Tall fescue grown in Kentucky is productive and persistent and that is why the state has 5 million acres of the stuff! Fescue has tolerances to drought, low fertility, and over-grazing that are attributed to a fungal endophyte which infects most tall fescue plants. Unfortunately, these advantages of tall fescue that livestock producers appreciate are offset by reduced calving percentages and calf weight gains caused by consumption of ergot alkaloids produced by the endophyte. Ergot alkaloids affect the physiology of cattle to cause elevation in body temperature, reduced sweating, retention of winter hair coats and uncontrollable growth of summer hair coats, and a reduction in the prolactin hormone (not just the milk hormone!). Cattle inflicted with this toxicosis suffer from heat stress with high air temperature and humidity to reduce grazing time and dry matter intake. Consequently, with endophyte-infected tall fescue it can be difficult to maintain body condition and acceptable reproductive performance of cow herds and weight gain of yearling cattle is generally regarded as unacceptable for profitable stocker and replacement heifer production.

There presently are three management options for improving cattle performance on tall fescue. First, cattle can be moved from endophyte-infected fescue to warm-season perennial grass pastures (for example, eastern gamagrass or bermudagrass) in the late spring or early summer when maximum daily air temperatures increase (> 80°F). Secondly, ergot alkaloids can be diluted in the diet by feeding concentrates/by-product feeds, or by interseeding fescue pastures with legumes, such as ladino white clover or red clover. A third option is to replace ‘Kentucky 31’ tall fescue infected with the wild type endophyte with tall fescue that is infected with novel endophytes that do not produce the toxic ergot alkaloids. This paper will discuss results of grazing experiments that have evaluated these management options for improving cattle performance on tall fescue.

**Rotating Cattle to Warm-Season Perennial Grass Pasture during the Summer**

Research has shown that a warm-season perennial grass can be utilized in a forage system to avoid vulnerability to heat stress during the summer. Brown and others
(2001) found that spring calving cows grazed on toxic tall fescue during the fall through spring and moved to bermudagrass in the summer to have 34% greater milk yields than those that remained on fescue through the summer. Aiken and others (1999) in a 2-yr grazing experiment grazed yearling steers on toxic fescue in April and May and rotated the cattle to eastern gamagrass during the summer from early June to early August. Those grazed with light stocking rates (avg. total body weight = 993 lb/acre) had average daily gains of 2.2 lbs/day and those on heavy stocking rates (avg. total body weight = 1938 lb/acre) had average daily gains of 1.7 lb/day. Average daily gain of yearling cattle on toxic fescue typically range from 0.2 to 1.2 lb/day. It was further observed in the study that 50% of the steers had sleek hair coats and 33% were expressing some shedding of hair coats by the end of summer grazing on eastern gamagrass. Rotating to a non-toxic grass during the warm season appears to provide some relief from the toxicosis, but extent of this relief likely depends on previous time on toxic pasture, pasture fungal infection levels, and animal genetics.

Two perennial warm-season grasses with potential are eastern gamagrass and bermudagrass. Eastern gamagrass is a native grass that provides robust growth from mid-May through September. To maintain stand persistence the grass should be rotationally grazed to provide 45 days of regrowth and should not be grazed to less than an 8-inch stubble. ‘Pete’ eastern gamagrass, the first released cultivar, gained considerable popularity in the southeast, but USDA-NRCS has released other cultivars with improved forage yield and quality. One of interest to Kentucky producers is ‘Highlander’, which was originally collected in Montgomery County, TN (across the border from southwest Kentucky). The other warm-season perennial, bermudagrass, can be continuously grazed, but fertility with this grazing method is more critical in maintaining productive stands as grazing intensity increases. Planting of bermudagrass cultivars with cold tolerance (‘Wrangler’, ‘Quickstand’, or ‘Greenfield’) will be required in Kentucky. Grazing should be deferred or lenient in the fall to prepare these grasses for winter dormancy.

Feeding Concentrates or Over-seeding Clovers

Replacing some of the fescue in cattle diets with concentrates or clovers has consistently been shown to dilute the ergot alkaloids and enhance performance and physiology. Grazing experiments have shown substantial improvements in average daily weight gain when feeding broiler litter-ground corn (1:1 ratio) (Aiken and others, 1998) or soybean hulls (Aiken and others, 2008) (Table 1). Another experiment showed that feeding soybean hulls to yearling steers grazing endophyte-infected fescue substantially increased steer daily weight gain and the shedding of winter hair coats, and there was an almost 4-fold increase in prolactin concentrations in the blood serum (low serum prolactin is an indicator of fescue toxicosis), as compared to those not fed. Although symptoms of toxicosis were not completely alleviated, there appeared to be
enough dilution of ergot alkaloids to reduce the severity of toxicosis. Steers in each of these experiments were group fed at a rate of 5 lbs/steer/day (as fed). Amounts of offered feed should be 0.75 to 1% of body weight to adequately overcome the low intake of cattle grazing fescue and to adequately dilute the ergot alkaloids. Therefore, cheaper by-product feeds (view Table 2 for examples) will be needed for this management option to be cost effective.

