



Fungal Infestation Of Tall Fescue

Introduction

Tall fescue (*Festuca arundinacea* Schreb.) is the most widely grown pasture grass in the U.S., being grown on over 35 million acres. The most popular cultivar is Kentucky-31. This forage species has enjoyed such great acceptance for a wide variety of reasons, which include: wide range of adaptation, ease of establishment, persistency of stand, tolerance of poor soil, and a long grazing season with superior winter growth. Chemical tests of forage quality show it is high and should give good animal performance. Instead, light calf weaning weights, reduced gain in grazing steers and replacement heifers, reduced milk production in dairy and beef cows, reproductive problems in all livestock, and poor performance of mares and foals have plagued this forage for years. All in all, it represents millions of dollars in losses of animal performance and health to the livestock industry each year. Two disorders which have been seen with regularity in livestock consuming fescue are “fescue foot” and “fescue toxicosis.”

Fescue Foot

The most visible disorder observed in animals grazing fescue is fescue foot. This problem usually occurs during the winter and is a dry, gangrenous condition resulting in the loss of hooves and the tips of tails and ears. This condition is a result of peripheral vasoconstriction causing reduced blood flow to these extremities. Even though fescue foot is a severe problem on a single animal or herd basis, its effect on the livestock industry as a whole is not as economically significant as the other more common disorder known as fescue toxicosis.

Fescue Toxicosis

This disorder is often referred to as “summer slump” or “summer syndrome” because it is most

commonly observed in the warmer months of the year. The causative agent is a fungus (*Neotyphodium coenophialum*) called an “endophyte” that lives within the plant and therefore does not affect the appearance of the grass. Signs in animals grazing endophyte-infected fescue are reduced gains, reduced feed intake, intolerance to high environmental temperatures, more time spent in the water or shade and less time grazing, excessive salivation, rough hair coats, elevated body temperatures, faster respiration rates, reduced reproductive performance, and hormonal imbalances. Consuming endophyte-infected fescue results in the animal’s inability to properly regulate body temperature because of vasoconstriction of the peripheral blood vessels and dysfunction of the thermoregulatory and hormonal centers in the brain. Evidence suggests that a family of ergot alkaloidal compounds produced by the endophytic fungus, namely ergovaline, are the culprits of fescue toxicosis. Even though this disorder is most severe in the warm season of the year, performance of animals consuming fungus-infected fescue hay also is adversely affected.

Influence On Animal Performance

Gains of grazing steers and replacement heifers are dramatically reduced by the presence of the endophyte (Table 1 on page 2). Reductions in daily gains by up to 50% are not uncommon in research studies comparing cattle consuming endophyte-infected fescue pastures or hay compared to endophyte-free. Animal performance on endophyte-infected pastures depends on many factors in addition to the level of infestation, including: stocking rate, climatic conditions, season of the year, and pasture composition. In general, a reduction in ADG of 0.1 lb for each 10% infection level has been noted. In mixed pastures (fescue and a companion forage such as clover)

(continued)

Table 1. Daily gains of steers as affected by low or high incidence of endophyte infection.

| Location | Endophyte ¹ | | Daily Gain | | Feed | Reference |
|-------------|------------------------|-----------------|------------|--------|---------|-------------------------|
| | Low E | High E | Low E | High E | | |
| | % | % | lb/day | lb/day | | |
| Alabama | 2 | >90 | 1.83 | 0.99 | Pasture | Hoveland et al., 1983 |
| Alabama | 0 | >90 | 1.46 | 0.62 | Hay | Schmidt et al., 1982 |
| Alabama | 0 | 100 | 2.12 | 0.44 | Seed | Schmidt et al., 1982 |
| Arkansas | 0 | 81 | 1.57 | 1.21 | Pasture | Goetsch et al., 1988 |
| Georgia | 0 | 76 | 1.30 | 0.99 | Pasture | Stuedemann et al., 1986 |
| Kentucky | <1 | 61 | 1.54 | 0.99 | Pasture | Boling et al., 1985 |
| Mississippi | NR ² | NR ² | 1.50 | 1.01 | Pasture | Evans et al., 1989 |
| Missouri | 3 | 83 | 1.37 | 0.46 | Pasture | Crowford et al., 19889 |
| Oklahoma | <1 | 76 | 1.87 | 1.37 | Pasture | McMurphy et al., 1990 |
| Texas | 8 | 91 | 2.14 | 1.01 | Pasture | Read and Camp, 1986 |
| Virginia | 0 | 77 | 1.43 | 0.90 | Pasture | Tulley et al., 1989 |

¹Number of infected tillers per 10 tillers.

²Not reported.

gains are improved; however, cattle tend to prefer the clover and therefore over time a loss of stand for the companion forage is experienced and the pasture tends to become primarily fescue. Even though animals suffer reduced feed intake, this reduction does not completely account for the reduction in animal gain. This indicates that the toxic effect of the endophyte is causing physiological modifications and stresses on the animal in addition to the reduction in feed intake.

