Performance of Finishing Steers Fed Modified Wet Distillers Grains

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Allen Trenkle, professor of animal science

Summary

Preconditioned steer calves weighing 690 lbs were fed diets containing on a dry basis 0, 24.9 and 47.0 percent modified wet distillers grains (DGS) for 186 days. Wet DGS replaced a portion of corn and supplement in a diet containing dry rolled corn, corn silage, tub-ground corn stalks and supplement. Steers were implanted initially with Component E-S and terminally with Component TE-S. Daily gains were not statistically different among diets. Steers fed 47% DGS consumed less feed and tended to be more efficient. There were no statistically significant differences in carcass weight, backfat, ribeye area, marbling score or yield grade, however feeding 47% DGS decreased the percent of carcasses grading USDA Choice from 83 to 72 and the percent of carcasses meeting Certified Angus Beef standards from 19 to 12. Establishing the value of each carcass using a grid pricing structure indicated the average carcass values of steers fed 24.9% or 47% DGS were respectively $7 more than or $38 less than the carcasses from the control steers. With price of DGS at 1.0, 0.75 and 0.50 times the cost of corn on a dry basis feed costs ($/steer) were 181, 165 & 151 (corn, $2/bu) and 246, 237 & 218 (corn $3/bu) for 0, 24.9 and 47.0% DGS, respectively with DGS priced equal to corn; 181, 155 & 134 and 246, 222 & 192 with DGS priced 0.75 times the price of corn and 181, 146 & 117 and 246, 208 & 166 with DGS priced 0.50 times the price of corn. This analysis indicated that high levels of wet DGS should not be fed when DGS is priced equal to corn, but the high levels can be fed at all prices of corn when the DGS is priced at 75% or less than the price of corn.

Introduction

The potential feed value of wet distillers grains with solubles (Wet DGS) has been summarized in previous reports. In those studies wet DGS was found to be an excellent feed to replace corn and protein supplement in diets for finishing beef cattle. Wet DGS was found to have the greatest economic value when fed at levels to satisfy the supplemental protein requirements of cattle. At higher levels of inclusion the economic value of DGS was in relation to its energy content relative to corn grain. The wet DGS fed in those studies contained about 70% moisture. Since those experiments were conducted, several ethanol plants have changed processing of distillers grains by drying the wet grains and adding the condensed solubles with dried grains to produce what is commonly termed modified wet DGS that contains about 50% moisture. With increased numbers of ethanol plants, production of ethanol has created an increased demand for corn grain. The objectives of this study was to evaluate modified wet DGS as a feed for finishing cattle and to determine the value of replacing corn grain with DGS with increasing prices of corn.

Materials and Methods

Preconditioned and weaned steers, predominantly Angus with some red and Charolais cross steers, weighing 690 lbs were purchased for this experiment. After arrival at the research farm the calves were placed in pens of six animals and fed a ration containing dry rolled corn, corn silage and chopped grass hay. About three weeks after arrival 108 steers were allotted at random from outcome groups based on weight to 18 pens of six steers and started on the experimental diets. Six pens were assigned at random to three dietary treatments. The starting weight of each steer was the average of two weights taken early in the morning on two consecutive days prior to feeding but with access to water. The steers were implanted with Component E-S at the start of the experiment and reimplanted with Component TE-S 126 days later.

The steers were fed the finishing diets shown in Table 1. The concentrate portion of the diet was prepared as a mix. The grain mixture, corn silage, tub-ground corn stover and modified DGS were weighed and mixed in a mixer wagon prior to delivery to the cattle. The cattle were fed twice per day and the amount of feed offered the cattle was gradually increased until their appetite was satisfied. Then they were fed according to appetite. If the amount of feed consumed decreased, they were offered less feed and feed that accumulated in the bunks was removed and sampled for determination of dry matter. The mixed concentrate portion of the diet, corn silage and wet distillers grains were periodically sampled for chemical analysis. Average dry matter of the DGS was 53.6% and on a dry basis contained 25.9% protein, 15.0% ether extract, 27.5% NDF and 8.9% ADF. Feed costs were determined based on performance of the cattle and representative feed costs at the time the data were summarized (See footnote to Table 4).

