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Feeding fat from distillers dried grains with solubles to dairy heifers: I. Effects on growth performance and total-tract digestibility of nutrients

J. L. Anderson, K. F. Kalscheur,[1,2] A. D. Garcia, and D. J. Schingoethe
Dairy Science Department, South Dakota State University, Brookings 57007

ABSTRACT

The objective of this study was to determine if increased dietary fat from dried distillers grains with solubles (DDGS) in diets of growing heifers affected dry matter intake, average daily gain (ADG), growth performance, and nutrient digestibility. Thirty-three Holstein heifers (133 ± 18 d old) were used in a 24-wk randomized complete block design. Treatments were (1) control (CON) containing ground corn and soybean products, (2) low-fat (LFDG) containing low-fat, high-protein DDGS and ground corn, and (3) high-fat (HFDG) with traditional DDGS. All diets contained 39.8% grass hay, 24.8% corn silage, and 1.5% vitamins and minerals. The HFDG diet was formulated to contain 4.8% fat compared with 2.8% in the CON and LFDG diets, which were greater in nonfibrous carbohydrate. Diets had a net energy gain of 1.0 Mcal/kg of dry matter and were limit-fed at 2.45% of body weight. Heifers were weighed every 2 wk and rations were adjusted accordingly. Heart girth, hip and wither heights, body length, and body condition score were recorded every 2 wk. Total-tract digestion of nutrients was evaluated during wk 16 using fecal grab sampling and an external marker. No treatments by time interactions were found. Dry matter intakes, body weights, ADG, and gain-to-feed ratio were similar among treatments; however, ADG averaged 0.96 kg/d among treatments, which is greater than recommended. All body frame measurements and body condition scores were similar among treatments. Total-tract digestibilities of dry matter and organic matter were not different among treatments. However, crude protein and neutral detergent fiber digestibility were increased in the HFDG diet compared with the CON and LFDG diets. These results demonstrate that using DDGS or low-fat DDGS with corn in growing heifer rations can maintain performance. Utilizing the fat in DDGS as a dietary energy source in replacement of starch from corn did not influence growth performance or negatively affect nutrient digestion.

Key words: distillers grains, dairy heifer, dietary fat

INTRODUCTION

Very limited research regarding the feeding of dried distillers grains with solubles (**DDGS**) to growing dairy replacement heifers over long periods of time is available. Only a few studies (Anderson et al., 2009; Suarez-Mena et al., 2013; Schroer et al., 2014) have been published on feeding distillers grains to dairy heifers. These studies typically fed heifers for only a few weeks to a few months and with dietary inclusion rates of distillers grains at less than 25% of diet DM. Despite this lack of research, it has been observed in the field that dairy producers are feeding heifers distillers grains over longer periods because it is economically attractive compared with corn and soybean meal. This is a cause for concern because little substantiated knowledge and only circumstantial evidence exists on how it affects heifer growth performance and nutrient utilization. Some understanding of the effects of feeding distillers grains to dairy heifers can be implied from comparatively abundant research on beef cattle or mature dairy cattle (Klopfenstein et al., 2008; Schingoethe et al., 2009). However, more research on specifically feeding distillers grains to dairy heifers is warranted.

Past research (Klopfenstein et al., 2008; Anderson et al., 2009; Schingoethe et al., 2009) demonstrated that feeding distillers grains can improve feed efficiency. Improvements in efficiency are thought to be from the additional fat, fermentable fiber, and RUP provided by distillers grains, compared with nutrients from corn and soybean meal (Klopfenstein et al., 2008; Schingoethe et al., 2009). When considering whether to feed dairy heifers distillers grains, the additional dietary fat is of particular concern. Traditional dairy heifer diets typically contain between 2 to 3% fat. In research by Anderson et al. (2009), it was noticed that dietary fat was close to 5% when a large portion of the heifer diet was distillers wet grains with solubles. Lammoglia et al., (2000) found with beef heifers that leaner breeds exhib-

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[1]Corresponding author: kenneth.kalscheur@ars.usda.gov
[2]Current address: US Dairy Forage Research Center, USDA-ARS, 1925 Linden Drive West, Madison, WI 53706.

ited increased sensitivity to dietary fat compared with fatter breeds. We speculated that because Holsteins are a leaner breed of cattle an increase from 2 or 3 to 5% dietary fat could alter heifer growth performance.

