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Case Study: Use of dried distillers grains, soybean hulls, or both to background beef calves fed bahiagrass hay

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ABSTRACT

Two experiments were conducted to evaluate dried distillers grains (DDG), soybean hulls (SBH), and a slow-release urea (SRU) product as supplements to background beef steer calves. In both experiments, 56 Angus steers were individually supplemented for 42 d and provided ad libitum access to bahiagrass (Paspalum notatum) hay. On d 0, 14, 28, and 42, BW were recorded and blood samples were collected. In Exp. 1, steers (BW = 236 ± 26 kg) were randomly allotted to 1 of 4 supplement treatments: 1) DDG (1.19 kg/d), 2) DDG+SRU (1.19 kg/d of DDG + 45.5 g/d of SRU), 3) SBH (2.63 kg/d), or 4) SBH+SRU (2.63 kg/d of SBH + 45.5 g/d of SRU). Final BW did not differ ($P \geq 0.74$); however, 42-d BW gain was greater ($P = 0.05$) and estimated mean total DMI was greater ($P < 0.002$) for calves consuming SBH supplements compared with those eating DDG. Addition of SRU did not affect ($P \geq 0.29$) steer performance or DMI. Plasma glucose concentrations were not affected by supplement ($P \geq 0.12$) or SRU ($P \geq 0.22$). No interaction of supplement and SRU was detected ($P \geq 0.10$). Concentrations of plasma urea N were greater ($P < 0.001$) for DDG compared with SBH, and SRU increased plasma urea N ($P \leq 0.05$). In Exp. 2, steers (BW = 274 ± 26 kg) from Exp. 1 were randomly allotted to 1 of 4 supplement treatments: 1) DDG (2.8 kg/d), 2) DDG/SBH (1.93 kg/d of DDG, 0.98 kg/d of SBH), 3) SBH/DDG (0.96 kg/d of DDG, 2.05 kg/d of SBH), or 4) SBH (3.12 kg/d). Supplement treatment had no effect ($P = 0.79$) on final BW. Across all 42 d, ADG of SBH-supplemented steers were less than those of DDG/SBH ($P = 0.05$) and SBH/DDG steers ($P = 0.03$) but similar to those of DDG steers ($P = 0.45$). Estimated mean hay DMI and estimated total DMI were less ($P < 0.05$) for the DDG-treatment steers compared with those of the other 3 treatments. Plasma glucose concentrations were not different ($P = 0.85$) between treatments. Concentration of plasma urea N increased ($P < 0.001$) with increased inclusion of DDG in the supplement on d 14, 28, and 42. Supplementing steers consuming forage with a combination of coproducts optimized calf performance. Steer cost of gain was similar ($P \geq 0.37$) among treatments that included DDG, and less ($P \leq 0.04$) than SBH only; therefore, the cost of coproduct feedstuffs would dictate the optimal proportions.

Key words: backgrounding, beef cattle, coproduct

INTRODUCTION

Backgrounding or preconditioning programs for weaned, growing beef cattle are implemented by cow-calf producers for a variety of reasons. The type and amount of feedstuffs for the backgrounding period are prime considerations in the management scheme. Feed costs are the largest expense after the cost of the calf during the backgrounding period (Peel, 2003; Savell et al., 2007a,b). The use of coproducts as feed resources for backgrounding cattle has increased with their increased availability.

Beef cow-calf producers who wish to background their calves may only have the capacity to store and handle 1 or 2 coproduct feedstuffs. Selection of the coproducts used should be based on optimizing the nutrient supply to compliment the basal forage (Hersom, 2008), coproduct palatability, and per unit price of energy and CP (Lalman et al., 2002). Supplemental feeds that are high in fermentable fiber and low in starch provide the most effective sources of energy for cattle on forage diets, because starch may interfere with fiber digestion within the rumen (Richards et al., 2006). Soybean hulls (**SBH**) are a common coproduct with a wide

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variety of applications for feeding beef cattle. Dried distillers grains (**DDG**), a product of the dry milling industry (Stock et al., 2000), have increased in availability as a result of ethanol production from corn. Both SBH and DDG can be used as a feed resource for growing cattle. However, little data exist that directly compare these 2 coproducts as supplements or in combination as supplements to high-forage diets for backgrounding cattle. Forages can be limiting in total CP and RDP supply for growing cattle; DDG and SBH may have adequate CP content but may be limited in the amount of RDP that is available. Addition of a slow-release urea (**SRU**) source may provide additional N to support rumen function at a low inclusion rate (Pinos-Rodriguez et al., 2010). This manner of N addition may improve the synchrony and efficiency of N utilization (Taylor-Edwards et al., 2009) and animal performance. It was our objective to compare SBH and DDG alone, in combination, or augmented with an SRU product as supplements for backgrounding steers on high-forage diets.

