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## Dried distiller's grains with solubles in steam-flaked or dry-rolled corn diets with reduced roughage levels

### Abstract

Distiller's grains have been used extensively in the U.S. Corn Belt, where producers commonly feed dry-rolled or highmoisture corn. Fuel ethanol production is expanding into the High Plains, where most feedlots flake grain. Compared with dry-rolled corn, steam-flaked corn usually increases or has no change in average daily gain, yields lower dry matter intake and results in 12 to 16% improvement in efficiency. Previous research at Kansas State University and elsewhere suggests that the value of distiller's grains is different in flaked grain diets than in dry-rolled diets. We think this might be due to lower rumen pH when flaked grains are fed, perhaps reducing digestibility of the diet, especially the fibrous components. Because distiller's grains contain considerable amounts of fiber, it might be possible to add less roughage to finishing diets that contain distiller's grains, and doing so, improve efficiency.

### 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; Distiller's grains; Reduced roughage levels

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## **DRIED DISTILLER'S GRAINS WITH SOLUBLES IN STEAM-FLAKED OR DRY-ROLLED CORN DIETS WITH REDUCED ROUGHAGE LEVELS**

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### **Introduction**

Distiller's grains have been used extensively in the U.S. Corn Belt, where producers commonly feed dry-rolled or high-moisture corn. Fuel ethanol production is expanding into the High Plains, where most feedlots flake grain. Compared with dry-rolled corn, steam-flaked corn usually increases or has no change in average daily gain, yields lower dry matter intake and results in 12 to 16% improvement in efficiency. Previous research at Kansas State University and elsewhere suggests that the value of distiller's grains is different in flaked grain diets than in dry-rolled diets. We think this might be due to lower rumen pH when flaked grains are fed, perhaps reducing digestibility of the diet, especially the fibrous components. Because distiller's grains contain considerable amounts of fiber, it might be possible to add less roughage to finishing diets that contain distiller's grains, and doing so, improve efficiency.

### **Procedures**

Crossbred-yearling heifers (n = 582) were used in a finishing trial to determine the feasibility of reducing roughage levels when dried distiller's grains with solubles (DDGS) are included in the diet. Basal diets consisted of steam-flaked or dry-rolled corn and contained either 0% DDGS, with 15% corn silage; 25%

DDGS with 15% corn silage; or 25% DDGS with 5% corn silage. Heifers were fed in 24

dirt-surfaced pens, with four pens per treatment and between 21 and 25 heifers per pen. Heifers were fed once daily for 110 days. Heifers were weighed as a pen at the beginning of the study and immediately before delivery to a commercial abattoir in Emporia, KS. At harvest, incidence and severity of liver abscesses and hot carcass weights were recorded. Following a 24-hour chill period, USDA yield grade; USDA quality grade; marbling score; 12th-rib fat thickness; kidney, pelvic and heart fat; ribeye area; and incidence of dark cutting beef were recorded.

### **Results and Discussion**

Cattle fed flaked corn consumed less feed and were more efficient than those fed dry-rolled corn. Cattle fed steam-flaked corn had a numerically greater final live weights and hot carcass weights compared with cattle fed rolled corn. USDA yield grades (as determined by USDA graders) were higher for heifers fed rolled corn than for those fed flaked corn, but calculated yield grades were not different. Lowering the level of roughage in finishing diets decreased feed intake, but did not affect gain. Additionally, cattle were approximately 6.5% more efficient when silage level was reduced, regardless of method

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

used to process the grain. Dressed yield tended to be greater when cattle were fed less roughage. In contrast with some of our previous experiments, feeding DDGS had no effect on quality grade.

## Implications

Contrary to previous experiments, feeding dried distiller's grains had no negative effects on performance or carcass merit. It may be feasible to decrease roughage levels in feedlot diets containing distiller's grains.

