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Optimizing the Length of Feeding an Elevated Level of Dried Distillers Grains plus Solubles-Soybean Hull Diet to Feedlot Cattle

J. W. Homm,* L. L. Berger,*[1] PAS, L. A. Forster Jr.,† and T. G. Nash*
*Department of Animal Sciences, University of Illinois, Urbana 61801;
and †Archer Daniels Midland Company, Decatur, IL 62526

ABSTRACT

The rapid expansion of ethanol production has resulted in an abundance of co-products available to cattle feeders. Two hundred forty steers were used to determine the optimum length of time for feeding a diet containing 40% dried distillers grains with solubles (DDGS) and 35% soybean hull (SH, DM basis) to feedlot cattle. Treatments consisted of feeding the DDGS-SH diet for 56, 84, 112, 140, and 196 d before switching to a corn-based finishing diet. All cattle were harvested after 196 d and serial ultrasound measurements were taken every 28 d. Data were analyzed for linear and quadratic effects, and orthogonal polynomial contrasts of 56 vs. 196 and 84 vs. 112 to 140 d were analyzed. Adjusted final BW and ADG increased linearly (P < 0.01) and G:F decreased linearly as length of time on the DDGS-SH diet increased. Dry matter intake increased linearly as days on the DDGS-SH diet increased. Adjusted final BW tended (P = 0.09) to be greater and ADG was greater (P = 0.01) for 196-d steers than 56-d steers. However, G:F was reduced (P < 0.01) for 196-d steers compared with 56-d steers. Dry matter intakes were greater (P < 0.01) for 196-d steers than 56-d steers. Liver scores and hot carcass weights increased linearly (P = 0.04) as days on the DDGS-SH diet increased. Cost of gain was not significantly different. These data indicate that the use of a DDGS-SH diet can achieve comparable performance and carcass characteristics to cattle fed a typical corn finishing diet.

Key words: distillers dried grains with solubles, soybean hull, beef, performance

INTRODUCTION

The rapid expansion of ethanol production has resulted in an abundance of co-products available to cattle feeders, which may offer an advantage to them by decreasing feed prices without hindering performance. Combining co-products that complement each other may improve production efficiency. For example, distillers grains are high in protein, phosphorus, and sulfur. Soybean hulls are relatively low in these 3 nutrients and would dilute their concentration in the total diet. Larson et al. (1993) reported that wet distillers co-products averaged 169 and 128% of the energy value of corn when fed to yearlings and calves, respectively. Recent research has demonstrated that cattle consuming co-product diets can gain over 1.4 kg/d (Buckner et al., 2007a, b; Huls et al., 2008). The objective of this trial was to determine the optimum length of feeding a distillers grain-soybean hull diet to growing-finishing cattle as determined by animal performance and carcass characteristics and to evaluate if beef steers can be finished on a diet that contains limited corn.

MATERIALS AND METHODS

Animals and Management

Two hundred forty steers were obtained from central Kentucky. Upon arrival, all steers were vaccinated

[1] Corresponding author: llberger@uiuc.edu

Table 1. Ingredients and nutrient composition of distillers-soybean hull diet

Item	%, DM basis
Dried distillers grain	40.00
Soybean hulls	35.00
Corn silage	15.00
Ground corn	9.01
Limestone	0.68
Rumensin (80)	0.02
Thiamine	0.03
Trace-mineralized salt[1]	0.10
Copper sulfate	0.01
Vitamins A, D, and E	0.01
Liquid fat	0.15
Nutrient composition (%DM basis)	
CP	17.1
ADF	29.4
NDF	47.4
Calcium	0.75
Phosphorus	0.44

[1]Trace-mineralized salt contained 81 to 86% NaCl, 2.57% Fe, 2.86% Zn, 5,710 mg/kg Mn, 2,290 mg/kg Cu, 100 mg/kg I, and 85.7 mg/kg Se.

for infectious bovine rhinotracheitis, parainfluenza-3 (TSV-2, Pfizer, Exton, PA), bovine viral diarrhea, bovine synctical respiratory virus (Bovishield-4, Pfizer), and *Pasturella hemolytica* (One Shot, Pfizer) and given a visual and electronic identification. Additionally, all steers were implanted with Component E-S (20 mg estradiol benzoate, 200 mg progesterone; VetLife, Overland Park, KS) at receiving and re-implanted with Component TE-S (24 mg estradiol, 120 mg trenbolone acetate; Vet life) after 84 d on feed (**DOF**).

