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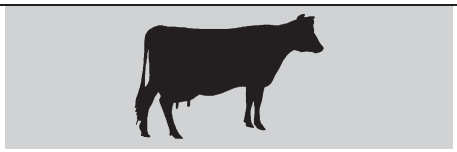

Intake and growth of prepubertal dairy heifers fed reduced-fat dried distillers grains

R. C. Schroer,* T. D. Nennich,*[1] PAS, T. S. Dennis,* M. M. Schutz,* S. S. Donkin,* and D. Little†
*Department of Animal Sciences, Purdue University, West Lafayette, IN 47907; and
†DairyNet Inc., Brookings, SD 57006

ABSTRACT

Recent growth in the ethanol industry has led to increased availability of distillers grains that have undergone various processing methods resulting in differing nutrient composition. A modified dried distillers grains product with reduced fat due to removing oil through a solvent extraction process provides a new feed option for dairy heifers. The objective of this study was to evaluate intake, feed efficiency, and growth of dairy heifers fed diets containing reduced-fat dried distillers grains with solubles (RFDGS). Holstein heifers (n = 27), averaging 161 ± 9 d of age and 157.5 ± 11.4 kg at the start of the study, were blocked according to BW and fed 1 of 3 dietary treatments. Dietary treatments included control, dried distillers grains fed at 20% of the diet DM, and RFDGS fed at 20% of the diet DM for 12 wk. Heifers were weighed every 2 wk to determine ADG. Hip and withers heights were measured on d 0, 42, and 84 of the study, and BCS were determined on d 0 and 84. Blood samples were collected via coccygeal venipuncture at the end of the study for determination of plasma urea nitrogen. In situ DM disappearance and intestinal CP disappearance were determined for feed and diet samples using lactating cows. Dry matter intake, BW gain, and feed efficiency were similar among treatments. In summary, inclusion of either DDGS or RFDGS at 20% of the diet resulted in similar intake, feed efficiency, and gains, and they are viable options for replacement dairy heifers.

Key words: dairy heifer, reduced-fat dried distillers grains, coproduct feed

INTRODUCTION

The recent interest in using ethanol as a fuel source has led to increased availability of resulting coproduct feeds, including dried distillers grains plus solubles (**DDGS**), for use in animal diets. Dried distillers grains plus solubles has proven to be a safe and economical feedstuff for livestock (Schingoethe et al., 2009; Zhang et al., 2009). When feeding DDGS to ruminant animals, the level of fat in the DDGS has raised concerns because of the potential to cause milk fat depression in lactating animals (Leonardi et al., 2005; Schingoethe et al., 2009, Zanton et al., 2013). However, the fat concentration in DDGS can be accounted for during diet formulation and is less likely to cause concern in growing animals.

There is limited research on the inclusion of DDGS in the diets of dairy heifers. A review by Schingoethe et al. (2009) reported that DDGS can be successfully included in diets of calves and heifers, and Suarez-Mena et al. (2011) found that inclusion of DDGS at rates of up to 20% in calf starter resulted in similar growth of calves. Also, Holstein heifers fed a coensiled mixture of wet distillers grains and soyhulls had similar growth performance compared with heifers fed a corn and soybean–based grain mix (Anderson et al., 2009).

Recently, new varieties of DDGS with different nutrient compositions have become available; however, it is not known how these new types of DDGS affect animal growth and performance. In addition, there is potential for variations in digestibility to occur when distillers grain are processed differently and have different levels of fat (Tedeschi et al., 2009; Kelzer et al., 2010). Variations in the site or extent of digestion can affect the efficiency with which heifers are able to use various feeds for growth. Understanding how different types of distillers grains affect digestibility and performance of animals is important as additional types of distillers grains become available.

Reduced-fat dried distillers grains with solubles (**RFDGS**) is becoming an option for feeding livestock. Mjoun et al. (2010a) fed diets containing ei-

[1] Corresponding author: tnennich@purdue.edu

ther RFDGS or common DDGS, containing 3.5 or 10.8% ether extract, respectively, at 20% of the dietary DM to early lactation cows. In this study, feeding RFDGS had no effect on DMI, milk yield, BW, or BCS (Mjoun et al., 2010a). As there is currently no information available on the effect of feeding RFDGS to dairy heifers, the objective of this study was to evaluate the feed efficiency and growth performance of prepubertal Holstein dairy heifers fed diets containing common DDGS or RFDGS.

