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Comparison of corn and grain sorghum dried distillers grains as protein supplements for growing beef heifers

Abstract

An experiment was conducted to determine if corn and grain sorghum dried distillers grains could be effective protein supplements for growing beef replacement heifers. Crossbred heifers (n=77) were individually fed 6 lb/heifer daily (dry matter basis) of supplements containing 20% crude protein. The three supplements compared were: 1) 50% cracked corn, 25% soybean meal, and 25% ground grain sorghum; 2) 50% cracked corn and 50% corn distillers grains with solubles; and 3) 50% cracked corn, 31% sorghum distillers grains with solubles, and 19% ground grain sorghum. Heifers grazed a common native-grass pasture and had free-choice access to smooth broom hay in round bale feeders. During the last week of the trial, heifers (n=4) from each supplement were used to determine diet digestibility. Although there were no differences in weight gain or total diet digestibility, dry matter intake as a percentage of body weight was less for heifers receiving supplements containing dried distillers grains from either corn or grain sorghum. Our data indicate that producers can expect similar growth performance, regardless of the grain source of dried distillers grains used to formulate a 20% crude protein supplement fed at about 1% of body weight daily.

Keywords

Cattlemen's Day, 2006; Kansas Agricultural Experiment Station contribution; no. 06-205-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 959; Beef; Corn; Grain sorghum; Dried distillers grains; Heifers

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COMPARISON OF CORN AND GRAIN SORGHUM DRIED DISTILLERS GRAINS AS PROTEIN SUPPLEMENTS FOR GROWING BEEF HEIFERS

K. W. Harborth, T. T. Marston, and D. A. Llewellyn

Summary

An experiment was conducted to determine if corn and grain sorghum dried distillers grains could be effective protein supplements for growing beef replacement heifers. Crossbred heifers (n=77) were individually fed 6 lb/heifer daily (dry matter basis) of supplements containing 20% crude protein. The three supplements compared were: 1) 50% cracked corn, 25% soybean meal, and 25% ground grain sorghum; 2) 50% cracked corn and 50% corn distillers grains with solubles; and 3) 50% cracked corn, 31% sorghum distillers grains with solubles, and 19% ground grain sorghum. Heifers grazed a common native-grass pasture and had free-choice access to smooth broom hay in round bale feeders. During the last week of the trial, heifers (n=4) from each supplement were used to determine diet digestibility. Although there were no differences in weight gain or total diet digestibility, dry matter intake as a percentage of body weight was less for heifers receiving supplements containing dried distillers grains from either corn or grain sorghum. Our data indicate that producers can expect similar growth performance, regardless of the grain source of dried distillers grains used to formulate a 20% crude protein supplement fed at about 1% of body weight daily.

Introduction

With the expansion of ethanol production in Kansas, the availability of ethanol co-products will continue to increase. There are many uses for these co-products as animal feed due to their high protein and energy con-

tent, but the physical characteristics and nutrient profiles suggest potential in diets for growing cattle. A majority of the research involving distillers grains has focused on their use as protein/energy supplements in confinement feeding. University of Nebraska research recently demonstrated that corn dried distillers grains can be a suitable supplement for high-protein forages because it contains little starch but much fermentable fiber. It is possible, based on differences in chemical composition, that dried distillers grains from corn or from grain sorghum could lead to differences in diet digestibility. Therefore, the objective of this study was to determine if dried distillers grains originating from either corn or grain sorghum could be used interchangeably in a 20% crude protein supplement used in a management system for growing cattle grazing on medium- to low-quality forage.

Experimental Procedures

Seventy-seven crossbred heifers (average starting weight=637 lb) were individually fed supplements for 71 days. Treatments (Table 1) consisted of feeding about 6 lb/heifer daily (dry matter basis) of 20% crude protein supplements made from: 1) 50% cracked corn, 25% soybean meal, and 25% ground grain sorghum; 2) 50% cracked corn and 50% corn distillers grains with solubles; or 3) 50% cracked corn, 31% sorghum distillers grains with solubles, and 19% ground grain sorghum. When not being fed supplements, heifers grazed a common Flint Hills, native-grass pasture near Manhattan, Kansas, with free access to brome hay (in round-bale feeders), fresh water, and a commercial pasture-type mineral

supplement. The experiment was designed as a randomized complete-block design. Because the supplements were fed daily to individual animals, each heifer was considered as an experimental unit. The trial began on February 15, 2005. Heifers were weighed on March 10, April 5, and April 27. All heifers were weighed after being held off feed and water overnight. During the final 2 weeks of the trial, all heifers were placed in dry lot, with free access to brome hay fed in round-bale feeders.