At the start of the trial, all steers were weighed (304.5 ± 39.5 kg) and allotted to pens (8 head per pen, 6 pens per treatment) based on BW and hide color. Steers were housed in open fronted, south exposure barns with automatic waters. Pens were concrete slatted floors covered with 1.8-cm thick rubber mats. Each pen was 4.9 m^2, which provide 3.0 m^2 of floor space per steer. Dietary treatments of 56, 84, 112, 140, and 196 d on distillers-soybean hull diet (Table 1) were randomly assigned to pens. One week before being placed on the finishing diet (Table 2), steers were placed on an adaptation diet (Table 3). Diets were formulated to meet or exceed the 1996 NRC nutrient requirements of beef cattle (NRC, 1996). All steers were fed for 196 d. Body weights and ultrasound measurements of backfat, marbling score, and ribeye area were taken at 28-d intervals throughout the trial. Animals used in this trial were managed according to the guidelines recommended in the *Guide for the Care and Use of Agriculture Animals in Agriculture Research and Teaching* (Consortium, 1988). Experimental protocols were reviewed and approved by the University of Illinois Institutional Animal Care and Use Committee.

Performance Data Collection

Steer weight and ultrasonic measurements of 12th to 13th backfat thickness (**BF**), marbling score, and LM area were recorded approximately every 28 d throughout the feeding period to evaluate live animal performance. Daily feed intake was recorded using the GrowSafe automated feeding system (GrowSafe Systems Ltd., Airdrie, Alberta, Canada). Final individual animal ADG and G:F were calculated based on carcass adjusted final weights, which were calculated by dividing hot carcass weight (**HCW**) by the average dressing percent of the slaughter group. Interim gains and efficiencies were calculated by multiplying the full weight by 0.96. Steers were harvested after 196 DOF.

Carcass Data Collection

Steers were harvested at a commercial processing facility. Animals were stunned via captive bolt pistol and exsanguinated. Individual carcass measurements were taken for HCW and liver score on the day of harvest, and BF, LM area, KPH percentage, and marbling score were collected by trained university personnel after a 24-h chill at −4°C. An image of the LM was made using chromatography paper, and planometer measurements of the image were used to measure LM area. University

Table 2. Ingredient composition of finishing diet

Ingredient	%, DM basis
Dried distillers grain	25.00
High-moisture corn	57.00
Corn silage	8.00
Ground corn	8.57
Limestone	0.65
Urea	0.50
Rumensin (80)	0.02
Trace-mineralized salt[1]	0.10
Copper sulfate	0.01
Vitamins A, D, and E	0.01
Liquid fat	0.15
Nutrient composition (% DM basis)	
CP	15.2
ADF	9.2
NDF	21.7
Calcium	0.52
Phosphorus	0.41

[1]Trace-mineralized salt contained 81 to 86% NaCl, 2.57% Fe, 2.86% Zn, 5,710 mg/kg Mn, 2,290 mg/kg Cu, 100 mg/kg I, and 85.7 mg/kg Se.

Table 3. Ingredient composition of adaptation diet

Ingredient	%, DM basis
Dried distillers grain	35.00
High-moisture corn	40.00
Corn silage	15.00
Ground corn	8.57
Limestone	0.65
Urea	0.50
Rumensin (80)	0.02
Trace mineralized salt[1]	0.10
Copper sulfate	0.01
Vitamins A, D, and E	0.01
Liquid fat	0.15

[1]Trace-mineralized salt contained 81 to 86% NaCl, 2.57% Fe, 2.86% Zn, 5,710 mg/kg Mn, 2,290 mg/kg Cu, 100 mg/kg I, and 85.7 mg/kg Se.