**Table 1. Composition of Steam-flaked or Dry-rolled Corn Based Finishing Diets with Reduced Corn Silage Levels and 25% Dried Distiller's Grains with Solubles (DDGS)**

Item, % dry matter	Dry-rolled corn			Steam-flaked corn		
	0% DDGS	25% DDGS	25% DDGS	0% DDGS	25% DDGS	25% DDGS
	15% Silage	15% Silage	5% Silage	15% Silage	15% Silage	5% Silage
Steam-flaked corn	-	-	-	74.06	56.51	65.72
Dry-rolled corn	74.25	56.75	65.91	-	-	-
Corn silage	13.31	13.32	4.37	13.41	13.40	4.41
DDGS	-	25.40	25.05	-	25.54	25.22
Vegetable oil	2.20	-	-	2.22	-	-
Soybean meal	4.49	-	-	4.52	-	-
Urea	1.22	0.15	0.30	1.22	0.15	0.30
Limestone	1.64	1.66	1.72	1.65	1.67	1.72
Vitamin/mineral supplement <sup>1</sup>	0.68	0.52	0.51	0.68	0.52	0.47
Feed additive premix, % <sup>2</sup>	2.19	2.20	2.17	2.20	2.20	2.18
Nutrients						
Crude Protein	15.37	15.34	15.51	14.72	14.85	14.93
Calcium	0.75	0.67	0.65	0.75	0.66	0.65
Phosphorus	0.32	0.48	0.48	0.32	0.47	0.46
Ether extract	5.82	5.31	5.39	5.84	5.32	5.40
Neutral detergent fiber	10.98	19.28	13.54	11.05	19.37	13.62

<sup>1</sup>Vitamin/mineral supplement formulated to provide 1200 IU/lb Vitamin A, 0.15 ppm cobalt, 0.5 ppm iodine, 10 ppm copper, 60 ppm zinc, 60 ppm manganese, and 0.25 ppm selenium on a dry matter basis.

<sup>2</sup>Premix provided 300 mg Rumensin, 90 mg Tylan, and 0.5 mg MGA per animal daily in a ground corn carrier.

**Table 2. Performance of Yearling Heifers Fed Steam-flaked or Dry-rolled Corn Based Finishing Diets Containing Corn Dried Distiller's Grains with Solubles (DDGS)**

Item	Dry-rolled corn			Steam-flaked corn			SEM	Contrasts <sup>3</sup>				
	0% DDGS	25% DDGS	25% DDGS	0% DDGS	25% DDGS	25% DDGS		1	2	3	4	5
	15% Silage	15% Silage	5% Silage	15% Silage	15% Silage	5% Silage						
No. of pens (heifers)	4 (93)	4 (95)	4 (94)	4 (94)	4 (91)	4 (94)	-	-	-	-	-	-
Initial weight, lb	830	830	830	830	833	833	0.95	0.11	0.09	0.36	0.62	0.44
Final weight, lb <sup>1</sup>	1,108	1,117	1,112	1,134	1,119	1,119	8.19	0.08	0.64	0.82	0.20	0.94
Dry matter intake, lb	18.44 <sup>a</sup>	18.46 <sup>a</sup>	17.14 <sup>bc</sup>	17.80 <sup>ab</sup>	16.96 <sup>bc</sup>	15.55 <sup>d</sup>	0.15	<0.01	0.19	<0.01	0.18	0.88
Average daily gain, lb <sup>1</sup>	2.53	2.58	2.58	2.78	2.62	2.60	0.08	0.13	0.52	0.92	0.19	1.00
Feed:Gain <sup>1,2</sup>	7.25 <sup>a</sup>	7.09 <sup>ab</sup>	6.62 <sup>bc</sup>	6.41 <sup>cd</sup>	6.45 <sup>cd</sup>	6.02 <sup>d</sup>	0.18	<0.01	0.88	0.02	0.62	0.90

<sup>1</sup>Final weight, average daily gain and efficiency were computed by using carcass-adjusted final weights. Final live weight = hot carcass weight divided by a common dressed yield of 0.635.

<sup>2</sup>Statistics were performed as gain:feed, reported as feed:gain.

<sup>3</sup>Contrast 1: Dry-rolled corn diets vs. steam-flaked corn diets.

Contrast 2: Diets with 0% DDGS and 15% silage vs. diets containing 25% DDGS and 15% silage.

Contrast 3: DDGS diets with 15% silage vs. DDGS diets with 5% silage.

Contrast 4: Interaction between grain source and DDGS (15% silage).

