Substituting Wet Distillers Grains or Condensed Distillers Solubles for Corn Grain in Finishing Diets for Yearling Heifers

A.S. Leaflet R1451

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Summary

A feeding trial was conducted with 790-lb yearling heifers fed an average of 121 days to evaluate replacing cracked corn and supplemental urea with wet distillers grains or condensed distillers solubles. Wet distillers grains were evaluated at 16%, 28% and 40% of diet dry matter. Condensed distillers solubles were added at 6.5% of diet dry matter. Control diets were supplemented with urea or a combination of urea and soybean meal. Feeding 16% wet distillers grains or condensed distillers solubles increased gain of heifers compared with those fed the control urea diet. Increasing the amount of wet distillers grains tended to decrease feed intake and reduce gain. The calculated apparent net energy based on gain of the heifers was greatest for the heifers fed 16% wet distillers grains. The apparent energy of the wet distillers grains declined as the quantity fed was increased. The calculated net energy values were 1.09 and 1.35 Mcal/lb of dry matter for the average of the three concentrations of wet distillers grains and condensed distillers solubles. These results confirm the high energy values of wet distillers grains relative to cracked corn as observed in a previous steer feeding trial.

Introduction

Coordination of production of fuel ethanol in dry-mill corn processing plants with cattle feeding can be economically beneficial to both (A.S. Leaflet R1342, 1996). A previous study designed to evaluate wet distillers grains as a feed for finishing cattle indicated that the wet feed had an energy value 1.5 times that of corn grain on a dry basis. Dry distillers grains, however were found to have an apparent energy value no greater than corn grain. The purpose of this experiment was to further evaluate feeding wet distillers grains to finishing cattle to confirm the results observed in the experiment last year and to evaluate condensed distillers solubles as a feed for finishing cattle.

Table 1. Composition of diets (dry basis).

Diet Ingredient	1.07% Urea	10.0% SBM	6.5% Sol	16% WDG	28% WDG	40% WDG
Crude protein, %	12.0	14.0	14.0	14.0	14.5	16.9
Cracked corn	83.63	74.75	70.50	68.53	57.40	45.51
Dehydrated alfalfa	12.00	12.00	12.00	12.00	12.00	12.00
Cane molasses	2.00	2.00		1.67	1.43	1.19
Distillers solubles			6.50			
Distillers grains				16.0	28.0	40.0
Soybean meal		10.0	10.0			
Urea	1.07	.34		.66		
Dicalcium PO_4	.14					
Limestone	.48	.48	.58	.51	.57	.70
NaCl	.30	.30	.30	.30	.30	.30
KCl	.22			.16	.19	.18
Elemental sulfur	.039	.012		.024		
Trace minerals	.o24	.024	.024	.024	.024	.024
Vitamin A[a]	.08	.08	.08	.08	.08	.08
Rumensin®[b]	.0175	.0175	.0175	.0175	.0175	.0175

[a]Provided 1,400 IU of vitamin A per pound of dry matter.
[b]Provided 14.4 mg sodium monensin per pound of dry matter.

Materials and Methods

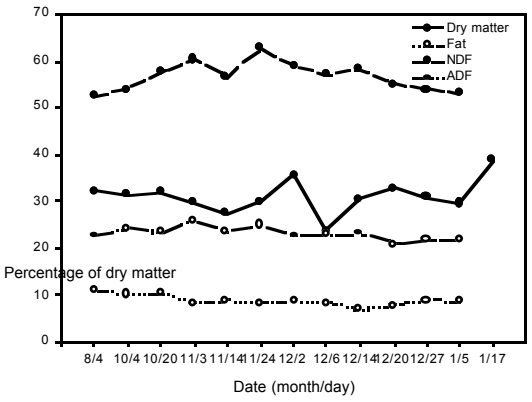
One hundred forty-four 17- to 18-month-old heifers with an average weight of 790 pounds were selected from a group of 156 yearling heifers purchased at an Iowa auction in September. The heifers were of mixed breeding and color and had been grazing summer pasture in Western Iowa. The heifers were pregnancy checked, immunized and treated for external and internal parasites before beginning the test in early October. Six heifers were allotted at random from weight-outcome groups to each of 24 pens. Four pens were allotted at random to each of six diets shown in Table 1. Wet distillers grains and condensed distillers solubles were purchased from a commercial dry-mill corn processing plant that annually produced 15 million gallons of ethanol. Wet distillers grains were delivered at 10- to 16-day intervals and stored in a small bunker silo. Condensed distillers solubles were transported to the research farm in 55-gallon drums as needed. The grain mix of the diets was prepared separately from the wet distillers grains. Wet distillers grains and grain mix were weighed separately and given to the cattle twice daily. Condensed distillers solubles were mixed with the grain portion of the diet and the total mixed diet fed twice daily.