MATERIALS AND METHODS

All procedures used for handling animals were approved by the Purdue University Animal Care and Use Committee (PACUC #08–050). Twenty-seven Holstein heifers, provided by CalfCare Enterprises (Dr. Jan Gawthrop, North Manchester, IN), averaging 157.5 ± 11.4 kg and 161 ± 9 d of age, were blocked by BW and randomly assigned within block to 1 of 3 treatments with 9 heifers per treatment. Treatment diets are shown in Table 1 and included control (**CON**), dried distillers grains fed at 20% of the diet DM (DDGS), and RFDGS fed at 20% of the diet DM (RFDGS). Diets were formulated to meet or exceed nutrient requirements using the Dairy NRC (2001) and were balanced to be isocaloric and isonitrogenous. The fat content of the RFDGS product used for this study was reduced using a proprietary solvent extraction process (VeraSun Energy Corporation, Sioux Falls, SD, patent pending), and the DDGS used in this study was sourced from the same location but without undergoing the extraction process. Heifers were housed in barns in individual pens that were 2.2 × 11.6 m. Half of each pen was indoors (roof covered), and the remaining portion was outside. Pen flooring was concrete, and the indoor portion was covered with sawdust bedding. The pens had elevated concrete feed bunks, and each heifer had an individual automatic watering trough. The heifers were fed ad libitum once daily to allow for 3 to 5% orts using a data ranger (American Calan Inc., Northwood, NH). Orts were collected and recorded daily.

Heifers were weighed on 1 d once every 2 wk. Hip heights and withers heights were collected at the beginning, middle, and end of the study (d 0, 42, and 84). Body condition score was evaluated on a scale of 1 to 5 by 2 independent observers and averaged to determine BCS on d 0 and 84 (Heinrichs and Ishler, 2010). The evaluators of BCS were the same for both observations. Blood samples were collected via coccygeal venipuncture at the end of the study to determine plasma urea N. Blood samples (10 mL) were collected in the morning immediately before feeding into Vacutainer tubes containing lithium heparin. Plasma was aspirated following centrifugation (2,500 × *g* for 15 min at 4°C) and frozen at −20°C for later analysis. One heifer on the CON treatment was removed from the study during the final week because of respiratory health problems, and measurements from d 84 were not included in the study. At the end of the study, all heifers were returned to the ownership of CalfCare Enterprises Inc. to finish development before being returned to their herds of origin.

Table 1. Ingredient composition of treatment diets[1]

Ingredient, % of dietary DM	CON	DDGS	RFDGS
Corn silage	40.9	36.2	33.8
Dried distillers grains with solubles	0.0	20.0	0.0
Reduced-fat dried distillers grains with solubles	0.0	0.0	20.0
Corn, ground	21.5	16.6	19.5
Cottonseed hulls	17.7	17.7	17.6
Soybean meal	18.5	8.1	7.7
Vitamins and minerals[2]	1.4	1.4	1.4

[1]CON = corn–soybean meal control diet; DDGS = dried distillers grains diet; RFDGS = reduced-fat dried distillers grains diet.

[2]Vitamin and mineral mix contained 23.8% Ca, 5.5% Na, 8.5% Cl, 2.6% P, 1.9% Mg, 5,255 mg/kg Zn, 3,775 mg/kg Mn, 2,145 mg/kg Cu, 76 mg/kg I, 26 mg/kg Co, 23 mg/kg Se, 757,000 IU/kg vitamin A, 95,000 IU/kg vitamin D, and 3,654 IU/kg vitamin E.

Sample Collection and Analysis

Samples of individual feeds and mixed diets were collected weekly. The samples were dried at 55°C using a forced-air drying oven, and DM calculations were used to determine DMI. Individual samples were ground through a Wiley Mill (Arthur H. Thomas Co., Philadelphia, PA) using a 1-mm screen. Samples were composited by month before analysis. The composited samples were analyzed by DairyOne Forage Analysis Laboratory (Ithaca, NY) for chemical analysis. The analyses reported included CP (AOAC International, 2000; method 990.03), ADF (AOAC International, 2000; method 973.18; using an ANKOM A200 Digestion Unit, Ankom, Macedon, NY), NDF (Van Soest et al., 1991; using an ANKOM A200 Digestion Unit, Ankom), crude fat (AOAC 2003.05 with extraction using anhydrous diethyl ether using the Soxtec HT6 system; Foss North America, Eden Prairie, MN), and minerals (Ca, P, Mg, K, Na, and S; Thermo IRIS Advantage HX or Intrepid Inductively Coupled Plasma Radial Spectrometer after microwave digestion; Thermo Fisher Scientific Inc., Waltham, MA). Energy values, NE_m and NE_g, were calculated by DairyOne Forage Analysis Laboratory using Dairy NRC (2001) equations. To determine in situ disappearance and in vitro intestinal CP digestibility, samples of diets and distillers grains (1.5 g) were placed into 3 × 5 cm Ankom digestibility bags (Ankom

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