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Evaluation of wheat and triticale forage for stocker production in the Gulf Coast region

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ABSTRACT

A 3-yr grazing experiment was conducted to quantify productivity, quality characteristics, and beef performance from wheat (Triticum aestivum) and triticale (× Triticosecale) forage compared with ryegrass (Lolium multiflorum) for use in the Gulf Coast region. Six 1.42-ha pastures (2 paddocks/forage treatment) were seeded in early fall of each year and stocked continuously beginning in late fall and early winter with 3 yearling steers (322 ± 10 kg initial BW). Additional put-and-take steers were used to maintain available forage mass at 1,500 to 2,000 kg of DM/ha. Steer ADG was not different between ryegrass and wheat (1.51 and 1.36 kg, respectively) but was less ($P < 0.10$) for triticale (1.23 kg/d). Wheat required a greater ($P < 0.10$) mean stocking rate (4.0 steers/ha) than ryegrass (3.2 steers/ha) and triticale (3.4 steers/ha) to maintain target forage mass, and wheat supported a greater ($P < 0.10$) number of grazing days per hectare (497) than ryegrass (406) and triticale (415). Forage concentrations of NDF and ADF were greater ($P < 0.05$) for triticale and wheat than ryegrass, and total nonstructural carbohydrates were greater ($P < 0.05$) for ryegrass and wheat than triticale. Steer ADG was positively correlated ($P < 0.10$) with forage CP and total nonstructural carbohydrate concentrations and negatively correlated ($P < 0.0001$) with concentrations of cell-wall constituents. Stepwise linear regression analysis revealed that forage nutritive value was not an especially important determinant of animal performance. Steer ADG and grazing days per hectare from these forages indicate a potential superiority of wheat for production of total BW gain per hectare in Gulf Coast stocker production systems.

Key words: forage, Gulf Coast, ryegrass, stocker production, triticale, wheat

INTRODUCTION

Small-grain forages and annual ryegrass (*Lolium multiflorum*) have been used for decades to support winter grazing of stocker cattle as an economically viable enterprise in the southeastern United States (Rankins and Prevatt, 2013). Planting of cool-season annuals such as ryegrass, oat (*Avena sativa*), and rye (*Secale cereale*) is common in the Gulf Coast region of the southeastern United States to provide grazing for beef cattle from November to May (Myer et al., 2008), but wheat (*Triticum aestivum*) and triticale (× *Triticosecale*) are planted to a lesser extent than in other areas of the United States where they are well adapted for winter grazing and often followed by production of a grain crop for cash sale (Coblentz and Walgenbach, 2010). Beck et al. (2005) reported that ADG and BW gain per hectare over a 3-yr period in northern Arkansas did not differ between calves grazing wheat or ryegrass established in clean-tilled fields. In a 3-yr experiment in southwest Arkansas (Beck et al., 2007), ADG and BW gain per hectare were greater for calves grazing wheat than triticale interseeded into a bermudagrass (*Cynodon dactylon* L.) sod.

Triticale exhibits cold and disease tolerance in southeastern variety trials (Day et al., 2013), but its use in the Gulf Coast region to date has been limited primarily to green chop or silage for dairy production systems (Blount et al., 2010). Wheat is similar to oat in herbage production, and it is less susceptible to freeze damage in the lower Coastal Plain (Blount et al., 2013). Because of these desirable agronomic traits, expanded use of triticale and wheat in Gulf Coast beef cattle production systems is desired; however, information on productivity, nutritive value, and capacity of these small-grain forages to support winter grazing by stocker cattle in the region is limited. Research is needed

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to evaluate the potential of these forage species for use in regional beef-production systems. For this reason, the objective of this experiment was to characterize productivity, nutritive value, and beef cattle performance from triticale and wheat compared with ryegrass planted into prepared seedbeds and managed using adjustable stocking densities in response to changing forage mass.

MATERIALS AND METHODS

Research-Site Characteristics

The 3-yr grazing experiment was conducted at the Wiregrass Research and Extension Center in Headland, Alabama (31.35°N, 85.34°W). Soils (sandy, fine-loamy, kaolinitic, thermic Plinthic Kandiudults) and climatic conditions (warm to hot, humid, maritime) at the research site are characteristic of the lower tier of the eastern Gulf Coastal Plain that encompasses portions of 5 states (GA, FL, AL, MS, and LA) from southwestern Georgia across the Florida panhandle and west to southeastern Louisiana. Monthly total and 30-yr average monthly total precipitation at the research site between September and May of each year are presented in Figure 1, and corresponding monthly mean and 30-yr average monthly mean temperatures during these same periods are presented in Figure 2.

