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Effect of daily or alternate-day distillers grains supplementation with or without monensin on performance of grazing calves[1]

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ABSTRACT

The objective of these experiments was to determine the effect of daily or alternate day supplementation of dried distillers grains with solubles (DDGS) with or without monensin on performance of grazing calves. Treatments included (1) a negative control with no supplemental feed except free-choice mineral; (2) DDGS offered daily at 1.02 kg as-fed per calf, including a mineral premix; (3) daily DDGS and monensin (Rumensin, Elanco, Greenfield, IN) at 1.02 kg as-fed per calf, including a mineral premix supplying 160 mg of monensin/calf daily; (4) alternate day DDGS to supply 2.04 kg as-fed per calf, including the mineral premix offered on alternate days; and (5) alternate day DDGS and monensin to supply 2.04 kg as-fed per calf, including a mineral premix and 320 mg of monensin/calf on alternate days. Four experiments were conducted which included both steers (n = 70) and heifers (n = 230) grazing warm season grass based pastures (Exp. 1, 2, and 3) or nontoxic endophyte-infected tall fescue (Exp. 4). Supplementation increased ADG ($P \leq 0.04$) by 0.16 to 0.26 kg/d in the 4 studies, with an average improvement ($P < 0.01$) of 0.21 kg/d. Monensin addition and supplement timing had no effect ($P \geq 0.16$) on BW, ADG, or supplemental efficiency in any of the 4 experiments. Supplementation increased ADG of growing beef calves regardless of pasture quality or basal cattle performance. The performance improvement was similar whether supplements were fed daily or on alternate days. Contrary to expected results, monensin inclusion in the supplement had no effect on animal performance or supplemental efficiency.

Key words: bermudagrass, corn dried distillers grain, growing calf, monensin, tall fescue

INTRODUCTION

Growing calves often require supplementation for maximum BW gains while grazing (Moore et al., 1999; Beck et al., 2013). Beck et al. (2013) reported warm season grass pastures in the southeastern United States have fiber content that reduces forage digestibility and limits BW gains to <0.7 kg/d, yet CP content was not limiting to animal performance, providing CP levels at 146% of NRC (1996) requirements for steers gaining 0.91 kg/d. Moore et al. (1999) stated that supplementation with RDP resulted in positive associative effects when the forage TDN to CP ratio was >7:1, whereas negative associative effects would be expected from supplementation when the ratio was <7:1 in the forage.

Gadberry et al. (2009, 2010) reported that midprotein-degradable

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fiber by-product-based supplements [cottonseed cake or dried distillers grain with solubles (**DDGS**), respectively] increased gains of growing calves grazing warm season grass by over 25%. The TDN-to-CP ratio in the introduced warm season grasses range between 4:1 and 5:1, indicating that forage DE content, not CP, is the limiting factor for growth (Beck et al., 2013). Thus, the increased performance observed in Gadberry et al. (2009, 2010) was due to the addition of energy. Performance of calves grazing tall fescue (*Festuca arundinacea* Shreb.) may be limited by unbalanced TDN-to-CP ratios of 2.5 to 5.2 during the growing season (Moore et al., 1999), which indicates a deficiency in ruminal energy availability for growth.

Along with supplying needed protein or energy, supplements are often designed to carry required minerals and ionophores (Horn et al., 2005). Ionophores, such as monensin, are commonly recommended to increase ADG of growing calves (Beck et al., 2013; Horn et al., 1981). Improved performance with ionophore additions increases the net returns of supplementation programs, which is important because of recent increases in feed costs. Additionally, increased fuel and labor costs have increased interest in supplying supplements to livestock less frequently. The current research was designed to determine the effects of supplementing beef calves grazing warm season-based pasture (Exp. 1, 2, and 3) or tall fescue (Exp. 4) pastures with DDGS on a daily or alternate day basis with or without monensin.