A digestibility trial was conducted during the last week of the animal performance trial. Four heifers were randomly selected from each treatment and individually fed supplement and brome hay for 7 days. Daily forage and supplement intakes, as well as feed refusals, were measured. Fecal grab samples were collected twelve times over 4 days, and fecal output was estimated to calculate digestibilities by using acid detergent insoluble ash as an internal marker.

Results and Discussion

One heifer was removed from the trial (SBM treatment) due to refusal to readily consume her supplement, which was possibly due to her aversion to the confines of the feeding facilities. For the remaining heifers, once they became accustomed to the facilities and feeding routines, no feed refusals were noted for any of the supplements. Therefore, we believe that the palatability of the supplements had no effect on our results.

Previous research has indicated that, due to its high fat content, the maximum inclusion amount for corn dried distillers grains with solubles is between 3 and 3.5 lb/day for growing cattle weighing 500 to 700 lb. Producers

typically feed growing cattle about 1% of body weight daily of a supplement (grain mix) containing 20% crude protein. In consideration of these two criteria, supplements were formulated to contain about 20% crude protein via the addition of cracked corn and ground grain sorghum and were fed at 6 lb/heifer daily (dry matter basis). Supplements differed in fat content (Table 1).

Body weights and gains are presented in Table 2. No differences in heifer weights and average daily gains were noted among treatments ($P=0.13$). Heifers receiving the corn dried distillers grains supplement exhibited a slight numerical advantage in gain early in the trial; this is interesting because the digestibility of the corn dried distillers was numerically less (Table 3). This difference can possibly be explained by the higher fat content of the corn distillers grains. Diet digestibility data are presented in Table 3. Total diet intake was similar among all treatments ($P=0.42$), but dry matter intake as a percentage of body weight was significantly greater for heifers receiving the soybean meal treatment ($P=0.02$). The difference in intake may possibly be due to the greater degradable intake protein content of the soybean meal, but the entire diet was formulated to be sufficient in degradable intake protein as analyzed by the National Research Council beef cattle model. The starch concentrations in the supplements were similar because cracked corn, the main source of starch, was present in equal amounts in all supplements. The total diet digestibilities were also similar among treatments ($P=0.51$).

The results of our study showed that co-products of ethanol production, of either corn or grain sorghum origin, can be used in a management system for growing cattle grazing on medium- to low-quality forage.

Table 1. Ingredient and nutrient composition of supplements and brome hay fed to heifers grazing native grass pastures

Item	Supplement			Brome Hay
	Soybean Meal	Corn DDGS ¹	Sorghum DDGS ¹	
Ingredient composition, %				
Soybean meal	25.0	–	–	
Corn dried distillers grains with solubles	–	50.0	–	
Sorghum dried distillers grains with solubles	–	–	31.3	
Ground grain sorghum	25.0	–	18.7	
Cracked corn	50.0	50.0	50.0	
Amount fed, lb/heifer daily ²	6.2	6.0	6.0	Free-choice
Nutrient composition				
Moisture, %	6.3	9.2	9.7	7.7
Crude protein, % ²	20.5	19.9	20.2	10.8
ADF, % ²	4.8	12.5	13.4	40.5
NDF, % ²	8.4	23.7	16.0	66.4
Estimated NEm, Mcal/lb ²	0.91	0.88	0.86	0.56
Estimated NEg, Mcal/lb ²	0.58	0.55	0.54	0.23
Estimated TDN, % ²	79.1	76.5	75.5	52.6
Ether extract (fat), % ²	3.7	7.3	5.3	2.8

¹DDGS=Dried distillers grains with solubles.

²Dry matter basis.

Table 2. Performance of heifers fed supplements while grazing native grass pastures and having access to brome hay

Item	Supplement			SEM
	Soybean Meal	Corn DDGS ¹	Sorghum DDGS ¹	
No. heifers	25	26	26	
Initial wt (Feb. 15), lb	635	637	637	9.6
Wt gains, lb				
Feb. 15 to March 10	39	43	36	2.3
March 10 to April 5	36	44	42	4.6
April 5 to April 27	11	9	8	4.7
End Wt (April 27), lb	722	732	722	4.1
Daily gain, lb				
Feb. 15 to April 27	1.21	1.35	1.21	0.06

¹DDGS=Dried distillers grains with solubles.

Table 3. Intakes and total tract digestibilities

Item	Supplement			SEM
	Soybean Meal	Corn DDGS ¹	Sorghum DDGS ¹	
No. heifers	4	4	4	
Average wt, lb	724	727	762	23
Daily dry matter intake, lb	20.7	19.6	20.8	0.29
Daily dry matter intake, % of body weight	2.86 ^a	2.70 ^b	2.72 ^b	0.04
Dry matter digestibility, %	61.2	57.2	62.5	3.2

¹DDGS=Dried distillers grains with solubles.

^{a,b}Means having different superscript letters differ significantly (P<0.05).