Cattle that previously consumed endophyte-infected fescue are typically rough-haired and unthrifty when entering the feedlot. Research has shown that these cattle generally experience compensatory gains in the feedlot, especially the first 28 days. These responses are generally greater when entering the feedlot in the cool months rather than times of high environmental temperatures. Because these cattle are often discounted as feeders due to their unthrifty appearance, coupled with anticipated compensatory gain in the feedlot, a retained ownership strategy should be considered.

Influence On Reproduction And Milk Production

In several studies involving cows and nursing calves, cows grazing endophyte-infected fescue lost

weight and their calves had slower gains and reduced weaning weights compared to those grazing endophyte-free or low infection level pastures (Table 2 on page 3). Calf weaning weights have been shown to be reduced by up to 90 pounds when their dams were grazing highly-infected pastures as compared to cows grazing endophyte-free or lowly-infected pastures. Pregnancy rates in cows also were reduced in addition to more days to first service, most likely as a result of poor condition at calving. Heifers raised on endophyte-infected pastures as young calves have shown delayed puberty and decreased first service pregnancy rates. Heifers grazing endophyte-free pastures showed a 96% conception rate compared to 55% for heifers grazing pastures with an 80% infection level. Evidence exists which indicates that the fungus has an influence on hormonal status, which affects reproduction beyond that expected based on body condition and energy status of the animal. Many studies have reported a reduction in milk production in beef cows (45%) and heifers (50%), as well as dairy cows (up to 60%), when consuming endophyte-infected fescue. In replacement heifers continually consuming fescue pasture or hay varying from 0 to 99% infected, it was observed that milk production decreased 0.33 lb and pregnancy rate decreased 3.5 for each 10% increase in infection level. As with animal gains, the reductions in milk flow

(continued)

Table 2. Effect of endophyte-infected fescue on the performance of cows and nursing calves.

| Cows | | | | Calves | | | | Reference |
|------------|--------|-----------------|--------|------------|--------|----------------|--------|----------------------|
| Daily Gain | | Pregnancy Rate | | Daily Gain | | 205-d Wean Wt. | | |
| Low E | High E | Low E | High E | Low E | High E | Low E | High E | |
| lb/day | | % | | lb/day | | lb | | |
| 1.01 | -0.51 | — ¹ | — | 2.56 | 1.87 | 520 | 434 | Schmidt et al., 1983 |
| 0.46 | -0.11 | 95 | 55 | 1.72 | 1.37 | 474 | 410 | Gay et al., 1988 |
| 0.44 | -0.15 | 87 | 58 | 1.63 | 1.30 | 489 | 419 | Essig et al., 1989 |
| 0.09 | -0.24 | 89 ² | 74 | 1.61 | 1.28 | — ¹ | — | Tucker et al., 1989 |
| 0.79 | 0.46 | 78 | 49 | 2.25 | 1.90 | 529 | 461 | McDonald, 1989 |

¹Not determined or not reported.

²Low E was 21% infected versus 77% for high E.

often are greater than expected based on diet composition, suggesting impaired hormonal function may play a role in mammary development and milk production.

Influence On Horses

The effects of endophyte-infected fescue on mares and foals are more severe than in cattle or sheep. Pregnant mares consuming infected fescue show the following signs: prolonged gestation length, failure of normal mammary development, severe dystocia, greater incidence of abnormal presentations, retained placentas, agalactia, rebreeding problems, and stillborn or weak foals. A striking difference between horses and cattle is the lack of a prolonged carryover effect when mares are removed from the endophyte-infected fescue. Apparently, horses respond very rapidly to the fungus and have a rapid turnover of the toxicants to quickly overcome negative effects of the fungus. Because of this it is recommended that mares be removed from endophyte-infected fescue 60 days before anticipated foaling date or use of a product that has shown promise in gestating mares for 14 days prior to foaling.

Pasture Management

The endophyte is contained in the seed and is consequently spread in that manner. Several methods have been suggested to alleviate the effects of fescue toxicosis in grazing livestock.

These include interseeding a companion forage such as clover, prevention of seed head formation by clipping or continuous grazing, pasture renovation, controlled supplementation with grain or grain by-products, and the use of creep feeding or grazing; all of which work to dilute the consumption of the endophyte-infected fescue. Heavy continuous grazing or clipping is probably the best method because the fungus is the most concentrated in the seed head. This high stocking rate or clipping not only eliminates the formation of seed heads but also the grass is maintained in a more vegetative stage where it is of higher nutritive value. Likewise, if hay is to be harvested it is suggested that it be baled in a more vegetative stage as well. Pasture renovation with endophyte-free varieties of fescue have been used with limited success, especially in the southern climates. The presence of the endophyte imparts specific advantages to the plant agronomically, which were the reasons that fescue was so widely cultivated in the first place. A new variety of fescue (Max Q) has been commercially released recently which contains a novel endophyte that retains the agronomic advantages of endophyte-infected fescue but does not produce the poor animal performance associated with toxic endophyte-infected fescue. Vigortone manufactures **Fescue Balancer** and **Grass Grazer** products that are specifically designed for cattle consuming endophyte-infected tall fescue whether from grazing or hay.

References available upon request.