Effects of Fat Level in Distillers Grain on Feedlot Finishing Performance and Carcass Traits

Vern Anderson and Chanda Engel

Introduction

Distillers grains with solubles (DGS) is a palatable, energy- and protein-dense feed for beef feedlot cattle. Corn oil makes up 12 to 15 percent of DGS dry matter (DM) if no oil is removed. Considering that corn oil has 2.25 times the energy value of starch, this lipid component of the diet is a significant energy source.

Corn oil has higher monetary value in markets other than feed. Partial removal of corn oil has become common in the ethanol industry, with levels in DGS reported at 3 to 9 percent, depending on the process. The effect of removing a portion of the corn oil on animal performance is not well-defined. A summer feedlot finishing study was conducted to compare effects of decreasing corn oil levels in the DGS.

Methods and Procedures

Fall-born calves (n = 92) and spring-born yearling Black Angus and Angus-cross steers (n = 90) were delivered to the NDSU Carrington Research Extension Center as part of the second annual North Dakota Angus University feedout program in late May 2013. Steers were blocked (four weight blocks) by weight and allotted to one of 16 pens (11 or 12 animals per pen), with four pens per treatment in a randomized complete block design.

The fall calves were fed growing diets for 42 days before transitioning to finishing treatments. Three different DGS products were sourced (Table 1) based on specific corn oil levels with no oil removal (HIGH; 12.96% corn oil), partial oil removal (MED; 8.05% corn oil) and reduced oil (LOW; 5.47% corn oil). The control diet (CON) included sunflower meal (2.44% oil).

Table 1. Nutrients in distillers grains with different fat levels.

Nutrient Composition	Low Fat[a]	Medium Fat[b]	High Fat[c]
		DM basis	
Dry matter, %	88.83	89.26	89.63
Crude protein, %	32.69	31.90	28.76
Fat, %	5.47	8.05	12.96
ADF, %	11.93	16.48	15.74
NEg, Mcal/lb	0.62	0.62	0.62
Calcium,%	0.12	0.11	0.13
Phosphorus,%	1.00	0.83	0.83
Sulfur,%	1.07	0.48	0.52

Source: [a]POET, Groton, SD; [b]Blue Flint Ethanol, Washburn, N.D.; [c]Highwater Ethanol, Lamberton, Minn.

Distillers grains were sourced from different plants to obtain the desired corn oil levels. HIGH corn oil DGS was purchased from High Water Ethanol, Lamberton, Minn., MED corn oil DGS from Blue Flint Ethanol, Washburn, N.D., and LOW corn oil DGS from POET, Groton, S.D. Dietary treatments (Table 2) were DGS with different oil content fed at 19.4 percent (DM) of the corn-based finishing diet.

Table 2. Finishing diets with increasing fat in distillers grain.

Ingredient	Diet Treatments			
	Control	Low Fat	Medium Fat	High Fat
	Percent, Dry matter basis			
Corn, dry-rolled	66.68	60.96	60.95	61.02
Dry distillers grains with solubles	0.57	19.40	19.34	19.40
Sunflower meal	13.30	--	--	--
Grass hay, chopped	11.13	11.29	11.29	11.27
Condensed separator by-product	6.76	6.73	6.73	6.73
Ionophore, vitamin, and mineral supplement	1.56	1.62	1.69	1.58
Nutrient Composition				
Crude protein, %	12.42	12.88	12.70	12.12
Fat, %	3.58	4.02	4.52	5.48
NEg, Mcal/lb	0.60	0.62	0.62	0.62

Other ration ingredients included dry-rolled corn grain, chopped grass hay, corn silage, condensed separator byproduct and a supplement that contained vitamins, minerals and monensin sodium (Rumensin, Elanco, Greenfield, Ind.). The diets were formulated to meet or exceed NRC (1996) nutrient requirements for finishing steers. Cattle were fed to appetite with rations mixed in a truck-mounted Knight "Little Augie" three-auger mixer wagon and delivered to fenceline bunks once each day. Ration adjustments were made daily according to morning bunk readings. All calves were implanted with a Revalor S (Merck Animal Health, Whitehouse Station, N.J.) anabolic implant at the start (day zero) of the finishing trial. Steers were marketed in two groups (days on feed were 105 and 69) at Tyson Fresh Meats, Dakota City, Neb., with carcass traits evaluated by the same trained grader. Statistical analysis was performed using PROC Mixed procedures of SAS. Pen was the experimental unit. This project was reviewed and approved by the NDSU Animal Care and Use Committee.

