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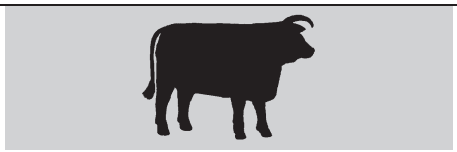

Effects of feeding perennial peanut hay on growth, development, attainment of puberty, and fertility in beef replacement heifers[1]

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ABSTRACT

The objective of this experiment was to determine the influence of supplementation with perennial peanut hay (Arachis glabrata Benth.) on growth performance and age at puberty in growing beef cattle heifers. Over a 2-yr period, 120 heifers were randomly allocated into 12 pens and assigned to 1 of 3 supplement treatments: 80% corn and 20% soybean meal supplement (CSBM), perennial peanut hay supplementation (PPH), and a control, which received no supplement (CON). All heifers received ad libitum access to bermudagrass hay [Cynodon dactylon (L.) Pers.] during the 140-d developmental phase. Following the developmental phase, heifers were commingled for an 84-d breeding season during the breeding phase. The mean age of the heifers at the initiation of yr 1 was 270 ± 21.7 d of age, and mean BW was 244 ± 23.7 kg. In yr 2, the mean was 255 ± 23.9 d of age with a mean BW of 226 ± 29.7 kg. Period influenced ADG (P = 0.002), and treatment affected ADG, with the CON tending (P = 0.06) to have lesser ADG than the CSBM and PPH heifers. There was a treatment × day interaction (P = 0.06) on mean BW, with heifers in the CON treatment being lighter at the end of the development phase (P = 0.02). Total DMI during the 140-d development phase was greater (P < 0.01) for PPH (5.3 ± 0.25 kg/heifer per d) than for CON (3.4 ± 0.25 kg/heifer per d) and CSBM heifers (4.3 ± 0.25 kg/heifer per d), with CSBM being greater than CON. There was no effect of treatment on age (P = 0.32), BW (P = 0.16), and BCS (P = 0.27) at attainment of puberty, nor the days on treatment until puberty was attained (P = 0.42). In addition, no differences in fetal age (P = 0.34) existed; however, treatment affected overall pregnancy rates (PR; P = 0.015), with PPH and CSBM heifers having greater pregnancy rates than the CON heifers. In conclusion, treatment affected the DMI, BW, and ADG, with the supplemented heifers being greater. Whereas, attainment of puberty was not affected by treatment, the overall pregnancy rate was greater for the supplemented heifers, with there being no difference between PPH- and CSBM-supplemented heifers. Therefore, PPH is a viable feed option in the southeastern United States of America for replacement-heifer development.

Key words: perennial peanut, replacement heifer, heifer development

INTRODUCTION

Critical analyses of nutritional and reproductive factors that influence the growth and reproductive maturation of replacement heifers have revealed

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benchmarks that serve as guidelines for beef-heifer development that most producers adhere to. Decades of research have led to the conclusion that BW (Nelsen et al., 1982), body composition (Buckley et al., 1990), age (Laster et al., 1972), and genetics (Baker et al., 1989) are critical components to the attainment of puberty. Producers can select genetic composition of heifers and the age at which they enter the development program, allowing the remaining factors that affect puberty to be managed nutritionally.

Replacement-heifer development can be especially challenging in the southeastern United States because the availability of high-protein feedstuffs such as ethanol by-products or alfalfa (*Medicago sativa* L.) hay is limited. Thus, alternative feeds are being explored as an option for replacement-heifer diets. A forage that is gaining popularity among producers in the southeastern United States is perennial peanut (*Arachis glabrata* Benth.). It is a warm-season legume grown in the southeastern United States for use as hay, silage, and improved pasture. Similar to alfalfa in nutritive value and appearance (Myer et al., 2009), perennial peanut forage has typical yields approximately 1 to 2 t of DM per hectare, with approximately 12,140 ha being planted in northern Florida and southern Georgia (Hill, 2002; Newman et al., 2009). Perennial-peanut hay has potential to be included in replacement-heifer feeding strategies because of its increasing availability in the southeastern United States and nutritive value (TDN = 60%, CP = 14%; Myer et al., 2009).