Pasture Establishment

Six 1.42-ha pastures (experimental unit; 2 pastures per treatment) of wheat (*Triticum aestivum* L.), triticale (× *Triticosecale Wittmack*), and ryegrass (*Lolium multiflorum* L.) were established annually in a clean-tilled, prepared seed bed. Experimental units were seeded with SS8641 wheat (Southern States, Richmond, VA), Trical 2700 triticale (Resource Seeds Inc., Gilroy, CA), and Marshall ryegrass (Wax Seed Company, Amory, MS) at recommended seeding rates of 140, 125, and 32 kg/ha, respectively. Pastures were disked and chisel-plowed beginning in September of each year and were planted on 26 October 2009, 5 October 2010, and 25 October 2011. Before establishment of small grains and ryegrass in early fall, the experimental area was planted in summer-annual grasses {pearl millet (*Pennisetum glaucum* L.), sorghum-sudangrass [*Sorgum bicolor* (L.) Moench], and corn (*Zea mays* L.) in 2009; pearl millet in 2010 and 2011} and grazed from July until September during each year of the experiment. Before 2009 the experimental area had been in a crop rotation consisting of winter-annual grazing of small grains and annual peanut (*Arachis hypogea* L.) during the late spring until harvest in early fall for 5 yr. Pastures were randomly assigned to forage treatments in yr 1 of the experiment and again in yr 2 with the restriction that pastures could not receive the same treatments as in yr 1. In yr 3, pastures were assigned by default to treatments that they had not received in either yr 1 or 2. Thus, each pasture was assigned to each forage treatment once over the 3-yr experiment.

In 2009 and 2010, pastures initially received 40 kg of N/ha, 45 kg of P/ha, and 45 kg of K/ha as NH_4NO_3, P_2O_5, and K_2O, respectively, at planting according to soil test recommendations of the Auburn University Soil Testing Laboratory. Initial application rates were 25 kg of N/ha and 67 kg of K and P/ha, respectively, in 2011. Ammonium nitrate and ammonium sulfate were applied in December and March 2009 at rates of 67 kg of N/ha and 11 kg of S/ha, respectively. In 2010 and 2011, a liquid fertilizer mixture (18-0-0-3) was applied in December at a rate of 90 kg of N/ha and 15 kg of S/ha, and urea was applied in late February at a rate of 67 kg of N/ha.

Animal and Pasture Management

Animal handling and management procedures were conducted according to a research protocol that had been approved by the Institutional Animal Care and Use Committee of Auburn University. Pastures were stocked initially with 3 yearling Angus × Simmental test steers (average initial BW of 340 ± 7.1, 302 ± 19.6, and 324 ± 19.1 in 2009, 2010, and 2011, respectively) per pasture. Steers were born in the fall before the experimental year and were maintained on bermudagrass (*Cynodon dactylon* L.) pasture after weaning until the beginning of the experiment. When forage mass became limiting during the late summer, steers were given ad libitum access to bermudagrass hay. Steers were treated with moxidectin pour-on (Pfizer Animal Health, New York, NY) dewormer at the beginning of the grazing experiment in 2009 and 2011 and with doramectin pour-on (Zoetis Inc., New York, NY) in 2010. All steers had ad libitum access to salt-mineral mix (Cattlemen's Hi-Mag Beef Mineral, Southern States Cooperative Inc., Richmond, VA) and water.

Grazing was initiated when forage mass in each treatment had achieved 1,000 to 1,200 kg of DM/ha (Table 1). Steers were weighed full every 28 d, and grazing was terminated when herbage mass and quality could no longer support satisfactory animal performance. Pastures were managed under continuous stocking throughout the experiment to maintain a target herbage mass of 1,500 to 2,000 kg of DM/ha, which is intermediate to values of 1,220 and 2,230 kg of DM/ha that Hafley (1996) reported should result in maximum animal performance and forage DMI, respectively, by steers grazing ryegrass. Stocking densities were adjusted using put-and-take steers as described by Sollenberger and Burns (2001). Stocking density adjustments were made on the basis of calculations of forage mass and animal use at the time of sampling as described by Mullenix et al. (2012).

Forage Sampling and Laboratory Analyses

Herbage mass and nutritive value were determined by clipping representative 0.25-m^2 quadrats (8/pasture) immediately before grazing was initiated and every 2 wk during each