Abstract

Bermudagrass (Cynodon dactylon) is the predominant warm-season perennial grass used for cattle production in Arkansas and throughout a majority of the southeastern U.S. Bahiagrass (Paspalum notatum), also a warm-season perennial, is grown along the Gulf Coast but not utilized extensively in Arkansas because it does not persist in this colder environment. Objectives were to compare forage availability and nutritive composition of a more cold-tolerant bahiagrass variety, ‘Sand Mountain’ (n = 4 pastures) or ‘Common’ bermudagrass (n = 4 pastures) grown in west-central Arkansas, and to determine performance of crossbred steers (initially n = 48; last 54 days n = 32) with or without steroid implants grazing bahiagrass and bermudagrass pastures for 97 days. Forage availability was evaluated every 2 weeks, and forage samples were collected monthly to determine nutritive composition. Forage availability during the entire grazing period was lower (P < 0.001) for Sand Mountain bahiagrass (1043 lb dry matter (DM)/acre) than Common bermudagrass (2042 lb DM/acre), and forage availability declined (P < 0.001) for each forage during the experiment. A forage x date interaction affected (P < 0.05) acid detergent fiber (ADF) and crude protein (CP), and tended (P = 0.08) to influence neutral detergent fiber. Percentages of CP were lower and ADF was greater in bahiagrass compared with bermudagrass. Forage type, steroid implant, and the interaction did not influence (P > 0.10) average daily gain (mean = 1.9 lb/day per steer) during the grazing period. Sand Mountain bahiagrass may be suitable as a warm-season grass in northern portions of the Southeast; however, several years of data are needed to determine the persistence of Sand Mountain bahiagrass in west-central Arkansas.

Introduction: Bermudagrass and bahiagrass are the two perennial warm-season grasses utilized for cattle grazing in the southeastern U.S. Winterkill is problematic for specific varieties of both forages and limits their use to adapted areas of the southeastern U.S. (Ball et al., 2002). Bermudagrass is used extensively throughout the Southeast, usually at latitudes below 36° N (Taliaferro, 2005) while bahiagrass is widely used along the Gulf Coast but not utilized extensively in Arkansas because it does not persist in this colder environment.
Coast and covers approximately 25 million acres in Florida (Chambliss and Sollenberger, 1991). Sand Mountain bahiagrass, a naturally selected bahiagrass developed by E. van Santen and Auburn University, is more cold-tolerant than other bahiagrass varieties and may be a suitable warm season grass for northern portions of the Southeast. To our knowledge, performance data of steers grazing bahiagrass as far north as west-central Arkansas are non-existent. Objectives of the current experiment were to 1) compare forage availability and nutritive composition of 'Sand Mountain' bahiagrass with 'Common' bermudagrass grown in west-central Arkansas, and 2) determine performance of steers with or without steroid implants grazing bahiagrass and bermudagrass pastures.

Materials and Methods: This experiment was conducted near Booneville (35° 5' N; 94° 0' W) in west-central Arkansas. Crossbred steers (n = 48; initial body weight = 610 ± 57 lb) with (n = 24 steers) or without (n = 24 steers) steroid implants (Synovex S™) were randomly assigned to 2.5-acre pastures of Sand Mountain bahiagrass (n = 4 pastures) or Common bermudagrass (n = 4 pastures) for 97 days. Due to drought conditions, the initial stocking rate of 6 steers/pasture (2.4 steers/acre) was reduced to 4 steers/pasture (1.6 steers/acre) on 21 July until termination of the experiment (13 September). Body weights were recorded at the initiation (8 June), day 56 (3 August), 84 (31 August), and at termination of grazing (13 September). Implanted steers were reimplanted at day 56 of grazing. Pastures were fertilized prior to initiation of grazing on 5 May (65 lb N/acre), and again on 7 July (51 lb N/acre) and 22 August (91 lb N/acre). Forage availability was evaluated every 2 weeks using a disk meter (Bransby et al., 1977), and compressed forage height was recorded at 50 locations within pastures. To calibrate disk meter measurements, forage was clipped to ground level beneath the disk meter at five locations across each pasture monthly. Samples were dried (140°F) in a forced-air oven for 72 h and weighed for calculation of regression equations relating lb dry matter (DM)/acre with disk meter height. Random grab samples (10-12 samples/pasture) for nutritive analyses were collected monthly, ground to pass through a 0.04-inch screen, and analyzed for crude protein (CP; Leco® Nitrogen Determinator, St. Joseph, MI), acid detergent fiber (ADF), and neutral detergent fiber (NDF) using the Goering and Van Soest (1970) procedure modified for use with the Ankom Daisy II In Vitro Digester® (Ankom Technology Corp., Fairport, NY).

Forage availability and nutritive composition were analyzed as repeated measures using the MIXED procedure of SAS (SAS Inst., Inc., Cary, NC) with a compound symmetry covariance structure. The model included forage type, date, and the interaction. Least squares means were compared using the PDIF statement of SAS when protected by a significant (P < 0.05) treatment effect. Effects of forage type, implantation, and the interaction on ADG of steers at day 56 and 84, and an overall ADG at day 97 was determined by the MIXED procedure of SAS using pasture as the experimental unit.