Table 1. Average daily gain between with and without supplemental feeding of yearling steers grazing endophyte infected all fescue.

<table>
<thead>
<tr>
<th>Feed</th>
<th>With</th>
<th>Without</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broiler litter-corn</td>
<td>1.48</td>
<td>0.82</td>
<td>Booneville, AR</td>
</tr>
<tr>
<td>Pelleted soybean hulls</td>
<td>1.17</td>
<td>0.62</td>
<td>Versailles, KY</td>
</tr>
<tr>
<td>Pelleted soybean hulls</td>
<td>2.10</td>
<td>1.58</td>
<td>Versailles, KY</td>
</tr>
</tbody>
</table>

1 Aiken and others, 1999.
2 Graduate research conducted by Jessica Carter

Table 2. Nutrient composition for various by-product feeds.*

<table>
<thead>
<tr>
<th>Feed</th>
<th>Dry matter</th>
<th>Total digestible nutrients</th>
<th>Crude protein</th>
<th>Neutral detergent fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dried distillers grains</td>
<td>91</td>
<td>88.0</td>
<td>30.4</td>
<td>46.0</td>
</tr>
<tr>
<td>Wet distillers grains</td>
<td>25</td>
<td>25.0</td>
<td>29.7</td>
<td>40.0</td>
</tr>
<tr>
<td>Bakery waste</td>
<td>92</td>
<td>89.0</td>
<td>9.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Dried brewers grains</td>
<td>92</td>
<td>66.0</td>
<td>29.2</td>
<td>48.7</td>
</tr>
</tbody>
</table>

* Nutrient Requirements of Beef Cattle, National Research Council, 2000

Escalating cost of nitrogen fertilizers is making the interseeding of clovers into fescue pastures a management tool that should be considered. Animal performance and a reduction in the severity of fescue toxicosis can be achieved if the stand has a minimum of 10 to 25% clover. High-quality clovers and other legumes can boost animal performance and soil nitrogen, but a lack of persistence under grazing has minimized the commercial acceptance of clovers. However, costs of sources of commercial nitrogen are presently at levels that justify shifts in pasture management needed to improve clover stand persistence. Implementing rotational stocking systems that complement the clover and fescue are definitely needed. Stocking rates may need adjustments to provide enough residual clover at end of grazing a given paddock. Although clovers do not require nitrogen fertilization, soil phosphorus, potash, and pH will have to be maintained at recommended levels to improve persistence.
Planting Novel Endophyte Tall Fescue

Novel endophyte strains have been discovered and developed by AgResearch Ltd. (New Zealand) that do not produce the toxic ergot alkaloids. A novel endophyte (AR542) has been inserted into the cultivar ‘Jessup’ and is commercially sold under the trade name MaxQ. Reproductive performance of cows and growth performance of yearling cattle have shown to be similar to endophyte-free fescue (Parish and others, 2003; Watson and others 2004). MaxQ persisted well over a 5-yr grazing experiment conducted in Oklahoma and Louisiana (Hopkins and Alason, 2006), but more cultivars are needed to provide alternative novel endophyte fescues throughout the fescue belt. A different endophyte, AR584, has been inserted into a fescue that was developed by Dr. Tim Phillips, a forage breeder in the Plant and Soil Sciences Department at UK, to provide a productive and persistent novel endophyte fescue for the upper south. A grazing evaluation is presently being conducted with this novel endophyte fescue to compare steer weight gain, stand productivity and persistence with wild-type endophyte Kentucky-31 and MaxQ.

It should be understood that good grazing management practices are required for novel endophyte fescue. The major concern is that novel endophyte pastures will not carry as many animals as Kentucky-31 pastures in the late spring and summer. This is because cattle in novel endophyte fescue pasture will be grazing at times when cattle in wild-type Kentucky-31 pastures are normally standing in the shade or ponds. Therefore, stocking rates should be adjusted lower to accommodate greater grazing during the warmer months. Otherwise, rotational stocking will be needed to reduce chances of stand deterioration.

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