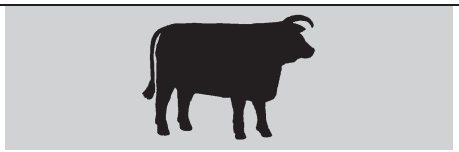
The Professional Animal Scientist 29 (2013):518–528



Effects of reduced-fat modified wet distillers grains with solubles on beef steer performance and carcass composition

J. L. Veracini,* P. M. Walker,*[1] PAS, B. R. Wiegand,† R. L. Atkinson,‡ M. J. Faulkner,* and L. A. Forster§[2]

*Department of Agriculture, Illinois State University, Normal 61761; †Division of Animal Science, University of Missouri, Columbia 65211; ‡Department of Animal Science, Food and Nutrition, Southern Illinois University, Carbondale 62901; and §Archer Daniels Midland Co., Decatur, IL 62526

ABSTRACT

Two experiments were conducted to examine feedlot performance and carcass characteristics of beef steers fed reduced-fat, modified wet distillers grains with solubles (RMDGS). Angus cross steers were stratified by BW in each experiment and assigned to 20 pens containing either 6 or 7 steers per pen. In Exp. 1, pens were randomly assigned to 1 of 4 diets containing 15% corn silage and 1) 25.0% RMDGS and 57.04% whole shelled corn (25 RMDGS); 2) 40.0% RMDGS and 42.69% whole shelled corn (40 RMDGS); 3) 70.0% RMDGS and 12.49% whole shelled corn, fed 84 d, then switched to 40 RMDGS (70/40 RMDGS); 4) 70.0% RMDGS and 12.49% whole shelled corn (70 RMDGS). In Exp. 2, the same diets were fed except 70/40 RMDGS was replaced with a diet containing 73.16% whole shelled corn and 9.60% soybean meal (0 RMDGS). In Exp. 1, no significant differences in DMI, ADG, G:F, or carcass characteristics were found. In Exp. 2, DMI increased ($P = 0.003$) with increasing RMDGS. In Exp. 2, LM samples from 2 steers in each pen at each slaughter date were analyzed. There were no differences ($P > 0.05$) in percentage of moisture, fat, or cooking loss in shear force of rib steaks among treatments. Steers fed the 70 RMDGS diet produced rib steaks with lower a ($P < 0.05$) following 7 d of chilled storage. Fatty acid analysis showed an increase ($P < 0.05$) in SFA at the expense of MUFA because of RMDGS supplementation. Increases were observed in PUFA, PUFA/SFA, conjugated linoleic acid, and omega-6 fats, with increasing RMDGS. Steers fed 70 RMDGS had inconsistent feedlot performance with a trend for lighter HCW, lower QG, and reduced meat quality.*

Key words: beef steer, carcass characteristic, distillers grains, finishing performance, reduced fat

INTRODUCTION

Distillers grains with solubles (**DGS**) are the main by-product of the fuel ethanol industry and are a source of protein (24 to 30% CP) and energy (6 to 12% fat) (NRC, 1996; Uwituze et al., 2010). Distillers grains with solubles are increasingly used as a feedstuff in the cattle industry because of their availability, nutrient value, and lower relative cost to shelled corn (Leupp et al., 2009). Considerable research has evaluated the dietary inclusion of DGS below 40% of the diet DM (Leupp et al., 2009; Vander Pol et al., 2009; Schoonmaker et al., 2010). It has been shown that DGS can be used as a protein and energy source up to 40% of the diet DM with no adverse effects on performance or meat qual-

[1] Appreciation is expressed to Archer Daniels Midland, Decatur, Illinois, and to the Illinois Corn Marketing Board, Bloomington, Illinois, for partial funding of these experiments.

[2] Corresponding author: pwalker@ilstu.edu

ity (Klopfenstein et al., 2008). Ham et al. (1994) fed high-fat wet distillers grains plus thin stillage as 40% of the diet and observed a greater BW gain and improved efficiency without negative effects on carcass characteristics. However, Gunn et al. (2009) compared inclusion rates of dried DGS at 50% versus 25% inclusion combined with corn protein and vegetable oil and observed that 50% dried DGS resulted in lower marbling scores and QG. Little research has evaluated DGS inclusion rates above 50%. In an experiment conducted by Atkinson et al. (2012) no significant differences were observed in carcass characteristics when low-fat, modified wet DGS were fed at a 70% inclusion rate for a portion of the feeding period compared with shelled corn and 40% low-fat, modified wet DGS diets.

According to Gunn et al. (2009), as the combination of dietary fat and CP increase in the diet, performance characteristics and meat quality characteristics are negatively affected. However, little attention has been given to the fat content of DGS in most research and a paucity of information is available regarding modified wet DGS inclusion levels above 50% on performance and meat quality characteristics.