Contrast 5: Grain source by roughage level interaction for diets containing DDGS.

<sup>abc</sup>Means within a row without a common superscript letter differ (P<0.05).

**Table 3. Carcass Characteristics of Yearling Heifers Fed Steam-flaked or Dry-rolled Corn Based Finishing Diets Containing Corn Dried Distiller's Grains with Solubles (DDGS)**

Item	Dry-rolled corn			Steam-flaked corn			SEM	Contrasts <sup>2</sup>				
	0%	25%	25%	0%	25%	25%		1	2	3	4	5
	DDGS	DDGS	DDGS	DDGS	DDGS	DDGS						
	15% Silage	15% Silage	5% Silage	15% Silage	15% Silage	5% Silage						
Hot carcass weight, lb	705	707	707	720	711	711	5.26	0.08	0.64	0.78	0.22	0.96
Dressed yield, %	63.30 <sup>a</sup>	64.28 <sup>abd</sup>	65.00 <sup>bcd</sup>	63.27 <sup>ab</sup>	63.90 <sup>ab</sup>	65.27 <sup>bcd</sup>	0.36	0.89	0.04	<0.01	0.63	0.38
USDA quality grade												
Prime, %	1.04	0.00	1.00	0.00	1.04	2.23	0.92	0.59	1.00	0.25	0.27	0.92
Choice, %	56.89	62.86	61.11	66.94	67.98	61.64	3.80	0.11	0.37	0.30	0.52	0.55
Upper 2/3 Choice or greater, %	18.13	13.77	15.52	22.15	16.94	19.84	3.77	0.24	0.22	0.52	0.91	0.91
Select, %	39.99	37.14	34.77	32.02	30.98	34.00	3.78	0.13	0.61	0.93	0.81	0.49
Standard, %	2.09	0.00	0.00	1.04	0.00	0.00	0.66	0.53	0.03	1.00	0.44	1.00
Dark cutter, %	1.04	0.00	2.08	0.00	0.00	2.13	1.10	0.72	0.64	0.07	0.64	0.98
USDA yield grade	2.59	2.65	2.66	2.54	2.42	2.54	0.06	0.02	0.64	0.30	0.16	0.34
Calculated yield grade	2.90	2.83	2.89	2.94	2.86	2.88	0.07	0.71	0.31	0.57	0.91	0.83
Yield grade 1, %	6.53	4.17	7.43	8.47	11.82	5.64	2.47	0.21	0.84	0.56	0.26	0.07
Yield grade 2, %	36.68	39.49	35.60	39.27	39.31	42.81	4.75	0.42	0.77	0.97	0.77	0.45
Yield grade 3, %	48.23	45.70	41.89	73.70	41.44	42.78	4.26	0.46	0.58	0.78	0.98	0.55
Yield grade 4 and 5, %	8.56	9.60	14.00	8.56	6.38	8.77	3.42	0.33	0.87	0.34	0.64	0.77
Marbling score <sup>2</sup>	519	517	522	528	531	530	7.33	0.11	0.92	0.80	0.74	0.65
Kidney, pelvic, heart fat, %	2.34	2.37	2.34	2.36	2.35	2.40	0.05	0.57	0.84	0.98	0.58	0.33
Back fat over 12 <sup>th</sup> rib, in	0.54	0.55	0.58	0.58	0.57	0.55	0.02	0.58	0.84	0.73	0.73	0.21
Ribeye area, square in	12.8	13.1	13.1	13.1	13.2	13.0	0.15	0.44	0.24	0.52	0.45	0.53
Liver abscess, %	2.17	2.17	1.00	2.13	2.08	4.64	1.73	0.44	0.99	0.73	0.99	0.32

<sup>1</sup>Marbling score 500 = Small.

<sup>2</sup>Contrast 1: Dry-rolled corn diets vs. steam-flaked corn diets.

Contrast 2: Diets with 0% DDGS and 15% silage vs. diets containing 25% DDGS and 15% silage.

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Contrast 4: Interaction between grain source and dried distiller's grains (15% silage).

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<sup>abcd</sup>Means within a row without a common superscript letter differ (P<0.05).