Evaluation of a Low Protein Distillers By-product for Finishing Cattle

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Summary

An experiment was conducted to evaluate the effect of level of a low protein distillers by-product, Dakota Bran Cake (DBRAN), on feedlot performance and carcass characteristics of yearling steers. Diets contained 0, 15, 30, 45% DBRAN, or 30% dried distillers grains plus solubles (DDGS), replacing corn (DM basis). Final BW, ADG, and F:G improved linearly and daily DMI had a quadratic positive response as level of DBRAN in the diet increased. With the exception of HCW, there were no significant differences for carcass characteristics. The DBRAN had feeding performance similar to DDGS at the same inclusion level. Feeding DBRAN in this trial, up to 45% of the diet, resulted in improved performance compared to feeding high-moisture/dry-rolled corn, suggesting DBRAN has 100 - 108% of the energy value of corn.

Introduction

The growing ethanol industry is continually developing innovative ways to increase ethanol production and, in turn, market by-products derived from the milling process. Feeding some by-products as a significant portion of dietary intake presents challenges with managing various nutrient concentrations in the feed. Dakota Bran Cake (DBRAN) contains less highly fermentable starch than corn and lower levels of protein than other by-product feeds. Although DBRAN shows potential for widespread feedlot use based on composition analysis, animal performance of the product has not been evaluated.

The objectives of this research trial were to determine the effect of level of DBRAN on feedlot performance and carcass characteristics and to calculate the energy value of DBRAN relative to corn in feedlot cattle.

Procedure

Three hundred crossbred long yearling steers (BW = 837 ± 44 lb) were used in a randomized complete block design experiment. Dietary treatments (Table 1) consisted of 0, 15, 30, and 45 % DBRAN and 30% dried distillers grains plus solubles (DDGS), replacing corn (DM basis). Basal ingredients consisted of high-moisture corn and dry-rolled corn, fed at a constant 1:1 ratio (DM basis), plus ground alfalfa hay and dry supplement each fed at 5% of diet (DM basis). Rumensin®, thiamine, and Tylan® were fed at a rate of 320, 140, and 90 mg/head/day, respectively. Steers were weighed for two consecutive days (day 0 and day 1) to determine initial weight following a 5-day limit feeding period. The weights from day 0 were used to assign the cattle. Steers were blocked by weight into three blocks, stratified by weight within block, and assigned randomly to pen. Pens were assigned randomly to treatment within block with five pens per treatment and 12 steers per pen. The steers were implanted with Revalor-S® at the end of the step-up phase on day 21. In addition, one steer was removed from trial due to poor health unrelated to the study. Steers were fed for 116 days and slaughtered on day 117 at a commercial abattoir (Greater Omaha Pack, Omaha, Neb.) where livers were scored and hot carcass weights recorded. Fat thickness, ribeye area, and USDA marbling score were recorded after a 46-hour chill. Hot carcass weight, fat thickness, and ribeye area were used to calculate yield grade assuming a common kidney, heart, and pelvic fat of 2%. Performance was calculated based on hot carcass weights adjusted to a common dressing percentage (63%). Net energy value of diets was estimated using an iteration process for net energy calculation based on animal performance (Owens et al., 2002).

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Table 1. Ingredient composition and diet and ingredient analysis for diets (values presented as a percentage of dietary DM).[a]

	Treatments				
Ingredient	0 DBRAN	15 DBRAN	30 DBRAN	45 DBRAN	30 DDGS
Dry-Rolled Corn	45.0	37.5	30.0	22.5	30.0
High Moisture Corn	45.0	37.5	30.0	22.5	30.0
Dakota Bran Cake	—	15.0	30.0	45.0	—
DDGS	—	—	—	—	30.0
Alfalfa Hay	5.0	5.0	5.0	5.0	5.0
Dry Supplement	5.0	5.0	5.0	5.0	5.0
Ingredient Analysis[b]	DBRAN	DDGS	HMC	DRC	ALF
DM	52.1	93.5	70.3	87.0	86.0
Starch	26.9	8.5	72.0	72.0	
NDF	39.4	42.3	10.0	10.0	59.3
CP	14.9	30.8	9.6	10.0	17.6
Ether Extract	10.4	11.4	4.1	4.1	1.1
Minerals					
Phosphorus	0.65	0.74	0.27	0.29	0.25
Sulfur	0.35	0.76	0.14	0.14	0.27

[a]DBRAN = Dakota Bran Cake, DDGS = dried distillers grains plus solubles, HMC = high moisture corn, DRC = dry rolled corn, ALF = alfalfa, 0 DBRAN = 0% DBRAN, 15 DBRAN = 15% DBRAN, 30 DBRAN = 30% DBRAN, 45 DBRAN = 45% DBRAN, 30 DDGS = 30% DDGS.
[b]Values presented as a percentage of ingredient DM.