Our hypothesis was that steers fed 70% of the dietary DM as reduced-fat, modified wet distillers grains with solubles (**RMDGS**) would have lower DMI, ADG, and QG with little effect on meat quality compared with steers fed 0, 25, or 40 RMDGS. The objectives of these experiments were to evaluate feedlot performance as well as selected carcass characteristics and meat quality of growing–finishing beef steers fed 25, 40, or 70% of the dietary DM as RMDGS.

MATERIALS AND METHODS

Animals and Diets

Care and handling of animals used in this experiment was approved by the Illinois State University Animal Care and Use Committee. In Exp. 1, 130 Angus crossbred steers (356 ± 42 kg initial BW, n = 6 or 7 per pen) were stratified by BW to 20 pens with unequal treatment replication. Pens were randomly assigned to 1 of 4 treatments (Table 1): 1) 25.0% RMDGS, 57.04% whole shelled corn, and 15.0% corn silage (**25 RMDGS**; n = 6 pens); 2) 40.0% RMDGS, 42.69% whole shelled corn, and 15.0% corn silage (**40 RMDGS**; n = 6 pens); 3) 70.0% RMDGS, 12.49% whole shelled corn, and 15.0% corn silage fed 84 d then switched to 40 RMDGS (**70/40 RMDGS**; n = 6 pens); and 4) 70.0% RMDGS, 12.49% whole shelled corn, and 15.0% corn silage (**70 RMDGS**; n = 2 pens). Exp. 1 was designed as a follow-up experiment to the research reported by Atkinson et al. (2012), who observed no effect on steer performance when feeding a 40/70 versus a 70/40 low-fat, modified wet DGS diet for a portion of the finishing period. Atkinson et al. (2012) hypothesized that steers would consume 70% modified wet DGS but may not be able to sustain that intake without fatalities due to sulfur toxicity. Thus, in Exp. 1, only 2 pens of steers were fed an inclusion rate of 70% RMDGS for the entire feeding period because the length of the experiment in which Atkinson et al. (2012) did not observe any symptoms of sulfur toxicity consisted of fewer days than the proposed number of days for Exp. 1. Because no sulfur toxicity was observed in Exp. 1, more steers were fed the 70 RMDGS diet in Exp. 2.

Based on the results of Exp. 1, Exp. 2 was designed using 140 Angus cross steers (367 ± 31 kg initial BW) stratified by BW to 20 pens with unequal treatment replication. Pens were randomly assigned to 1 of 4 treatments (Table 1): 1) 73.16% whole shelled corn, 9.60% soybean meal, and 15.0% corn silage (**0 RMDGS**; n = 2 pens); 2) 25.0% RMDGS, 57.04% whole shelled corn, and 15.0% corn silage (25 RMDGS; n = 6 pens); 3) 40.0% RMDGS, 42.69% whole shelled corn, and 15.0% corn silage (40 RMDGS; n = 6 pens); 4) 70.0% RMDGS, 12.49% whole shelled corn, and 15.0% corn silage (70 RMDGS; n = 6 pens). These 2 experiments were conducted in succeeding years. Exp. 1 started in late fall and ended during July, and Exp. 2 started in January and ended during August.

Steers in Exp. 1 were fed twice daily at 0800 h and 1500 h, and steers in Exp. 2 were fed once daily at 0800 h. At the start of Exp. 1 and Exp. 2, steers were initially adjusted to their respective treatment diet at a 50:50 (concentrate to forage) ratio and were stepped up to 85:15 over a 35-d period by increasing the concentrate portion and decreasing the forage 5% every 7 d. Steers in Exp. 1 and 2 were housed in an open-front building with concrete floors providing 12.3 m^2/steer. Steers had ad libitum access to fresh water via automatic water fountains and were fed in fence line bunks. The RMDGS used in this experiment were produced by a dry grind process with front end partial degermination of the corn kernel and contained 6.92 ± 1.84% ether extract and 23.0 ± 2.75% CP (Table 1). The RMDGS were received 454.5 mt at a time and stored in a concrete bunker silo. The storage procedure included leveling the top of the piled RMDGS, sprinkling the top surface area with 4.9 kg of salt/m^2, covering the top surface with plastic, and removing RMDGS from the face as needed. Because the RMDGS in this bunker was used for more than a single experiment, each 454.5 mt was fed and replaced approximately every 160 d during both Exp. 1 and Exp. 2.

Percentages of Ca, P, and S as a percentage of the diet, before Ca supplementation, were different ($P = 0.001$) among treatments. Therefore, ground limestone was added as a source of Ca resulting in higher ($P = 0.001$) Ca as RMDGS increased in the diet but similar Ca:P ratios between diets (Table 1).

Growth Performance Analysis

Steers in Exp. 1 and 2 were weighed on 2 consecutive days before feeding and the BW averaged at the beginning and the end of the feeding period. Steers were weighed monthly to monitor ADG. Gain-to-feed ratio