Results and Discussion

While some variation occurred in animal performance (Table 3), no significant overall effects for DMI ($P > 0.14$), gain ($P > 0.54$) and gain efficiency ($P > 0.26$) were observed due to fat level in DGS. A linear increase in DMI with increasing fat level was observed for the first 28 days on feed, however, most carcass traits were unaffected including carcass weight ($P > 0.18$); dressing percent ($P > 0.34$); fat thickness ($P > 0.30$); kidney, pelvic and heart (KPH) fat percentage ($P > 0.48$); and yield grade ($P > 0.27$; Table 4). However, a trend was observed ($P = 0.07$) toward higher marbling scores (linear $P = 0.02$) and increased percentage of USDA Choice with increased fat in DGS.

Table 3. Finishing performance of steers fed rations with increasing fat in distillers grains.

	Treatments				Contrast			
	Control	Low Fat	Medium Fat	High Fat	Std Err	*P*- Value	Linear	Quadratic
No. head	42	44	42	44	--	--	--	--
Initial wt., lb.	1017	1017	1014	1026	9.96	0.28	0.23	0.18
Final wt., lb.	1427	1416	1417	1446	9.98	0.20	0.23	0.08
DMI, lb/hd/d								
d0-d28	27.78	27.64	28.19	28.90	0.43	0.23	0.07	0.39
d29-finish	31.82	30.49	30.87	32.39	0.53	0.11	0.40	0.03
Overall	30.48	29.57	30.07	31.29	0.47	0.14	0.20	0.05
ADG, lb.								
d0-d28	4.68	4.51	4.91	4.96	0.17	0.27	0.13	0.54
d29-finish	4.71	4.58	4.42	4.63	0.11	0.39	0.44	0.18
Overall	4.68	4.59	4.61	4.77	0.09	0.54	0.53	0.20
Gain efficiency, gain to feed								
d 0- d 28	0.169	0.164	0.175	0.172	0.010	0.59	0.45	0.82
d 29 - finish	0.148	0.151	0.143	0.143	< 0.001	0.26	0.12	0.71
Overall	0.154	0.156	0.153	0.153	0.002	0.84	0.33	0.21

Table 4. Carcass traits of steers fed distillers grains with increasing fat levels.

	Treatments				Contrast			
	Control	Low Fat	Medium Fat	High Fat	Std Err	*P* -Value	Linear	Quadratic
Hot carcass wt., lb.	850	846	850	866	6.05	0.18	0.09	0.15
Dressing percent	62.62	62.83	63.11	63.03	0.20	0.34	0.12	0.44
Ribeye area, sq. in.	13.89	14.00	13.89	13.55	0.13	0.14	0.07	0.11
Fat thickness, in.	0.49	0.56	0.54	0.54	0.02	0.30	0.29	0.24
KPH, %	2.34	2.32	2.39	2.31	0.04	0.48	0.77	0.47
Yield grade[1]	2.98	3.11	3.10	3.27	0.10	0.27	0.07	0.81
Marbling sore[2]	444	442	482	493	14.24	0.07	0.02	0.64
Percent USDA Choice	67	72	82	89	--	--	--	--

[1]Yield grade is a numerical score relating to fat to lean proportions of a carcass with low score less fat.

[2]Score used to determine quality grade with 300-399 = USDA Select; 400-499 = USDA Low Choice.

This project included distillers grains at 19.4 percent of the diet DM, while some other studies include higher levels of DGS in feeding trials to test effects of fat content. Gigax et al. (2011) observed improved gain and carcass weight but no differences in marbling scores when wet distillers grain with 6.7 and 12.9 percent fat was fed in finishing diets at 35 percent of DM. Pritchard et al. (2012) also observed improved gain and feed efficiency but no difference in marbling score with diets that were 5.34 and 6.58 percent fat, respectively, with 40 percent DGS in the diet. However, Jolley et al., (2013) reported no differences in steer performance with different fat levels from DGS (9.2 and 11.8 percent fat) fed at 40 percent of DM and no differences when CDS was included at 27 percent of DM (6 and 21.1% fat).

Implications

Corn oil will continue to be removed from DGS with new technology available to remove a greater proportion of the lipid fraction. Differing animal performance results from the few studies completed

suggest reduced-fat distillers grains has minimal effect on feedlot performance and carcass traits and will continue to be useful in feedlot diets.

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