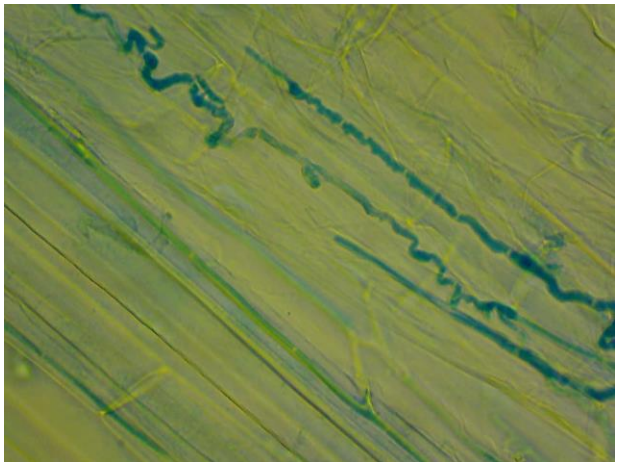
Gabriel Pent and John Fike

The Virginia Cattleman, May 2018, 40(5):14-15.

The fungus that allows you to have your grass and [your cows] to eat it too

It's hard to imagine a Virginia without tall fescue. We've been asking around, and we have yet to find anyone that remembers what Virginia pastures were like before Kentucky 31 tall fescue was introduced, probably sometime in the 1940s. Our winter landscape must have been a shade duller without the vibrant fescue green. It also has been an important grass for sod waterways and buffers, and those who've learned to stockpile it have saved lots of money in reduced winter feed costs. Tall fescue is here to stay and we're grateful for it.



The fungus within tall fescue appears as dark wavy lines under a microscope. Photo: J. B. Daniel.

However, tall fescue has some unique challenges as well. What gives tall fescue its persistence is a fungus living inside of the grass. It's a classical symbiotic relationship: the fescue gives the fungus "room and board," and in return the fungus provides some specialized chemicals that help the fescue tolerate drought and close grazing. Some of those chemicals, however, are toxic to livestock, and they cause a set of disorders collectively known as fescue toxicosis.

In beef cattle, fescue toxicosis symptoms are manifested as fescue foot, bovine fat necrosis, and summer slump. Fescue foot usually occurs in fall when temperatures drop. Cattle will be sore-footed and in severe cases they will lose hooves. Fat necrosis is a development of hardened, dead fat around the digestive tract. This can occur as animal get older or when fat animals move from low-fescue to a high-fescue diet. Summer slump is presented as poor gain during the summer, and hair coats of sensitive cattle often do not slick off. Stocker operators are well aware of the poor intake and performance of young cattle grazing on toxic tall fescue. Most cow-calf producers also suffer lower calving rate, reduced milk production, and lower weaning weights due to fescue toxicosis, although management often masks these effects.

Poor body temperature regulation is a key effect of fescue toxicosis. This is associated with both fescue foot and summer slump and can be a factor in reproductive success. The toxins in tall fescue are chemically similar to LSD, and they cause vasoconstriction. This means they constrict, or reduce, the size of blood vessels. During cold temperature events, the reduced blood flow to the extremities not only causes sore feet, but also can cause cattle to lose tail switches and tips of ears. Such telltale signs of toxicosis occur when these parts of the body get too cold and become vulnerable to frostbite.

Conversely, poor blood flow also intensifies heat stress. Blood flow to the body surface is an important means of cooling for cattle, but vasoconstriction reduces this flow – and heat loss to the environment. The wooly hair coat further compounds this problem. Poor reproductive performance associated with high body temperatures is a primary reason that many producers have switched to fall calving. It's harder to get a cow bred in late spring or summer if they're grazing toxic fescue.

Early efforts to address fescue toxicosis in the late 1980s and early 1990s were based on removing the fungus that produces the toxins. The resulting “endophyte-free” fescues were safe for livestock, but they often did not persist through severe droughts or frequent, close grazing.

After these early failures, a search ensued for non-toxic fungi to replace the toxic fungus strain found in Kentucky 31. These “novel” endophyte strains, developed in the late 1990s, help the plant persist, but they do not produce the toxins that cause fescue toxicosis. These fungi have been inserted into a number of productive varieties of tall fescue, resulting in nontoxic, persistent forages that can improve reproductive performance and greatly increase animal average daily gain.

Despite these benefits, few producers in Virginia have adopted the novel-endophyte fescue varieties for their farms. This may be because of the cost of conversion, a memory of failure with endophyte-free fescue, or both. To address this and to encourage adoption, a team of Virginia Tech extension specialists and agents is working to document the renovation process and animal performance outcomes on several farms across Virginia.

Collaborating producers are converting fields from toxic tall fescue to novel-endophyte tall fescue. The conversion process can be lengthy and intensive, but it is dependable. These farmers have all utilized the spray-smother-spray approach. With this method, farmers sprayed out the toxic fescue in the spring and grew a summer smother crop such as pearl millet or sorghum-sudangrass. Using a smother crop allowed the farmers to continue grazing or to make hay during the summer, offsetting some of the cost of renovation. These fields were sprayed again in late summer to kill the cover crop and any escaped toxic fescue seedlings. The new, novel-endophyte fescue was then planted at the recommended date in the fall. Despite dry weather after planting in 2017, producers may be able to harvest some hay or lightly graze these fields this year.

Along with the work on the collaborating demonstration farms, our team is routinely sampling pastures on surrounding “satellite” farms. Out of 35 pastures sampled in 2017, four fields were 40-59% infected, nine fields were 60-79% infected and 21 fields were 80-100%. High levels of fungal infection is widespread in fescue pastures across Virginia.

We also measured ergot alkaloids (the toxins produced by “wild” endophytes) in these pastures. Samples collected in the spring and fall averaged over 1500 ppb (parts per *billion*). The level of ergot alkaloid that causes fescue toxicosis is widely debated and varies between cows, but it is probably closer to 400 ppb. A cow on the average pasture would need to consume about 75% something else besides toxic fescue (clover, crabgrass, etc.) to effectively “dilute” out the toxin in the diet.

Not much has changed since fescue dominated our pasture landscapes six decades ago. Tall fescue is still the most versatile and hardy forage utilized in Virginia pastures. This grass still provides large amounts of nutritious, palatable forage at just the right time for fall and spring calving herds. And with the new discoveries of “friendly” fungi, we can have the grass without the toxicity.

As this fescue project continues, we’ll keep you posted on strategies to utilize these novel endophyte tall fescue varieties and manage the toxic tall fescue on your farms.

This project is funded by an NRCS Conservation Innovation Grant.