In the past, the unique composition of distillers grains has made it difficult to formulate experimental diets to examine the specific effects of its fat component without also altering dietary protein or fiber composition. Recently, however, the ethanol industry began to manufacture a new product, low-fat DDGS or reduced-fat DDGS. With low-fat DDGS, diets could be formulated that are close in protein and fiber composition compared with traditional DDGS but different in fat and starch composition. Because of the newness of low-fat DDGS only a few studies have been published on feeding it to ruminants and only one study was found by the authors on feeding it to dairy heifers. Over a 12-wk period, Schroer et al. (2014) fed growing dairy heifers a ration containing low-fat DDGS at 20% of the diet versus a ration containing traditional DDGS at 20% of the diet or a control diet formulated with corn and soybean meal. To make diets isocaloric, Schroer et al., (2014) did vary corn silage and corn grain across treatments, which caused variation in dietary compositions of fiber and fat. Starch and NFC dietary compositions were not reported. Their research found that hip heights, ADG, DMI, and feed efficiency were similar among treatments, indicating that total dietary energy may have more influence on growth performance than form of energy. In contrast to the Schroer et al., (2014) study, we wanted to conduct a longer experiment on feeding DDGS in which only fat and starch content varied, whereas forage fiber content was more consistent across treatments.

The objective of the present study was to determine the effects on growth performance and nutrient digestion of heifers fed increased dietary fat from DDGS over a longer period of time (6 mo). A secondary objective was to compare the 2 distillers grains diets to a control diet containing corn and soybean meal. This helped determine if effects of the fat or starch on protein and fiber utilizations could be detected. Overall effects were determined by measuring a variety of parameters, including gain-to-feed ratios, body frame growth, and total-tract digestibility of DM, CP, and NDF. We hypothesized that when fat from DDGS was fed as a replacement for starch from corn, growth performance would be maintained as dietary energy was formulated to be consistent across treatments. However, it was also hypothesized that total-tract digestibilities of protein and fiber may slightly decrease with additional fat in the diet. Differences in nutrient utilization could also potentially alter growth performance.

MATERIALS AND METHODS

Experimental Design

Thirty-six Holstein heifers (133 ± 18 d old) were used in a randomized complete block design with 3 treatment diets. Three heifers were removed from the study for reasons described herein. Heifers were blocked in groups of 3 based on birth date. After assignment to block, heifers were randomly assigned to treatment. Heifers were started on the study at different times in multiples of 3, with the target of starting to feed treatment diets at 4.5 mo of age. Heifers were acclimated to the barns and feeding system for approximately 2 wk, followed by an experimental feeding period of 24 wk. The feeding portion of the study was completed over a 20-mo period from May 2009 through December 2010, because of the staggered start dates for each group and pen availability.

Treatment diets fed were (Table 1) a corn-soybean meal control diet (**CON**), a diet utilizing a low-fat DDGS with corn (**LFDG**), and a higher-fat diet containing traditional DDGS (**HFDG**). The diets were formulated to be isonitrogenous and isocaloric. Diets were formulated using the NRC (2001) software to provide for 0.8 kg/d of ADG when fed to a 250-kg Holstein heifer at 2.45% of BW on a DM basis. The 250 kg of BW was the rough preestimated average for heifers on the study based on age range and herd data. The HFDG diet was formulated first for high inclusion of DDGS (33.8%) and, consequently, higher fat content compared with the other diets. The HFDG was formulated to be 4.8% ether extract (**EE**) versus 2.6% EE in the LFDG and CON diets. After the HFDG diet was formulated, the LFDG and CON diets were formulated for similar energy and CP content. Diets were formulated to provide 16.3% CP, 9.8% RDP, and 6.5% RUP as a percent of DM. The protein sources in the LFDG and HFDG were formulated to be similar in protein composition by using low-fat DDGS with corn in LFDG and traditional DDGS in HFDG. This also resulted in close formulation of other nutrients between these 2 diets, such as nonforage fiber, allowing for the observation of specific effects of fat from DDGS. The RUP and RDP concentrations were balanced in CON to match the concentration in DDGS diets by using expeller soybean meal and regular soybean meal as protein sources. The expeller soybean meal also helped to balance the formulated EE content between the LFDG and CON diet. Comparison of the 2 diets containing DDGS to CON allowed for observation of the effects of fat versus starch on the utilization of other nutrients such as protein and fiber.