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## Evaluation of dried distiller's grains and roughage source in steam-flaked corn-based finishing diets

### Abstract

Dried distiller's grains with solubles (DDGS) are the main byproduct of dry milling, the process used most frequently for fuel ethanol production. DDGS consist of the spent grains following ethanol distillation and are high in protein, fat, fiber, and minerals. Alfalfa hay and corn silage are roughages most commonly included in feedlot diets and are one of the most expensive ingredients in feedlot diets on an energy basis. Comparing use of alfalfa hay and corn silage in conjunction with DDGS can provide useful information on how to obtain maximum benefit from these ingredients. Our objective was to evaluate the use of corn DDGS as a partial replacement for steam-flaked corn when corn silage or alfalfa hay were used in feedlot diets.

### Keywords

Cattlemen's Day, 2008; Kansas Agricultural Experiment Station contribution; no. 08-212-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 995; Beef; Cattle; Dried distiller's grains with solubles (DDGS); Corn silage; Alfalfa

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## EVALUATION OF DRIED DISTILLER'S GRAINS AND ROUGHAGE SOURCE IN STEAM-FLAKED CORN-BASED FINISHING DIETS

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### Introduction

Dried distiller's grains with solubles (DDGS) are the main byproduct of dry milling, the process used most frequently for fuel ethanol production. DDGS consist of the spent grains following ethanol distillation and are high in protein, fat, fiber, and minerals. Alfalfa hay and corn silage are roughages most commonly included in feedlot diets and are one of the most expensive ingredients in feedlot diets on an energy basis. Comparing use of alfalfa hay and corn silage in conjunction with DDGS can provide useful information on how to obtain maximum benefit from these ingredients. Our objective was to evaluate the use of corn DDGS as a partial replacement for steam-flaked corn when corn silage or alfalfa hay were used in feedlot diets.

### Experimental Procedures

Heifers (n = 358; 786 lbs) were used in a finishing trial. Experimental diets were based on steam-flaked corn and contained 0% DDGS with 6% alfalfa hay, 0% DDGS with 10% corn silage, 25% DDGS with 6% alfalfa hay, or 25% DDGS with 10% corn silage (dry matter basis). On arrival at the feedlot, heifers were fed ground alfalfa hay and water free

choice. One day after arrival, heifers received Revalor<sup>2</sup>-200 implant, Bovishield<sup>3</sup>-IV, Fortress<sup>3</sup>-7, and Phoenectin<sup>4</sup> pour-on. Heifers were blocked by weight and randomly assigned to treatments and pens; 24 pens were used, with six pens per treatment and 14 to 15 heifers per pen. Heifers had free-choice access to four step-up diets leading to the final finishing diets (Table 1). Heifers were housed in dirt-surfaced pens that were 33 ft wide × 80 ft deep. Pens provided 18 to 20 linear inches of bunk space per animal and were equipped with fence-line water fountains that were shared between adjacent pens. Pen weights were collected before cattle were shipped to a commercial abattoir in Emporia, KS. Heifers were harvested on day 97; hot carcass weights and incidence and severity of liver abscesses were recorded the same day. Ribeye area; 12<sup>th</sup>-rib fat thickness; kidney, pelvic, and heart fat; marbling score; USDA yield grade; USDA quality grade; and incidence of dark cutting beef were recorded following a 24-hour chilling period.

### Results and Discussion

Partial replacement of steam-flaked corn with DDGS did not affect dry matter intake, average daily gain, or feed efficiency. Dry

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<sup>1</sup>Dakota Gold Research Association, Sioux Falls, SD.

<sup>2</sup>Revalor is a registered trademark of Intervet, Inc.

<sup>3</sup>Bovishield and Fortress are registered trademarks of Pfizer Inc.

<sup>4</sup>Phoenectin is a registered trademark of IVX Animal Health, St. Joseph, MO.

matter intakes were higher for heifers fed corn silage than for heifers fed alfalfa hay, but daily gains and feed efficiencies were similar. There were no differences among treatments with regard to carcass weight; dressing percentage; fat thickness over the 12<sup>th</sup>-rib; kidney, pelvic, and heart fat; or quality grades. Overall, heifers were relatively lean. The average yield grade for all treatment groups was near to 2. Liver abscess rates were higher for cattle fed 25% DDGS compared with those fed 0% DDGS when alfalfa hay was the roughage source but were higher for cattle fed

0% DDGS when corn silage was the roughage source.

