Lamb production and forage quality under a forage system consisting of AU Triumph tall fescue and Tifton 44 bermudagrass

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Abstract

The lamb production potential and forage quality of a forage system consisting of AU Triumph fescue and Tifton 44 bermudagrass was studied over a period of two consecutive years. Each spring, 60 yearling Suffolk ewes and 40 wethers were divided into two groups and allowed to graze two replicated 1 ha AU Triumph paddocks continuously. At the end of the spring grazing season, both groups were transferred to two replicated 1 ha Tifton 44 paddocks for summer grazing. Body weight was recorded fortnightly and composite forage samples analyzed for chemical composition, in vitro dry matter disappearance (IVDMD) and in vitro organic matter disappearance (IVOMD) at the end of the study. Mean crude protein (CP), ether extract (EE), ash, neutral-detergent fiber (NDF), acid-detergent fiber (ADF), cellulose, lignin, IVDMD and IVOMD contents of AU Triumph fescue were 13.26, 1.86, 7.38, 69.4, 36.37, 29.2, 6.81, 64.44 and 62.88%, respectively. The corresponding values for Tifton 44 bermudagrass were 7.5, 1.01, 5.2, 78.3, 41.0, 28.3, 8.8, 56.97 and 55.61%. Average daily gain (ADG) and lamb gain per hectare on AU Triumph fescue were 142.1 g and 412.59 kg/ha, respectively. However, lamb ADG started to decline and remained low when they were transferred from AU Triumph to Tifton 44 bermudagrass resulting in a low ADG and lamb gain per hectare of only 18.2 g and 84.09 kg/ha, respectively. In contrast, Tifton 44 yielded higher post grazing residual DM, suggesting that the decline in performance of the lambs grazing Tifton 44 to be related to poor forage quality rather than availability. The results indicate that low nutritive value of Tifton 44 bermudagrass is a limiting factor to lamb production in the forage system studied. To prevent the observed decline in lamb performance, it might be necessary to fertilize Tifton 44 at a higher rate or replace it with a better quality warm season forage. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: Forage system; Fescue; Bermudagrass; Lamb production

1. Introduction

In the southeast United States, the most limiting factor for lamb production is nutrition (Ball, 1993). Although genetics and animal health are equally important, it has not been possible to fully realize the genetic potential of livestock due to insufficient nutrition (Ball and Crews, 1993). Most lamb producers know which forage species or varieties are suited for use as pasture in their environment. However, studies dealing with forage system evaluation for lamb production are limited. Due to specificity in climatic...
adaptation of many forage species it is often necessary to utilize cool and warm season pasture crops alternately in a forage system for grazing lambs during any given year. To obtain the most return from the forage system, however, the preceding and subsequent pastures should possess good nutritive value so that lamb weight gained on one pasture will not be lost when moving lambs to another. Therefore, it is important to evaluate forage systems in terms of animal production in order to identify the most beneficial ones.

AU Triumph tall fescue (*Festuca arundinacea* Shreb) and Tifton 44 bermudagrass (*Cynodon dactylon* (L.) Pers.) are widely used as pastures in Alabama and other Southern states. AU Triumph is an endophyte fungus free fescue variety well-known for its good winter productivity, season-long forage yield and growth during cool weather as compared to other fescue varieties (Ball, 1993). However, like other fescue varieties it becomes practically dormant during the hot summer months. Consequently, warm season forage crops, such as bermudagrass must be used for grazing livestock during this period.

Tifton 44 bermudagrass is an improved warm season cultivar well known for its early growth and agronomic characteristics throughout the South and its superiority to other bermudagrass varieties have been established in yield and digestibility trials (Ball, 1993). It is not known, however, whether it can sustain satisfactory lamb production when used as a warm season forage crop, such as bermudagrass must be used for grazing livestock during this period.

Tifton 44 bermudagrass for lamb production.