The final weight of each steer was the average of two weights taken on consecutive days. Daily gain for each steer was calculated from beginning and ending weight and the average daily gain calculated for each pen. The steers were sold in a single group after feeding for 186 days. Weights of hot carcasses were taken after slaughter, and measurements on the carcasses were obtained after a 24-hr postmortem chill. The federal grader in the plant called marbling score, percentage of kidney, pelvic and heart fat (KPH) and yield grade. Area and fat thickness over the ribeye between the

12^{th} and 13^{th} ribs on the left side of each carcass were measured. Yield grade of each carcass was calculated from carcass measurements using the standard yield grade equation. Yield grade = 2.5 (fat thickness, inches) + 0.2 (percent kidney, pelvic and heart fat) + 0.0038 (hot carcass weight, pounds) – 0.32 (ribeye area, square inches). The value of each carcass was established by using a representative grid at the time the data were summarized (See footnote to Table 3).

Pen means were used as the experimental unit in the statistical analysis. Data were analyzed by analysis of variance. Main effects in the statistical analysis were diets. Differences were considered to be statistically significant at $P < .05$. Treatment means and probabilities of difference due to diet are presented.

Results and Discussion

Performance of the steers is summarized in Table 2. Feeding 24.9% of the diet dry matter as modified wet DGS did not affect feed intake or performance of the cattle. Increasing the inclusion of DGS to 47% of the intake decreased feed intake and improved feed conversion without affecting gain. There were no statistically significant effects on carcass measurements (Table 3). There was a trend for cattle fed 47% DGS to have lower marbling scores, fewer USDA Choice carcasses, more yield grade 2 carcasses and fewer yield grade 4 carcasses. The average value of the carcasses from the steers fed the higher level of DGS was $38 less than carcasses from the control steers. The discount of the carcasses from steers fed the high level of DGS was not offset by the premiums paid for yield grades.

The economics of substituting modified wet DGS for corn and supplement relative to cost of corn and three prices for DGS were calculated for the cattle in this experiment. The results are summarized in Table 4 and Figure 1. Feed cost (Table 4) were decreased by feeding either level of DGS but were decreased more by feeding the higher level of inclusion. When DGS was priced the same as corn grain on a dry basis, the reduction of feed cost was less as price of corn increased. However if DGS was priced as a fraction of the cost of corn, savings in cost of feed obtained by inclusion of DGS in the diet increased as price of corn increased. The same trends were observed when feed costs were expressed as cost per pound of gain (Figure 1). If wet DGS can be delivered to the feedyard at a fraction of the cost of corn on a dry basis, the advantage of feeding greater levels of DGS increased with higher prices of corn. Consideration of carcass value and feed cost indicated that feeding the lower level of modified wet DGS to steer calves would increase economic returns to the feedlot when price of the DGS was equal to corn on a dry basis. However feeding the higher level might not increase returns with DGS priced equal to corn. This observation agrees with results of previous experiments in which feeding wet DGS had the greatest value when fed to a level that replaced requirements for supplemental protein. In this study feeding the higher level was profitable at all prices of corn with wet DGS priced at 75% or less than the price of corn on a dry basis. The price of wet DGS should include transportation, storage and loss with storage in addition to price at the ethanol plant.

Implications

Up to 47% of the total feed intake of finishing cattle can be derived from modified wet distillers grains without affecting performance in the feedlot or carcass value. When corn prices are greater than $3.00 per bushel savings in feed cost can be greater than $50 per head if the wet distillers grains are priced at 75% or less the price of corn on a dry basis.

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Table 1. Formulated composition of diets (Dry basis)[1]

	Diets, % DGS		
	0	20	40
Dry rolled corn	73.58	65.70	44.50
Modified distillers grains		20.00	40.00
Corn silage	8.00	8.00	8.00
Chopped corn stalks	4.00	4.00	4.00
Cane molasses	0.75	0.58	0.41
Soybean meal[2]	12.24		
Urea		0.10	1.35
Limestone	1.01	1.20	1.32
Sodium chloride	0.30	0.30	0.30
Vitamin A premix[3]	0.08	0.08	0.08
Trace mineral premix	0.024	0.024	0.024
Rumensin premix[4]	0.0195	0.0195	0.0195

[1]Based on variability of dry matter content of ingredients, predominantly the wet DGS, during the experiment the actual concentration of DGS in the diets averaged 0, 24.9 and 47.0%.
[2]After 41 days the concentration of soybean meal was reduced to 4.1%, 0.5% urea added, and dry rolled corn increased to 81.22% in the control diet.
[3]Provided 1,400 IU of vitamin A activity per pound of diet dry matter.
[4]Provided 15.6 mg sodium monensin per pound of dry matter.

