OKLAHOMA COOPERATIVE EXTENSION SERVICE CR-3917
0310
Current Report

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Fescue Toxicity and Horses

David W. Freeman, Ph.D.
Extension Equine Specialist

Phillip W. Pratt, M.S.
Tulsa County Extension Director

Robert L. Woods, Jr., M.S.
Area Extension Agronomy Specialist

Tall fescue (*Festuca arundinacea Schreb*.) is a cool season, perennial bunchgrass brought to North America in the late 1800s from Europe. Since the discovery of a field in eastern Kentucky in 1931, and the subsequent release of the Kentucky-31 variety in 1943, fescue has become the dominant cool season perennial grass in the southeastern region of the United States. Most commonly referred to as fescue, tall fescue is used for forage, erosion control, and turf.

Oklahoma is on the western edge of the area of adaptation for tall fescue. It grows well in the eastern one-third of the state where the average rainfall is greater than 35 inches per year. It is grown farther west in Oklahoma, but the risk of losing a stand due to drought is greater. In eastern Oklahoma, fescue is the most persistent, best adapted, cool season perennial forage.

Tall fescue will grow in a wide variety of soil types, but grows best in loam or clay soils which have some water-holding capacity. It produces well on soils that are too wet for most other forage grasses. It does not do well on sites prone to drought or in deep sands. Many established stands that originated from Kentucky-31 tall fescue have persisted under low fertility, low pH soil, and over-grazing.

While fescue has some good qualities, it has significant and important shortcomings for use by horses. Problems with fescue and horses are related to ingestion of fescue infected with an endophyte.

The Endophyte

The term endophyte means a fungus that is located within a plant. The endophyte may have a parasitic or symbiotic relationship with the host plant. Laboratory testing has confirmed that a high percentage (85% +) of Oklahoma's fescue is infected with the endophytic fungus, *Acremonium coenophiliam*, which is commonly referred to as the fescue endophyte. Research has shown this fungus is the primary cause of fescue toxicity in pregnant mares. The fescue endophyte produces an alkaloid called ergovaline, which has been found to be the principle cause of the symptoms associated with most forms of fescue toxicity.

It is unclear how the endophyte first gained entrance into the fescue plant. Research indicates the fungus can not directly enter a fescue plant. Instead, the fungus is spread only through seed that has been produced from an endophyte-infected plant. This means fungus-free seed will produce fungus-free plants that will remain non-infected. There are no known chemical or non-chemical treatments that will remove the endophyte from infected plants.

Since the endophyte was imported into the United States with the fescue plant during the late 1800s, it is thought most fescue has always been infected. The endophyte lives within the fescue plant and grows between the cell walls. The fungus obtains nutrition from plant materials that exist in intercellular spaces. By so doing, it does not penetrate or destroy cells of the host plant. Since plant cells are not being destroyed, visual symptoms of infection do not occur. Therefore, infected fescue plants appear the same as non-infected plants. Laboratory tests have to be conducted to determine if a plant is infected with the fescue endophyte.

Researchers have found that the endophyte does not grow in all portions of the fescue plant. However, the alkaloid ergovaline is found in all portions of the plant. Even so, the concentration of ergovaline is highest in the developing seed head and lowest in expanded leaf blades. This has led to the recommendation to develop management strategies that reduce ingestion of seed heads by animals grazing infected fescue.

The Effect of the Endophyte on the Plant

Both the endophyte and the fescue plant clearly benefit from their relationship. The endophyte is provided a source of nutrition, protection from the environmental elements, and a means of reproduction. Research indicates the endophyte provides the plant with some resistance to herbivores, insects, nematodes, and environmental stresses such as drought.

The fescue fungus produces several alkaloids, one of which is peramine. Peramine is the alkaloid that makes endophyte-infested fescue resistant to some insects. Other alkaloids produced by the fungus, or by the plant in response to the presence of the fungus, are thought to be involved in the fescue plant's resistance to nematodes and root disease. The removal of the endophyte from the fescue plant and the resulting removal of its alkaloids will make fescue more susceptible to environmental stresses such as drought and close grazing. Some research indicates that new E- varieties are different morphological plant types that are less adapted to close grazing. Therefore, some lack of persistence may be due to management, especially grazing management, rather than the absence of the endophyte.

Consumption of Endophyte-Infected Tall Fescue

Cattle consuming endophyte-infected tall fescue may have decreased weight gains and consumption rates; increased body temperature; rough hair coats; and necrosis (death) of tissue in feet, tail, and ears. Physiologically, both cattle and sheep have been reported to have elevated body temperatures, and peripheral vasoconstriction (constriction of a blood vessel) in cattle is implicated as a cause of "fescue foot." Cattle and sheep may have decreased milk production following parturition (giving birth). The effects of consuming endophyte-infected fescue on horses have been mostly noted in broodmares.

