

A Grass Roots Analysis of Tall Fescue

The survival of America's small farms depends on some pretty basic factors. And sometimes they are right at our feet.

In the Southeast's tall fescue belt—stretching from Arkansas and Missouri to Georgia, North Carolina, South Carolina, and Virginia—many farmers realize how important the tall fescue at their feet is to their success.

Many of these farmers are also within a small-farm belt, where more than half the farms are less than 180 acres and are mostly pasture, hayfields, and woodlots. The farms usually have fewer than 30 beef cows. The farmers typically have another job in town.

Any major improvements in tall fescue would really help these farmers. They love the fescue because they can plant it and pretty much forget it. It competes well with other grasses and weeds, and it lasts for 10 to 20 years without requiring reseeding.

But there's a flip side to that love. The very reason fescue grows so well is also the reason farmers hate it: Tall fescue is usually infected with a fungus. This fungus helps the fescue survive tough conditions but also produces many compounds that are poisonous to cattle if they graze on it continuously.

ARS has been part of 30 years of research to help these small farmers by lessening the impact of fescue toxicosis, the name for the problems created for cattle by the fungus-produced toxins.

Lately, that research is paying new dividends and attracting intense interest from farmers.

In 1977, microbiologist Charles W. Bacon in the ARS Toxicology and Mycotoxin Research Unit in Athens, Georgia, working with ARS chemist James K. Porter, ARS animal scientist Joe D. Robbins, and University of

Georgia colleague E.S. Luttrell, made the first direct link between the fungus and cattle symptoms.

A farmer had asked them to find out why cows in one area were spending most of their time in a pond instead of in the field. Bacon and Porter took fescue samples from the field where the cows didn't seem to be eating and from another field where the cows were grazing. They found the fungus only in the field with the fasting cows.

The main problem farmers have with fescue toxicosis is in the summer. When the weather is hot, the alkaloids from the fungus cause "summer syndrome." When cows that are already hot eat infected fescue, they get even hotter because the alkaloids change their ability to regulate body temperature. The cows stop eating and seek shade or a pond to cool off.

Later, scientists found out that fescue's good qualities were also attributable to the fungus-fescue relationship, although they didn't understand how it worked.

The discovery by ARS agronomist David P. Belesky, at the Appalachian Farming Systems Research Center, in Beaver, West Virginia, of one way the positive side of the relationship works adds momentum to fescue toxicosis research. Belesky's work is described in the article *The Grass Farmers Love To Hate* (p. 4).

The article also mentions progress on a vaccination for fescue toxicosis. ARS animal scientist John A. Stuedemann, at the J. Phil Campbell Natural Resources Research Center, in Watkinsville, Georgia, has developed a prototype for a vaccine that may one day be used to immunize cattle and horses against the fungal toxins.

Another tactic in battling fescue toxicosis is to develop varieties with a friendlier, less toxic fungus strain. This work is being carried out at several facilities, including Bacon's unit, the ARS Dale

Bumpers Small Farms Research Center, in Booneville, Arkansas, and several universities.

Bacon's unit is focusing on obtaining friendlier fungi by genetically modifying the fungus, in collaboration with scientists at the University of Kentucky and at Watkinsville. The researchers hope to eventually map the entire genome of the fungus *Neotyphodium*. The team is also evaluating toxicity of the alkaloids from genetically modified and natural strains, including changes caused by the plant and bacteria in a cow's rumen.

Research at the Booneville center is taking three different angles:

- how farmers can use other forages and supplements to feed cattle during the summer months when infected fescue is most toxic
- ways to cross-breed cattle for more resistance to summer syndrome
- the effects of fescue toxicosis on cattle reproduction.

ARS scientist Georgia C. Eizenga, formerly with an ARS forage unit in Kentucky and now with the Dale Bumpers National Rice Research Center in Stuttgart, Arkansas, developed lines of tall fescue specially bred to help develop better varieties.

Her colleague, Timothy D. Phillips, formerly with ARS and now with the University of Kentucky, is maintaining the collection. He is also continuing the work of his ARS predecessor, Robert C. Buckner, who pioneered the use of wide hybridization between ryegrass and tall fescue and released the first fungus-free fescue varieties.

ARS, the universities, and seed companies are working together to offer farmers as many options as possible. But, particularly for small farmers, the only good options are the affordable ones.

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