

Relative Feeding Value of Wet Corn Distillers Solubles as a Feed for Finishing Cattle

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Summary

For 126 days, 850 lb. steers were fed diets of corn, corn silage, and ground hay containing either 0%, 4%, or 8% wet distillers solubles obtained from an Iowa dry mill ethanol plant. Addition of distillers solubles resulted in a linear decrease in feed consumption. Gains were increased 3.2% and decreased 6.4% by feeding 4% and 8% distillers solubles, respectively. Compared to the control diet, feed required per pound of gain was reduced 5% by low levels of distillers solubles and 1.5% by high levels. Feeding distillers solubles had no effect on carcass measurements. It was concluded that wet distillers solubles has value as a feed for cattle and can replace a portion of corn grain and supplemental nitrogen in a corn-based finishing diet for beef cattle. The decreased performance of steers fed the 8% level suggests that there might be a maximum amount of wet distiller solubles that can be fed to finishing cattle.

Introduction

Corn distillers solubles and distillers grains are by-products of producing fuel ethanol from corn grain. Not drying distillers grains saves a significant portion of the energy required to operate an ethanol plant. Not all of the solubles can be put with the wet grains, so there is an excess of distillers solubles if the grains are not dried. If wet distiller solubles has value as a feed for cattle, it could be marketed as an ingredient separate from distillers grains with solubles. In a previous study (A.S. Leaflet R1451, 1997), feeding 6.5% of the diet dry matter as distillers solubles resulted in improved gain and feed efficiency of finishing heifers. The purpose of this study was to conduct another study to confirm the feeding value of wet distillers solubles for finishing cattle.

Materials and Methods

Seventy-two crossbred steers, predominantly black and black-white face, with an average weight of 850 lbs. each were divided into weight outcome groups and randomly allotted from these groups to 12 pens of 6 steers each. Four pens of cattle were randomly allotted to each of 3 diets shown in Table 1. The 3 dietary treatments were the control diet, 4.0% distillers solubles, and 8.0% distillers solubles. The corn was processed in a roller mill to break or crack a majority of the kernels. The mixed grass hay was ground through a 2-in. screen. The concentrate portion of the diets was prepared as a mix in a stationary horizontal mixer and

weighed in a mixer wagon separately from the corn silage and ground hay. After mixing, total mixed diets were fed to the cattle twice per day. The amount of feed offered the cattle gradually was increased until their appetites were satisfied. If the amount of feed consumed decreased during the trial, they were offered less feed, and feed that had accumulated in the bunks was removed and sampled for determination of dry matter before increasing the quantity of feed offered. Periodically the mixed diet, corn silage, hay, and distillers solubles were sampled to determine dry matter and crude protein.

All of the steers in this study had been preconditioned and weaned prior to purchase. At that time, they had been implanted, mostly with Ralgro[®]. Twenty-one days after the experiment was initiated and 105 days prior to harvest, they were implanted with Component TE-S[®] with Tylan. The steers were sold in 2 groups 5 days apart to facilitate collection of carcass data. The 3 diet treatments were equally represented in each sale group. The steers were fed an average of 126 days. Weights of hot carcasses were taken after slaughter, and measurements on the carcasses were obtained after 24-hr. postmortem chill. The federal grader called marbling and yield grades. Ribeyes between the 12th and 13th ribs on the left side of the carcass were photographed with a digital camera, and fat thickness and muscle area were measured from the digital image using a calibrated computer software program.

The economic value of wet distillers solubles was established by calculating the value of the feeds replaced by addition of distillers solubles to the control diet. The cost of each ingredient was calculated on an individual steer basis by the following equation: Average gain (lbs.) x feed/gain x percentage of ingredient in the diet (% of dry matter) x cost of ingredient (\$/lb. dry matter). The sum of the costs of individual ingredients equaled the total feed cost for a steer. The difference in total feed cost between the control and the experimental diets divided by the quantity of dry distillers solubles fed to finish the average steer equaled the value of distillers solubles on a dry basis. Average gain used in this calculation was the average gain of all the steers. Feed/gain used in the calculation was the average for each diet. Feed costs for the primary ingredients were: corn \$2.00/bu.; corn silage \$25/ton; hay \$75/ton; molasses \$100/ton; and urea, \$288/ton.

Pen means were used as the experimental unit in the statistical analysis. Data were analyzed as a completely randomized design, with 4 replications (pens) per treatment, by analysis of variance and standard errors of the means calculated.