The objective of this experiment was to determine the influence of supplemental feeding of perennial peanut hay on growth performance and age at puberty in growing beef heifers. It was hypothesized that heifers receiving supplemental perennial peanut hay would have similar or improved growth performance and attain puberty at a similar age as contemporaries supplemented with a grain-based concentrate supplement.

MATERIALS AND METHODS

Animals and Treatments

All animal handling and care was approved and performed according to Institutional Animal Care and Use Committee guidelines. During 2 consecutive heifer development and breeding seasons (2010 and 2011), 120 (60/yr) *Bos indicus* × *Bos taurus* crossbred, spring-born heifer calves at the North Florida Research and Education Center in Marianna, Florida (30.8406191 Lat. and −85.1659651 Long.) were used. The climate at this location is subtropical to temperate, with hot humid summers and cool winters. The breed origins of the crossbred heifers used in the experiment were Angus, Brahman, Charolais, and Romosinuano. The mean age of the heifers at the initiation of yr 1 was 270 ± 21.7 d of age, and mean BW was 244 ± 23.7 kg. In yr 2 the mean was 255 ± 23.9 d of age, with a mean BW of 226 ± 29.7 kg. Heifers were weaned on August 28, 2009, for yr 1 and on July 29, 2010, for yr 2. All heifers were managed as a single herd from weaning until the initiation of the experiment (d 0) on October 20, 2009 (yr 1) and October 19, 2010 (yr 2). The experiment consisted of 2 separate phases: the development phase (d 0 to 140; phase in which treatments were applied) and the breeding phase (d 141 to 224; phase in which heifers were commingled until completion of the breeding season).

A generalized, randomized block design was used with pen serving as the experimental unit and 4 replicate pens per year per treatment, each with 5 heifers per pen. Pens were 1.3-ha paddocks containing dormant bahiagrass (*Paspalum notatum*) with limited to no forage availability for grazing and no shelter. Within year, heifers were blocked by BW and pen and then randomly assigned to 1 of 3 treatments: perennial peanut hay (*Arachis glabrata* Benth.) supplement (**PPH**), 80% corn and 20% soybean meal (44% CP) supplement (**CSBM**), or no supplement control (**CON**). The CSMB was fed to average 1.23 kg/heifer per day and the PPH was fed at 2.74 kg/heifer per day (DM basis) of each respective supplement (Table 1). Although diets were formulated to provide similar caloric intakes assuming that differences in intake of bermudagrass [*Cynodon dactylon* (L.) Pers.] hay (**BGH**) accounted for differences in supplement TDN intake to meet the requirements of a 230-kg beef heifer growing at 0.5 to 0.7 kg/d (NRC, 2000), some variations did exist in the diets (Table 2). Heifers in the CSBM and PPH treatments received supplements in each pen 3 times per week on Monday, Wednesday, and Friday and were fed in a feedbunk with adequate feeder space for all heifers to consume supplements simultaneously. Supplement feed was managed to ensure that all PPH and CSBM was consumed without any orts. Ad libitum access to BGH was allowed for all treatments throughout the development phase, with adequate feeder space for all heifers to eat at once. After completion of the development phase all heifers received 1.81 kg/heifer per day of 50% corn gluten feed and 50% soybean meal supplement (Table 3) with ad libitum access to BGH for 13 d (yr 1) or 21 d (yr 2) until annual ryegrass (*Lolium multiflorum* Lam.) pastures had sufficient growth to support all heifers grazing together until completion of the breeding season. All heifers received ad libitum access to water via automatic troughs and BGH round bales fed in ring feeders.

A complete mineral supplement was provided for ad libitum consumption and formulated for an intake of 0.11 kg/heifer per day. The mineral supplement for PPH (Ca = 12%, P = 12%, NaCl = 3%, Mg = 1%, K = 1%, S = 0%) differed from that for CON and CSBM (Ca = 14%, P = 7%, NaCl = 17%, Mg = 3.5%, K = 1%, S = 1.5%) to account for differences in mineral levels supplied by the diets.

Each year, every 28 d (periods) during the developmental phase, heifers were fasted for at least 16 h before measurement of BW, BCS, and collection of blood samples. The BCS was assigned by the same trained individ-