MATERIALS AND METHODS

All experimental protocols were approved by the University of Florida Institutional Animal Care and Use Committee (Protocol # E728) and conducted at the University of Florida Beef Research Unit, Gainesville.

Exp. 1 Animals and Diets

Fifty-six Angus steers, minimum age of 8 mo and weaned for 21 d, were blocked by BW (mean = 236 ± 26 kg) and randomly assigned to 1 of 7 pens and 1 of 4 treatments for 42 d. Eight steers, 2 steers per treatment, were placed in each pen. Treatments included 1) DDG (1.19 kg of DM/d of loose DDG), 2) DDG+SRU [1.19 kg of DM/d of DDG, 45.5 g of DM/d of SRU (Optigen II, Alltech, Nicholasville, KY)], 3) SBH (2.63 kg of DM/d of pelleted SBH), and 4) SBH+SRU (2.63 kg of DM/d of SBH, 45.5 g of DM/d of SRU). Basal supplements (DDG and SBH) were formulated (using CP values of 30 and 14%, respectively) to be isonitrogenous (0.36 kg of CP). Steers were offered basal supplements daily beginning 5 d before the initiation of the experiment. The SRU was first offered in the supplement on d 0. Bahiagrass (*Paspalum notatum*) hay was offered in each pen, ad libitum, as large round bales. Fresh hay bales were offered approximately each week when visual estimation indicated less than 1 d of available hay remained. No estimation of hay waste was made. Each bale was weighed and core sampled for analysis of chemical composition. Steers were individually supplemented at approximately 0700 h via a Calan gate system (American Calan, Northwood, NH). Approximately 57 g of a vitamin–mineral supplement (Lakeland Animal Nutrition, Lakeland, FL) was top dressed in the daily supplements (composition: 20% NaCl, 13% Ca, 6% P, 1% Mg, 0.95% Zn, 0.8% K, 0.4% Fe, 0.4% S, 0.22% Mn, 0.2% Cu, 0.08% F, 0.02% Co, 0.018% I, 0.005% Se, 45,400 IU/kg vitamin A, and 9,080 IU/kg vitamin D_3). One steer on the SBH+SRU treatment incurred a shoulder injury on d 21 and was unable to comfortably use the Calan gate. This steer was replaced on d 22 with a steer of similar BW that had been supplemented with 2.63 kg/d of SBH for the preceding 22 d. The replacement steer began consuming the SBH+SRU treatment on d 22.

Table 1. Composition of feedstuffs fed to growing beef steers in Exp. 1 and 2[1]

Item, % of DM unless noted	Bahiagrass hay	Dried distillers grains	Soybean hulls
DM, %	92.0	87.1	89.3
OM	93.7	94.1	96.1
CP	8.5	32.3	12.5
RDP, % of CP	52.2	27.3	58.0
NDF	70.3	32.5	67.6
ADF	38.7	16.7	47.6
Fat	1.5	13.4	2.1
TDN	54.9	84.3	61.0

[1]Laboratory analysis from Dairy One, Ithaca, NY.

Exp. 2 Animals and Diets

Fifty-six Angus steers (mean = 274 ± 26 kg) used in Exp. 1 remained in their original pens and were randomly assigned to 1 of 4 treatments. Treatments included 1) DDG (2.8 kg of DM/d), 2) DDG/SBH (1.93 kg of DM/d of DDG, 0.98 kg of DM/d of SBH), 3) SBH/DDG (2.05 kg of DM/d of SBH, 0.96 kg of DM/d of DDG), and 4) SBH (3.12 kg of DM/d). Treatments were designed to compare DDG, SBH, and reciprocal combinations. All treatments were initially formulated to be isoenergetic and provide adequate energy to achieve 0.91 kg/d of ADG. However, after analysis, SBH were 23% lower in TDN than anticipated (Table 1). All steers were fed approximately 2.7 kg/d of SBH for 5 d before the initiation of the trial. Supplement treatments began on d 0 after BW and blood collection. Bahiagrass hay was fed, sampled, and analyzed as described in Exp. 1. Steers were individually supplemented at approximately at 0700 h via a Calan gate system (American Calan). Approximately 57 g of the same vitamin–mineral supplement as Exp. 1 was top dressed in the daily supplements.

Exp. 1 and 2 Sampling and Analysis

Steers were fed for 42 d in each experiment. Unshrunk BW were taken on 2 consecutive days at the initiation