Results and Discussion: Forage availability during the entire 97 days grazing period was lower (P < 0.001) for Sand Mountain bahiagrass (1043 lb DM/acre) than Common bermudagrass (2042 lb DM/acre). Overall, forage availability of both forages declined during the experiment from a mean initial availability of 2556 lb DM/acre to 1045 lb DM/acre at termination of grazing (Figure 1) and was partially due to extremely dry
conditions in the Booneville area. Rainfall during the experiment (5.4 inches) was approximately 30% of the 30-yr norm (18 inches; NOAA-NWS, 2005). Nitrogen is frequently the most limiting factor for bahiagrass production (Williams, 1994) but sufficient rainfall also is necessary for growth. A forage x date interaction affected (P < 0.05) CP and ADF, and tended (P = 0.08) to influence NDF (Table 1). Crude protein was greatest (P < 0.05) for bahiagrass on the initial collection date (15 June) while CP was greatest for bermudagrass in June and August (Table 1). Arthington and Brown (2005) reported CP decreased approximately 38% from week 4 to week 10 of maturity in both ‘Pensacola’ bahiagrass and ‘Tifton 85’ bermudagrass. Fertilization of pastures on 7 July with 51 lb N/acre during the current experiment increased CP of bermudagrass on 10 August compared with CP on 12 July (Table 1). However, CP for bahiagrass was similar (P > 0.10) before and after the 7 July-fertilization (Table 1). Percentage of ADF was greatest for bermudagrass on 6 September; however, ADF was increased on 10 August and remained higher on 6 September (Table 1). Increased ADF is negatively correlated with digestibility (Van Soest et al., 1978). Averaged across all dates, bahiagrass contained 6.6% more ADF than bermudagrass which was similar to results reported by Johnson et al. (2001). Percentages of NDF were greatest for the August and September dates for both forages (Table 1).

Forage type, steroid implant, or the interaction did not influence (P > 0.10) cumulative ADG at days 56, 84, or total ADG during the entire 97 days grazing experiment. Total ADG was 1.9 lb/day (pooled standard error = 0.1) per steer for both bahiagrass and bermudagrass. Typically, steroid implants improve ADG in cattle by 9% to almost 18% in grazing cattle (Paisley et al., 1999), and DM intake is increased in implanted animals (Rumsey et al., 1992). Consequently, sufficient available forage is necessary to achieve additional weight gain with steroid implants (Rumsey and Hammond, 1990). Rayburn (1986) reported forage intake was maximized when forage availability was approximately 2000 lb of DM/acre. Due to less than normal rainfall, forage availability for both forages may have been limited from the end of July until the termination of the experiment in September (Figure 1), and may partially explain why ADG was not different (P > 0.10) between steers with or without steroid implants. Differences in forage quality between bahiagrass and bermudagrass at various times during the experiment, drought conditions, light stocking rates, cattle weighing schedule, and/or a limited number of animals also may have affected these results.

To our knowledge, these data are the first to report forage availability and nutritive composition of bahiagrass in west-central Arkansas (35° 5' N; 94° 0' W) grazed by crossbred steers with or without steroid implants. Forage availability and CP of bahiagrass was lower than bermudagrass, and ADF was higher in bahiagrass compared with bermudagrass. However, steers grazing either bahiagrass or bermudagrass had similar ADG (1.9 lb/day per steer) during the experiment. Bahiagrass may be suitable as a warm-season grass in northern portions of the Southeast. Several years of data are needed to determine the persistence of bahiagrass in west-central Arkansas.

Acknowledgment: The technical assistance of Larry Huddleston, Brent Woolley, Sam Tabler, and Jim Miesner, USDA-ARS, Booneville, AR; and Tracy Hamilton, USDA-
ARS, Lexington, KY is gratefully acknowledged. Names are necessary to report factually on available data; however, the USDA does not guarantee or warrant the standard of the product, and the use of the name by the USDA implies no approval of the product to the exclusion of others that also may be suitable.

**Literature Cited:**


Table 1. Percentages of crude protein (CP), acid detergent fiber (ADF), and neutral detergent fiber (NDF) of ‘Sand Mountain’ bahiagrass and ‘Common’ bermudagrass harvested on four dates during the summer and early fall in west-central Arkansas.

<table>
<thead>
<tr>
<th>Date</th>
<th>CP</th>
<th>ADF</th>
<th>NDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahiagrass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-June</td>
<td>12.9a</td>
<td>26.6d</td>
<td>53.7f</td>
</tr>
<tr>
<td>12-Jul</td>
<td>6.1d</td>
<td>29.5bc</td>
<td>57.1de</td>
</tr>
<tr>
<td>10-Aug</td>
<td>8.4cd</td>
<td>32.4a</td>
<td>60.8a</td>
</tr>
<tr>
<td>6-Sep</td>
<td>8.5cd</td>
<td>31.0ab</td>
<td>58.8bcd</td>
</tr>
<tr>
<td>Bermudagrass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-June</td>
<td>10.2abc</td>
<td>25.3e</td>
<td>55.5ef</td>
</tr>
<tr>
<td>12-Jul</td>
<td>6.8cd</td>
<td>27.4cd</td>
<td>57.7cd</td>
</tr>
<tr>
<td>10-Aug</td>
<td>13.5a</td>
<td>27.9cd</td>
<td>59.4abc</td>
</tr>
<tr>
<td>6-Sep</td>
<td>9.7bcd</td>
<td>31.6ab</td>
<td>59.5ab</td>
</tr>
</tbody>
</table>

Means without a common superscript differ; forage x date interaction (CP and ADF, P < 0.05; NDF, P = 0.08).

Figure 1. Forage availability of ‘Sand Mountain’ bahiagrass and ‘Common’ bermudagrass during summer and early fall in west-central Arkansas (forage effect, P < 0.05; date effect, P < 0.05).