2. Materials and methods

The study was conducted over a 2-year period (1995–96) at the Winfred Thomas Agricultural Research Station, Alabama Agricultural and Mechanical University using AU Triumph tall fescue and Tifton 44 bermudagrass pastures previously established in 1993 on decatur silty loam soil.

The grazing trial with AU Triumph was conducted in the Spring while that of Tifton 44 was in the Summer, with the experimental animals being moved from AU Triumph to Tifton 44 pasture as the former turned dormant. 2 ha of each forage species were divided into two replicated 1 ha paddocks using electric fences. Pasture was top-dressed with triple 13 (N–P–K) at the rate of 150 kg/ha before the beginning of the grazing season and proper weed control practiced throughout the grazing period. In 1995 and 1996, AU Triumph grazing was initiated on 10 and 18 May, respectively. Following deworming with SynanthicR (Merc, Whitehouse Station, NJ) at 5 ml/50 kg body weight, 60 yearling Suffolk ewes and forty wethers of comparable body weight (40 ± 2 kg) were divided into two groups and each paddock stocked at the rate of 50 animals per hectare (30 ewes and 20 wethers grazing each replicate paddock). The lambs were part of the flock maintained by Alabama A & M University for research purpose and were born the previous lambing season. Grazing was initiated when enough forage has accumulated to support grazing at the specified stocking rate based on visual assessment. At the end of AU Triumph grazing, when forage availability started to dwindle to the point where it was considered insufficient to maintain normal weight gain based on body weight change since the last measurement, final body weight was recorded and lambs transferred to two replicated 1 ha Tifton 44 paddocks for summer grazing, which started on 10 and 16 July in 1995 and 1996, respectively. Animals on both AU Triumph and Tifton 44 pasture had free access to salt lick and fresh water throughout the trial and were supplemented with 228 g of concentrate mixture (Table 1) per head during the last 15 days.

<table>
<thead>
<tr>
<th>Ingredient (%)</th>
<th>Cracked corn</th>
<th>Soybean meal, 48% CP</th>
<th>Dicalcium phosphate</th>
<th>Trace mineral salt*</th>
<th>Vitamin pre-mix*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>84.3</td>
<td>13.5</td>
<td>1.5</td>
<td>0.5</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Chemical composition:

<table>
<thead>
<tr>
<th>CP (%)</th>
<th>MEc (kcal/kg)</th>
<th>ADF (%)</th>
<th>NDF (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.2</td>
<td>3.1</td>
<td>3.0</td>
<td>14.5</td>
</tr>
</tbody>
</table>

* Supplied: 93–98% NaCl, 0.35% Zn, 0.28% Mn, 0.18% Fe, 0.035% Cu, 0.007% I, 0.007% Co.

* Supplied per kilogram: Vitamin A, 9, 98, 180 IU; Vitamin D3, 990,000 IU; Vitamin E, 3960 IU.

* Calculated (NRC, 1981).
on both pastures when forage quality declined. Paddocks were grazed continuously until available forage was insufficient to maintain normal body weight gain based on visual assessment.

Body weights were recorded at the beginning of the grazing period and fortnightly thereafter until the end of the grazing period following overnight fasting. Ten random pasture samples were obtained at the beginning, middle and end of the grazing study for nutrient composition, IVDMD and IVOMD determination. Samples for DM determination were obtained from 5.09 m² quadrats in each paddock. Pasture samples were clipped to ground level, oven dried at 65°C, ground to pass through 1 mm screen in a Wiley Mill (Arthur H. Thomas, Philadelphia, PA) and stored in air tight ziploc bags until analyzed. At the termination of the experiment, residual pasture was clipped, weighed and residual dry matter yield recorded.