Table 2. Performance of steers fed program modified wet distillers grains.

	Diets, % DGS			
Item	0	24.9	47.0	P[1]
Beginning wt, lbs	694	695	693	0.875
Ending wt, lbs	1382	1379	1356	0.206
Gain, lbs/d	3.70	3.68	3.56	0.247
Feed intake, lbs DM/d	20.5[a]	21.1[a]	19.4[b]	0.003
Feed/gain	5.56[ab]	5.75[a]	5.44[b]	0.035

[1]P is probability of a statistical difference.
[abc]Differences between means that do not have a common superscript are statistically significant ($P < .05$).

Table 3. Carcass measurements of steers fed modified wet distillers grains.

Item	Diet, % DGS			P[1]
	0	24.9	47.0	
Carcass wt, lbs	848.2	856.4	840.2	0.402
Dressing %	61.3	62.1	61.9	0.334
Back fat, in	0.63	0.62	0.55	0.088
Ribeye area, sq in	13.5	13.7	13.7	0.798
KPH, %	2.26	2.36	2.34	0.407
Marbling score[2]	548	551	527	0.343
Avg called yield grade	3.00	2.89	2.72	0.132
Quality grades				
Choice	8	8	4	
Choice -	22	20	21	
Select	6	8	10	
% USDA Choice	83.3	77.8	71.7	0.398
% CAB[3]	19.4	22.2	11.7	0.333
Yield grades				
2	5	8	11	
3	27	24	23	
4	4	4	1	
Carcass value[4], $	1168.45	1175.52	1130.38	0.266

[1]P is probability of a statistical difference.
[2]Marbling score, 400 = Slight[0], 500 = Small[0], 600 = Moderate[0].
[3]Certified Angus Beef. Percentages of carcasses eligible for CAB (black hair coat) 88.9, 83.3 and 82.9 for 0, 24.9 and 47.0 % DGS, respectively. Of eligible carcasses there were 21.9, 26.7 and 13.8% CAB from steers fed 0, 24.9 and 47.0% DGS, respectively.
[4]Grid: $140/Cwt for USDA Choice YG 3; quality grade: Prime +$29, CAB +$7, Select -$9, NR -$12; yield grade: YG 1 +$6.5, YG 2 +$2.5, YG 4 -$15 and weight: 951-1050 lbs -$18, >1050 lbs -$35, 526-550 lbs -$18, <525 lbs -$30.

Table 4. Feed costs in relation to cost of corn and pricing of distillers grains.

Corn, $/bu	Price distillers grains[1]	Diet, % DGS		
		0	24.9	47.0
		Feed cost[2], $/head		
2.00		180.70	165.46	151.34
2.50		213.18	201.42	184.58
3.00	1.0	245.66	237.38	217.83
3.50		278.14	273.34	251.08
4.00		310.62	309.30	284.33
2.00		180.70	155.52	134.16
2.50		213.18	189.00	163.12
3.00	0.75	245.66	222.47	192.07
3.50		278.14	255.94	221.02
4.00		310.62	289.42	249.98
2.00		180.70	145.58	116.98
2.50		213.18	176.57	141.64
3.00	0.50	245.66	207.56	166.31
3.50		278.14	238.55	190.97
4.00		310.62	269.54	215.63

[1]Price of distillers grains on a dry basis expresses as 1.0, 0.75 or 0.50 times the cost of corn on a dry basis (12% moisture).
[2]Feed costs other than corn and DGS were as follows: corn silage, 8 x cost corn ($/bu) + 5; tub-ground hay, $70/ton, tub-ground corn stover, $45/ton; soybean meal, $200/ton; urea, $375/ton; molasses, $175/ton; minerals and other supplemental ingredients, $400/ton.

Figure 1. Feed cost of gain for steers fed 0, 24.9 or 47.0 modified wet distillers grains. Costs of feed ingredients are given in Table 4.