MATERIALS AND METHODS

Animal Management

All procedures in the following experiments were approved by the University of Arkansas Institutional Animal Care and Use Committee. The current experiment was designed as a 2 × 2 + 1 factorial arrangement of treatments. Treatments included (1) a negative control (**CNTRL**) with no supplemental feed except free-choice mineral; (2) DDGS offered daily at 1.02 kg as-fed per calf, including a mineral premix; (3) daily DDGS and monensin (Rumensin, Elanco, Greenfield, IN) at 1.02 kg as-fed per calf, including a mineral premix supplying 160 mg of monensin/calf daily; (4) alternate day DDGS to supply 2.04 kg as-fed per calf, including the mineral premix offered on alternate days; and (5) alternate day DDGS and monensin to supply 2.04 kg as-fed per calf, including a mineral premix and 320 mg of monensin/calf on alternate days. Intake of the free-choice mineral was monitored weekly. The DDGS supplements offered were completely consumed within 24 h of feeding and no orts were collected.

Throughout the experiments, CNTRL calves had ad libitum access to a salt and mineral mixture designed to meet dietary requirements (NRC, 1996) for macro and trace elements. The mineral mixture (BOVA Beef Mineral 6, Furst-McNess Co.) contained 15.7 to 18.8% Ca and 6% P from $CaCO_3$ and Ca_2PO_4, respectively, 2.5% Mg from MgO, and 18.2 to 21.8% NaCl, as well as vitamins (661,500 IU of vitamin A/kg, 661 IU of vitamin E/kg, and 66,150 IU of vitamin D/kg) and trace minerals (3,250 mg of Mn/kg from $MnSO_4$, 1,500 mg of Cu/kg from $CuSO_4$, 4,500 mg of Zn/kg from ZnO, 12 mg of Co/kg from $CoCO_3$,26 mg of Se/kg from sodium selenite, and 410 mg of I/kg from ethylenediamine dihydroiodide). Supplements provided with daily DDGS, daily DDGS and monensin, alternate day DDGS, and alternate day DDGS and monensin supplied (as-fed basis) 25.5% CP, 7% crude fat, 1.4% Ca, 2.5 to 3.5% NaCl, 2.25 mg of Se/kg, and 55,125 IU of vitamin A/kg.

Exp. 1. On May 28, 2010, 80 beef heifers (BW = 260 ± 36 kg) were implanted with Component TEG with Tylan (Elanco Animal Health) and allocated into groups of 4 by BW; groups were randomly allotted to 20 mixed crabgrass or bermudagrass 0.8-ha pastures at the University of Arkansas Southwest Research and Extension Center near Hope, Arkansas (33°42′ N, 93°31′ W), and assigned to the 5 supplementation treatments (n = 4 pastures/treatment) until October 1 for 126 d of grazing. The average stocking rate for this experiment was 444 animal-unit-days per hectare. Heifers were weighed following a 16-h removal of feed and water at the initiation and termination of grazing.

These heifers were acquired from a local cooperator and were preconditioned before arrival at the site of the experiment and were medium and large frame, USDA muscle score number 1 and 2, and exhibited signs of primarily Angus and Brangus breeding with a minority (10%) exhibiting signs of Continental origin (Simmental or Charolaise).

Pastures at this research site consisted of primarily bermudagrass (50%) and crabgrass (45%), with dallisgrass (5%) also present in the stand as determined by the step-point method (Owensby, 1973). Soils in these pastures are primarily Smithdale fine sandy loam, but also include areas of Sawyer loam, which are deep, moderately well drained, and are low in native fertility, with low-soil pH and OM. In early May of each year, pastures were fertilized with P and K to meet soil test requirements. Nitrogen (56 kg of N/ha as ammonium nitrate) was applied to bermudagrass pastures in May and June each summer (112 kg of total N/ha).

Due to inadequate forage supply, round bales of moderate quality (11% CP and 57% TDN) warm season grass hay were offered from July 15 to the end of the experiment on October 1. Hay bales were offered in round bale feeders without a skirt on bottom. Bales were replaced when approximately 20% of hay was remaining of each bale, approximately every 10 to 14 d. Hay was from the same harvest of a single meadow and was stored in a 13 × 20 m barn. Hay was sampled on July 15 before hay feeding was started.

Exp. 2. On June 29 and 30, 2011, 80 beef heifers (BW = 235 ± 28.7 kg)