Forage samples were analyzed for DM (AOAC, 1990), CP (Kjeltec Auto 1030 Analyzer), EE (Soxtec System HT6, Tecator AB, Hoganas, Sweden), total ash, and gross energy (GE) using adiabatic bomb calorimeter (Parr Instruments, Moline, IL). Acid-detergent fiber, NDF and lignin were analyzed using the fiber bag technique (Ankom, Park Fairport, NY). In vitro dry matter disappearance and IVOMD were determined using in vitro rumen fermentor (Daisy 200, Ankom, Park Fairport, NY) with rumen fluid obtained from a fistulated steer.

3. Results

3.1. Nutrient composition, IVDMD and IVOMD

Results of proximate analysis are given in Table 2 while changes in chemical composition of forage with time are graphically depicted in Figs. 1 and 2. Tifton 44 was 29% higher in lignin (8.8 versus 6.81%) and 43% lower in CP (7.51 versus 13.26%) than AU Triumph, regardless of year of grazing study. In vitro dry matter disappearance of Tifton 44 and AU Triumph (56.97 versus 64.41%) and IVOMD (55.61 versus 62.88%) were also in favor of AU Triumph by a difference of 11.6 and 12.3%, respectively. As can be seen in Fig. 1, NDF content of AU Triumph fescue remained relatively constant throughout the grazing season while ADF, lignin and cellulose gradually increased with time. Crude protein and hemicellulose declined gradually from the beginning to the end of the grazing season while EE and ash changed very little with time. Changes in chemical composition of Tifton 44 bermudagrass, depicted in Fig. 2, show that NDF increased after the fist half of the grazing season. Acid-detergent fiber and cellulose increased with time, with the highest increase taking place in the second half of the grazing season. Lignin, CP, ash and EE contents of Tifton 44 appear to be little affected by time of grazing.

3.2. Lamb production and residual DM yield

Ewes and wethers gained an average of 86.45 g with a lamb gain per hectare of 412.59 kg when grazing AU Triumph (Table 3). Average daily gain on AU Triumph increased during the first quarter of the grazing season and leveled off thereafter, with no significant decrease towards the end. However, average daily weight gain of both ewes and wethers started to decline markedly after they were transferred to Tifton 44 pasture, and remained low as the grazing season progressed resulting in a low ADG of 18.2 g and lamb gain per hectare of only 84.08 kg on Tifton 44 bermudagrass. In contrast, Tifton 44 yielded higher post grazing residual forage DM (223.65 versus 82.12 kg/ha).

4. Discussion

In vitro dry matter disappearance for Tifton 44 obtained in the present study (55.61%) is comparable
Fig. 1. Changes in chemical composition of AU Triumph fescue with time.

Fig. 2. Changes in chemical composition of Tifton 44 bermudagrass with time.
to the value of 57.8% reported by Ball (1993), while that of AU Triumph is in agreement reported by Felix (1994, unpublished). Weight gained by ewes and wethers on AU Triumph was lost when they were transferred to Tifton 44, primarily a reflection of the lower nutritive value of the latter as evidenced by its low CP, high lignin, high ADF, high NDF and low IVDMD. Furthermore, the finding in the present study that Tifton 44 yielded higher residual forage DM at the end of the grazing trial suggests that nutrient quality rather than forage availability was the limiting factor for the observed decline in performance of the lambs grazing Tifton 44. However, the high summer ambient temperature might have also partly negatively impacted performance of the lambs through its feed consumption depressing effect. In a related study, Green et al. (1990) compared Brazos, Coastal and Tifton 44 bermudagrass cultivars and reported that Tifton 44 produced a slower ADG in July and August, as was the case in the present investigation.

5. Conclusion

Forage nutrient content, IVDMD, IVOMD and lamb growth performance results showed that in a forage system consisting of AU Triumph fescue and Tifton 44 bermudagrass, the latter to be a limiting factor for optimum lamb production. To prevent the observed decline in lamb performance, it might be necessary to replace Tifton 44 bermudagrass with other warm season grass species of better nutritive value or fertilize the pasture at a higher rate.

Acknowledgements

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References