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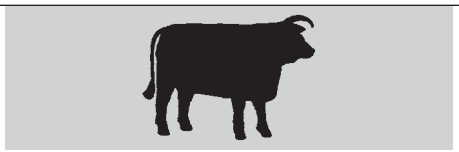

Limit feeding nonlactating, nonpregnant beef cows with bunkered wet distillers grains plus solubles or distillers solubles[1]

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ABSTRACT

Nonlactating, nonpregnant beef cows (593 ± 10.0 kg) were used in a completely randomized design to evaluate the performance of limit-fed diets containing bunkered wet distillers grains plus solubles (WDGS; n = 24) or bunkered condensed corn distillers solubles (DS; n = 22) compared with a control diet offered ad libitum (CON; n = 24). Cows were stratified by age and BW and randomly assigned to pens (3 pens/treatment, 7 or 8 cows per pen). The WDGS and DS were mixed and stored with 30% and 59% ground cornstalks (DM basis), respectively, for 30 d before feeding. Diets were fed for 76 d and formulated to maintain BW. Both WDGS and DS diets contained 41% by-product and 59% cornstalks at time of feeding, with DMI limited to 7.7 kg/d. The CON diet consisted of 43% bromegrass hay, 34% cornstalks, and 23% alfalfa haylage and was fed ad libitum (DMI = 10.4 kg/d). The WDGS diet was 4.1% fat and 0.24% sulfur. The DS diet was 5.5% fat and 0.37% sulfur on a DM basis. Initial BW and BCS among treatments were similar. Final BW was greater (P < 0.05) for cows fed WDGS (625.5 kg) than for cows fed the DS (611.8 kg) and CON treatments (610.9 kg). Gain tended (P = 0.09) to be greater for the WDGS group (0.37 kg/d) compared with the CON group (0.20 kg/d). Limit feeding diets of either WDGS or DS stored in a bunker with ground cornstalks to nonlactating beef cows results in similar performance to that of full-fed control cows.

Key words: beef cow, by-product, limit feeding

INTRODUCTION

Ad libitum intake of forages is a commonly used system for feeding mature beef cows (Schoonmaker et al., 2003). However, hay typically costs 50 to 100% more than corn per unit of energy (Loerch, 1996). It may be economically beneficial to use a limit-fed, high-energy diet to meet the requirements of mature cows. Restricted feeding of concentrates has previously been used in finishing diets without reduced performance (Loerch, 1990). Loerch (1996) reported limit feeding a corn-based diet as an alternative to hay had no negative effects on cow performance, conception rate, or calf weaning weight.

The recent expansion of the ethanol industry has increased the availability of by-products. Distillers grains are an excellent source of highly digestible fiber, and protein, and can be effectively used in combination with high-forage diets as an energy source (Klopfenstein et al., 2008). Data from a study by Klopfenstein et al. (2008) suggested that adding wet distillers grains plus solubles to finishing diets supplies NDF, reduces starch, and adds protein and moisture to the diet. Loy et al. (2008) determined cattle fed dried distillers grains plus solubles (**DDGS**) in high-forage growing diets had greater ADG and G:F compared with cattle fed a diet based on dry-rolled corn. Furthermore, researchers from the same study used the NRC (1996) model to estimate the energy value of DDGS in high-forage diets and determined the TDN content of DDGS was 27% greater than that of

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dry-rolled corn. Results from both Shike et al. (2009) and Radunz et al. (2010) indicated that both DDGS and corn-gluten feed can be successfully incorporated into limit-fed diets for beef cows. However, the effects of limit feeding beef cows either wet distillers grains plus solubles or condensed corn distillers solubles bunkered with a forage have not been previously investigated. Likewise, distillers by-products may be purchased cheaper in the summer, which makes storage in bunkers advantageous (Waterbury and Mark, 2008). Therefore, the objective of this study was to evaluate the performance of nonlactating, nonpregnant beef cows limit fed bunkered ethanol by-products mixed with low-quality forages compared with the performance of cows offered an ad libitum control diet.