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Results and Discussion

Performance of the steers is summarized in Table 2. Addition of wet distillers grains to the corn, corn silage, and hay diet linearly decreased feed intake. Gain of steers fed 4% solubles was increased 3.2% compared to those fed the control diet, but this difference was not statistically significant. Increasing distillers solubles to 8% of diet dry matter decreased gain 6.4%; but, again, this was not statistically significant. Compared to the control diet, addition of 4% and 8% wet distillers grains resulted, respectively, in 5% and 1.5% improvement in feed efficiency. In the previous study, feed intake was not reduced and gain was increased when wet distiller solubles was added to a finishing diet fed to heifers. Differences between the two experiments might be because the dry matter content of the distillers solubles fed in this experiment varied more than that fed in the previous experiment. The responses to feeding distillers grains were quantitatively less and not statistically significant in this study, but the trend toward improved responses were similar to those observed in the previous study with finishing heifers.

Feeding distillers solubles did not affect carcass weight, dressing percentage, fat thickness, or ribeye area. Carcass

quality and yield grades were not changed by feeding distillers solubles. Overall, the carcasses averaged a small degree of marbling and graded 55% to 60% USDA Choice or better, with an average yield grade of 2.

The calculated value of wet distillers solubles (30% dry matter; calculated from the value of ingredients replaced in the control diet and feed efficiency of the cattle) was \$68/ton and \$38/ton when fed at 4% and 8% of diet dry matter, respectively. The decrease in value when fed at the higher level resulted from the decline in performance of the steers. The value calculated from replacement value forces the feed costs of all the diets to be the same and does not include costs for transportation, storage, and handling wet feeds. To realize this value, adjustments in the diets (Table 1) must be made so that distillers solubles replace energy (corn and molasses) and supplemental nitrogen (urea).

This study confirmed that wet distillers solubles have value in corn-based finishing diets of beef cattle and can be fed at 4% of diet dry matter without affecting carcass value. Additional studies need to be conducted to determine the maximum quantity of distillers solubles that can be fed to finishing cattle.

Table 1. Rations for wet distillers solubles study (dry matter basis).

	Rations		
	Control	4% distillers solubles	8% distillers solubles
	----- % of DM -----		
Cracked corn	81.39	78.50	74.77
Distillers solubles		4.0	8.0
Corn silage	10.0	10.0	10.0
Ground hay	5.0	5.0	5.0
Molasses	0.75		
Urea	0.86	0.65	0.45
Limestone	0.92	1.09	1.22
Dicalcium phosphate	0.63	0.34	0.14
Salt	0.30	0.30	0.30
Vitamin A ^a	0.08	0.08	0.08
Trace minerals	0.024	0.024	0.024
Rumensin ^{®b}	0.0195	0.0195	0.0195
Elemental sulfur	0.0276		

^aProvided 1,400 IU of vitamin A activity per pound of dry matter.

^bProvided 15.6 mg sodium monensin per pound of dry matter.

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Table 2. Performance of yearling steers fed wet distillers solubles.

Item	Rations			SEM ^a
	Control	4% distillers solubles	8% distillers solubles	
Starting wt., lbs.	850	846	852	22.1
Ending wt., lbs.	1286	1296	1261	25.9
Days fed	126	126	126	
Daily gain, lbs.	3.46	3.57	3.24	0.127
Feed DM per day, lbs.	21.0 ^b	20.6 ^b	19.3 ^c	0.38
Feed/gain	6.08	5.78	5.99	0.189

^aStandard error of the mean.

^{b,c}Means with different superscripts are significantly different ($P < .05$).

Table 3. Effects of feeding wet distillers solubles on carcass measurements of yearling steers.

Item	Rations			SEM ^a
	Control	4% distillers solubles	8% distillers solubles	
Carcass wt., lbs.	779.6	777.0	766.5	13.03
Dressing percent	60.5	60.3	60.8	0.39
Fat thickness, in.	0.35	0.36	0.37	0.017
Ribeye area, sq. in.	13.3	13.7	13.3	0.28
Marbling ^b	530	512	522	23.8
Carcass grades				
Percent Prime			4.2	
Percent Choice	23.8	16.7	16.7	
Percent Choice -	33.3	41.7	33.3	
Percent Select	42.9	41.7	45.8	
Percent Yield Grade 1	9.5	20.8	16.7	
Percent Yield Grade 2	71.4	50.0	62.5	
Percent Yield Grade 3	14.3	29.2	20.8	
Percent Yield Grade 4	4.8			
Called yield grade	2.17	2.08	2.04	0.095

^aStandard error of mean. Differences in carcass measurements were not statistically significant ($P > .05$).

^b500 = Small⁰, 400 = Slight⁰.

Implications

The results of this study suggest that corn distillers solubles have value in replacing a portion of corn and supplemental nitrogen in finishing diets for beef cattle. The results suggest that there may be an upper level of distillers solubles that can be economically fed to finishing cattle.

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