Broodmares

Pregnant mares do not show the elevated temperatures noted in other species consuming endophyte-infected fescue, probably because horses are more efficient in losing heat through sweat. Further, maladies (diseases, disorders, or ailments) similar to fescue foot have not been noted in horses. Problems in mares have been associated with gestation, foaling, and milk production. Mares consuming endophyte-infected fescue can have prolonged gestation lengths in excess of the expected 335 to 345 days, probably because of interference with normal hormonal activity.

Foaling mares consuming endophyte-infected fescue have an increased incidence of dystocia (foaling difficulty) which is thought to be caused by an inadequate preparation of the reproductive tract, prolonged gestation, and fetal malpresentation. Mare and foal death have resulted from these incidences of dystocia.

Following parturition, some mares that have been consuming endophyte-infected fescue have a complete absence of milk production (agalactia) which is probably due to decreased production of the hormone prolactin. Agalactia appears to be the most consistently observed problem in mares consuming endophyte-infected fescue.

Growing Horses

Information on fescue and growing horses is less available than on mares. Studies on cattle grazing infected fescue have shown decreased rates of gain and feed intake. The few studies with growing horses have shown different results. In one trial, non-supplemented yearlings grazing endophyte-infected fescue had decreased gain rates as compared to those grazing low-infected fescue. The reductions in gain were probably due to decreased intakes and digestibility of endophyte-infected fescue. Another study on yearlings receiving grain supplementation resulted in similar gains when they consumed endophyte-infected and endophyte-free hay. Supplementation with grains may lessen the effects on growth of horses consuming endophyte-infected fescue.

Solving the Problems of Endophyte-Infected Fescue Consumption

Fescue Eradication

Eradicating existing fescue is difficult, slow, and expensive. The surest method will require a combination of herbicide treatments and cropping in annual crops for two years. This will allow adequate time for existing plants to be destroyed and the existing seed source to be removed.

Suppressing existing fescue for bermudagrass release may be more practical than eradication. Much of the fescue in Oklahoma has invaded existing bermudagrass pastures. This is partly due to fescue being well adapted to wet, cool, springtime soil conditions and the typically low soil pH found in eastern Oklahoma. Fescue growth is further encouraged by a tendency to fertilize before weather conditions are favorable for bermudagrass growth.

To suppress fescue and recover a stand of bermudagrass, producers may use herbicides, fertilizer, fire, or a combination of these strategies. Recent work in Mayes County, Oklahoma, successfully changed the dominant grass from fescue to bermudagrass using one or more of the following:

Herbicides—Herbicide applications that have demonstrated satisfactory control of tall fescue include Gramoxone applied at 1.5 pints per acre or Roundup applied at two quarts per acre in late March or early April.

Prescribed Burning—Prescribed burning after brownout from an early April herbicide treatment has been found to increase the efficacy of the herbicide treatment.

Fertilizer—Fertilizer, especially nitrogen, that is applied before May will tend to favor fescue production at the expense of the bermudagrass. On the other hand, waiting until after May 15 to apply fertilizer will favor bermudagrass production.

Animal Removal or Reduction of Intake

Decreasing the consumption of endophyte-infected fescue through supplementation with grain may be beneficial to growing horses. However, the same recommendation can not be made for broodmares. In one study involving mares in late gestation, mortality was 66% for those receiving grain supplementation and 50% for non-supplemented mares when both groups were fed endophyte-infected hay. Therefore, because supplementation will not insure a reduction of problems, the recommendation is to remove broodmares six weeks to three months before the expected foaling date.

The recommended time for removal of mares approaching parturition from endophyte-infected fescue varies. The few studies conducted in this area suggest rapid recovery of mares that are removed from endophyte-infected pastures. There are indications that problems can be avoided by removing mares as late as 30 days before foaling.

Drug Therapy

Several different prescription-only drugs such as phenothiazine, bromocriptine, perphenazine, have been administered to treat mares with observable signs of fescue toxicosis. An oral gel of one of the drugs doperidone, also may be prescribed as a preventative. Mares consuming endophyte fescue that receive daily administration of doperidone several days before foaling do not appear do develop symptoms of fexcue toxicosis. Horse owners should contact their veterinarian to discuss the recommended course of action for prevention and treatment of fescue toxicosis through drug therapy.

Summary and Conclusions

- Most of the fescue in Oklahoma is endophyte-infected. Tests can be conducted to determine infestation rates. Contact Oklahoma Cooperative Extension offices for test procedures.
- Eradication of existing fescue is difficult, but measures involving fertilization, herbicide use, and prescribe burning have been effective.
- Limited research in growing horses suggests little to no effect of endophyte-infected fescue consumption on growth. Grain supplementation is recommended for growing horses grazing endophyte-infected fescue.
- Mares in late gestation should be removed from fescue. Recommended removal times vary, however, research suggests removing as late as 30 days before foaling may be sufficient. The most common recommendation is to remove mares from fescue in the last trimester of gestation; that is, 90 days before the expected foaling date.
- Consult our veterinarian to develop your course of action for prevention and treatment of fescue toxicosis through drug therapy.

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Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

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- It is administered by the land-grant university as designated by the state legislature through an Extension director.
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- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
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- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert E. Whitson, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of 20 cents per copy. 0310 GH Revised.