### Implications

Heifers fed DDGS as partial replacement for steam-flaked corn had similar growth performance and carcass quality compared with heifers fed no DDGS. Corn silage and alfalfa hay were comparable roughages when a portion of steam-flaked corn was replaced with DDGS.

**Table 1 Composition of Finishing Diets Based on Steam-flaked Corn Containing Alfalfa Hay or Corn Silage with or without Dried Distiller's Grains (DDGS)**

Item	Alfalfa Hay		Corn Silage	
	0% DDGS	25% DDGS	0% DDGS	25% DDGS
Ingredients, (% dry matter)				
Steam flaked corn	82.7	59.7	76.8	54.7
Dried distiller's grains with solubles	-	24.3	-	24.0
Alfalfa hay	5.6	5.6	-	-
Corn steep liquor	6.0	6.1	6.0	6.0
Corn silage	-	-	11.0	11.0
Supplement <sup>1</sup>	5.6	4.2	6.4	4.3
Analyzed Composition (%)				
Dry matter	80.0	81.2	70.1	70.5
Crude protein	15.9	16.4	14.2	15.9
Fat	3.1	4.8	2.9	5.1
Fiber	10.8	16.8	11.6	17.7
Calcium	0.7	0.7	0.7	0.7
Phosphorus	0.3	0.5	0.3	0.5
Potassium	0.7	0.7	0.7	0.7

<sup>1</sup>Formulated to provide 300 mg/day monensin, 90 mg/day tylosin, 0.5 mg/day melengesterol-acetate, 1000 IU/lb vitamin A, 10 ppm copper, 60 ppm zinc, 60 ppm manganese, 0.5 ppm iodine, 0.25 ppm selenium, and 0.15 cobalt.

**Table 2: Growth Performance of Heifers Fed Various Steam-flaked Corn-based Diets**

Item	Alfalfa hay		Corn silage		SEM	P -value		
	0% DDGS	25% DDGS	0% DDGS	25% DDGS		DDGS level	Rough-age source	DDGS level × roughage source
Head count	89	90	90	89	-	-	-	-
Days on feed	97	97	97	97	-	-	-	-
Initial weight, lbs	786	786	786	786	29	0.95	0.89	0.61
Final weight, lbs <sup>1</sup>	1107	1097	1115	1100	9	0.19	0.56	0.85
Average daily gain, lbs/day	3.32	3.20	3.39	3.24	0.31	0.19	0.56	0.85
Dry matter intake, lbs/day	17.8	17.4	18.5	18.0	0.5	0.14	0.05	0.88
Feed:Gain	5.8	5.6	5.9	6.0	0.75	0.81	0.23	0.60

<sup>1</sup>Final weight was calculated by dividing carcass weight by a common dressing percentage (63.5%).

**Table 3: Carcass Performance of Heifers Fed Various Steam-flaked Corn-based Diets**

Item	Alfalfa hay		Corn silage		SEM	P -value		
	0 % DDGS	25% DDGS	0% DDGS	25% DDGS		DDGS level	Rough-age source	DDGS level × roughage source
Hot carcass weight, lbs	703	696	707	698	6	0.21	0.60	0.82
Dressed yield, %	62.9	63.7	62.9	63.4	1.8	0.43	0.78	0.25
Ribeye area, in <sup>2</sup>	12.8	13.0	13.0	12.8	0.2	0.77	0.78	0.25
12 <sup>th</sup> -rib fat, in	0.50	0.49	0.48	0.45	0.03	0.53	0.29	0.79
Kidney, pelvic, and heart fat, %	2.14	2.13	2.13	2.16	0.03	0.81	0.74	0.60
Liver abscess, %	3.4	7.9	11.1	5.6	2.0	0.82	0.20	0.02
Marbling score <sup>1</sup>	476	466	482	491	9	0.96	0.10	0.31
Yield grade	2.31	2.22	2.31	2.31	0.11	0.67	0.68	0.67
Prime, %	0.0	1.1	0.0	0.0	0.6	0.33	0.33	0.33
Choice, %	36.0	30.3	35.6	44.8	4.8	0.71	0.15	0.13
Select, %	59.5	61.8	63.3	48.5	4.4	0.17	0.30	0.07
Standard, %	0.0	0.0	0.0	2.2	1.1	0.33	0.33	0.33
No roll, %	4.4	12.0	1.1	4.5	3.3	0.11	0.12	0.54

<sup>1</sup>Marbling score 400-499 = Slight.