Table 2. Performance measurements and carcass characteristics for treatments.[a]

Item	0 DBRAN	15 DBRAN	30 DBRAN	45 DBRAN	30 DDGS	SE	*P* Value Lin.	*P* Value Quad.	*P* Value 30 DDGS vs. 30 DBRAN
Initial BW, lb	837	836	838	836	836	0.8	0.73	0.20	0.71
Final BW[b], lb	1273	1302	1315	1331	1301	8	<0.01	0.46	0.87
DMI, lb	25.1	26.8	27.1	26.9	26.3	0.3	<0.01	<0.01	0.19
ADG, lb	3.76	4.02	4.10	4.27	4.01	0.07	<0.01	0.54	0.90
Feed:Gain, lb/lb	6.74	6.72	6.68	6.37	6.62	0.09	0.01	0.08	0.33
Diet NE_m[c], Mcal/cwt	98.21	97.91	98.58	102.04	99.18	1	0.01	0.06	0.36
By-product NE_m, %[d]	—	98	101	108	103	4	0.14	0.28	0.39
Diet NE_g[c], Mcal/cwt	58.52	58.29	58.80	61.47	59.7	0.7	0.01	0.07	0.36
By-product NE_g, %[d]	—	98	101	107	102	3	0.14	0.28	0.39
Hot Carcass Weight, lb	809	828	835	846	827	5	<0.01	0.45	0.84
Marbling Score[e]	567	567	561	550	544	15	0.49	0.71	0.69
Ribeye Area, in^2	13.7	13.7	13.7	13.9	13.6	0.2	0.39	0.71	0.27
12^{th} Rib Fat Thickness, in	0.39	0.42	0.44	0.40	0.44	0.01	0.78	0.06	0.34
Calculated Yield Grade[f]	2.55	2.68	2.77	2.63	2.77	0.07	0.36	0.12	0.45

[a]DBRAN = Dakota Bran Cake, DDGS = dried distillers grains plus solubles, 0 DBRAN = 0% DBRAN, 15 DBRAN = 15% DBRAN, 30 DBRAN = 30% DBRAN, 45 DBRAN = 45% DBRAN, 30 DDGS = 30% DDGS.
[b]Calculated from carcass weight, adjusted to a 63% common dressing percentage.
[c]Calculated with iteration process for net energy calculation based on performance (Owens et al., 2002).
[d]Value relative to corn, calculated by difference of net energy, divided by by-product inclusion.
[e]400 = Slight ^{0}, 500 = Small ^{0}.
[f]Calculated as 2.5 + (2.5*Fat Depth) + (0.2* 2% KPH) + (0.0038* Hot Carcass Wt.) – (0.32*Ribeye Area) from Meat Evaluation Handbook, 2001.

All feed samples were oven dried at 60°C for 48 hours to calculate accurate DMI, feed energy analysis, and nutrient composition of ingredients.

Pen was the experimental unit, and data from each pen were analyzed as a randomized complete blocked design with the Mixed procedure of SAS for performance and carcass variables. Weight block was considered random in the model. Orthogonal polynomial contrasts were designed to test for significance of the highest order polynomial.

Results

A linear increase ($P < 0.01$) in carcass adjusted final live weight as the level of DBRAN in the diet increased (Table 2) occurred. Similarly, ADG increased linearly ($P < 0.01$) as the level of DBRAN in the diet increased. Further, G:F improved linearly ($P = 0.01$) as level of DBRAN in the diet increased. A quadratic response ($P < 0.01$) was observed for DMI as the level of DBRAN in the diet increased. Diet NE_m and NE_g values, based on performance, increased linearly ($P = 0.01$) as level of DBRAN in the diet increased. The energy value of DBRAN as a percentage of corn increased numerically as level of DBRAN in the diet increased. With the exception of hot carcass weight, there were no differences ($P > 0.05$) for carcass characteristics across treatments.

These results indicate the low protein distillers by-product has feeding performance similar to DDGS at the same inclusion level across all variables measured. Feeding DBRAN in this trial, up to 45% of the diet, resulted in improved performance compared to feeding high-moisture/dry-rolled corn, suggesting it has 100-108 % the energy value of corn depending on its inclusion level in the diet.

The energy value of DDGS in this trial was 103 % the energy value of corn at 30 % dietary DM inclusion. This number concurs with past research (2004 Nebraska Beef Report, pp. 45-48) showing similar performance of DDGS to a high-moisture corn/wet corn gluten feed control ration at 20 and 40 % DM inclusions of DDGS. In this study, WDGS was not fed. No comparison can be made between Dakota Bran Cake and WDGS.

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