MATERIALS AND METHODS

All experimental facilities and procedures described were approved by the University of Nebraska–Lincoln Institutional Animal Care and Use Committee. Nonlactating, nonpregnant beef cows (593 ± 10.0 kg) were used in a 76-d feeding experiment conducted at the University of Nebraska–Lincoln Agricultural Research and Development Center near Mead, Nebraska. Cows were stratified by age and BW and randomly assigned to 1 of 3 treatment groups (3 pens/treatment, 7 or 8 cows per pen). Pens were assigned randomly to treatments in a completely randomized design. Treatments included bunkered wet distillers grains plus solubles mixed with cornstalks (**WDGS**; n = 24), bunkered condensed corn distillers solubles mixed with cornstalks (**DS**; n = 22), and a control diet (**CON**; n = 24). Treatment diets were formulated to maintain cow BW. Diets are shown in Table 1. Cows assigned to the WDGS and DS treatments were limit fed at 7.7 kg of DM per cow daily or 1.3% of BW a diet consisting of a 41:59 ratio of by-product to cornstalks (DM basis). The CON diet consisted of 43% smooth bromegrass (*Bromus inermis*) hay, 34% cornstalks, and 23% alfalfa (*Medicago sativa*) haylage (DM basis) to provide ad libitum intake.

To prepare the material to be bunkered, cornstalks were ground through a 17.8-cm screen. Distillers solubles or wet distillers grains plus solubles and cornstalks were weighed into a Roto-Mix (Roto-Mix, Dodge City, KS) feed truck, mixed for 5 min at 1,500 rpm, and packed into a concrete bunker using a skid steer loader. The targeted by-product to cornstalks (DM basis) ratio for storage in the bunker was 65:35. However, distillers solubles material would not adequately pack at this ratio. Consequently, cornstalks were added until the material would pack for successful storage. The resulting ratio was 41:59 distillers solubles to cornstalks (DM basis). The wet distillers grains plus solubles mix was also adjusted to a storable ratio of 70:30 wet distillers grains plus solubles to cornstalks (DM basis). Wet distillers grains plus solubles and distillers solubles bunkered material was covered with plastic and stored for 30 d before feeding.

The bunkered wet distillers grains plus solubles material was mixed at feed delivery with an additional 29% cornstalks (DM basis) to attain the 41:59 by-product to cornstalks ratio. The distillers solubles mixture was fed directly from the bunker. Limestone was added to both by-product diets to achieve a minimum Ca:P ratio of 1.5:1. Salt and trace mineral blocks were offered free choice in the bunks for all treatments. Prior to trial initiation and at conclusion, cows were limit fed (1.9% of BW) a diet (40% brome hay, 10% alfalfa hay, and 50% wet corn-gluten feed; DM basis) for 5 d to minimize variation due to rumen fill. Two-day consecutive initial and final BW measurements were recorded to determine cow performance. Orts were recorded twice weekly to determine intake. Body condition score (Wagner et al., 1988) was assessed at the beginning and the end of the trial independently by 2 trained technicians.

Ether extract content was determined using the method of the AOAC (1999). It was determined in our laboratory that the more traditional Soxlet procedure overestimated lipid values in distillers solubles and wet distillers grains plus solubles, so a gravimetric fat procedure was developed to more accurately measure fat content in these feeds (Bremer et al., 2010). In this procedure, fat is determined by incubating samples in a 1:1 hexane:diethyl ether solution for 9 h. Following incubation, a dilute

Table 1. Diet and nutrient composition of diets of wet distillers grains plus solubles (WDGS) or distillers solubles (DS) stored with cornstalks before feeding and a full-fed forage control (CON) diet (DM basis)

Item	WDGS[1,2,3]	DS[1,2,3]	CON[3,4]
WDGS, %	41.0	—	—
DS, %	—	41.0	—
Cornstalks, %	59.0	59.0	34.0
Bromegrass hay, %	—	—	43.0
Alfalfa haylage, %	—	—	23.0
Diet nutrient composition, %			
DM	43.9	43.9	68.1
CP	16.0	13.6	9.3
TDN	78.4	78.4	55.8
NDF	54.8	40.9	64.3

[1]Cows limit fed at 7.7 kg/d (DM basis).

[2]Limestone added to reach a 1.5:1 minimum ratio of Ca:P.

[3]Trace mineralized salt blocks provided free choice.

[4]Cows fed ad libitum at 10.4 kg/d (DM basis).