All heifers were implanted with Synovex H® and Finaplix H® on day one. The heifers were housed in an open-front shed with feed bunks in the shed. The heifers were weighed individually in the morning, before feeding, on two consecutive days at start, and also when heifers were sold, and at approximately 28-day intervals throughout. Forty-three heifers were sold after being fed 84 days. The remainder of the heifers were sold after being fed 134 days. The cattle were started on the diets shown in Table 1, but intake was limited for the first four weeks while they adjusted to the grain. All the heifers were sold at a commercial beef-packing plant. Weights of hot carcasses were taken after slaughter, and measurements on the carcasses were obtained after 24 hours in the cooler. Yield grades from individual carcasses were calculated from measurements on the carcasses using the standard yield grade equation.

The net energy values for wet distillers feeds were calculated from the performance of the cattle using the net-energy equation from Nutrient Requirements of Beef Cattle, 1984 NRC ($ADG = 13.12\ NEg^{.8936}Wt^{-.6702}$). This equation was a modification of the NRC equation for heifers, to predict the gain of the heifers fed the control corn-based diet.

Pen means were used as the experimental unit in the statistical analysis. Data were analyzed by analysis of variance. Standard error of the means and least significant differences ($p < .05$) between means also were calculated.

Figure 1. Composition of wet distillers grains fed in the experiment.



Results and Discussion

The wet distillers grains had a shelf life of greater than two weeks during this experiment. The nutrient content of the 10 loads of wet grains delivered to the research farm is shown in Figure 1. The average composition of the wet grains was 31.1% dry matter, 8.8% fat, 56.7% neutral detergent fiber, 23.2% acid detergent fiber and 27.5% crude protein. The average composition of the condensed distillers solubles was 29.5% dry matter and 11.3% crude protein. The corn grain fed in this experiment averaged 87.8% dry matter and 8.6% crude protein.

Replacing corn grain and part of the urea with 10% soybean meal increased gain 14% and improved feed efficiency 9% compared with the urea supplemented diets (Table 2). This response is similar to responses from additions of soybean meal to corn-based diets for finishing yearling cattle implanted with estradiol and trenbolone acetate. Addition of condensed distillers solubles to the diet supplemented with soybean meal increased gain 5% and improved feed efficiency 4%. Heifers fed 16% wet distillers grains gained 20% faster and were 13% more efficient than those fed the urea supplemented diet. This improved efficiency is greater than that observed with feeding a similar concentration of wet distillers grains in the previous steer experiment (A.S. Leaflet R1342, 1996). Feeding the two higher concentrations of wet distillers grains resulted in similar improvements in feed efficiency as observed in the earlier steer experiment.

Carcass weight was increased by feeding soybean meal, the low concentration of wet distillers grains or condensed distillers solubles (Table 2). Dressing percentages were not changed by the diets fed in this study. The percentage of carcasses grading USDA Choice was not significantly changed in this study, but there was a numerical decrease in the percentage of Choice carcasses in the groups fed wet distillers grains as was observed in the steer experiment.

There were no trends for differences in fat thickness, ribeye area or yield grade that were related to the diets fed.

As calculated from performance of the cattle, the apparent energy values of wet distillers grains in comparison with the urea-supplemented diet decreased from 1.34 to .93 Mcal/lb of dry matter as the concentration of wet distillers grains was increased in the diets (Table 2). The average of the energy values for the three concentrations was 1.09 Mcal/lb of dry matter. This is 1.55 times the energy value for cracked corn, which is the same energy value obtained in the previous experiment with steers. An energy value greater than that of corn would be expected because of the higher concentration of oil in distillers grains, but this can not explain all of the difference. The greater gains of heifers fed soybean meal suggests these heifers responded to supplementation of natural protein. The calculated energy value of the diet supplemented with soybean meal was 11% greater than the control diet supplemented with urea. Part of the greater apparent energy of wet distillers grains may be the result of the addition of natural protein.

The calculated apparent energy value of condensed distillers solubles was high, being 1.34 Mcal/lb dry matter or 1.9 times that of corn grain. In the steer experiment, wet distillers grains had a higher energy value than dry distillers grains. The high energy value of condensed distillers solubles suggests that the high apparent energy value of wet distillers grains may be at least partially the result of the solubles fraction remaining on the wet grains.

Implications

The results of this experiment with heifers confirmed the high feeding value of wet distillers grains observed in the previous steer experiment. Wet distillers grains had an energy value 1.5 times that of corn grain on a dry basis in both experiments. There were no significant effects of feeding wet distillers grains or condensed distillers solubles on carcass measurements. The results of this experiment support the concept that coordinating cattle feeding with a dry-mill ethanol plant could be mutually beneficial for both enterprises

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Table 2. Feedlot performance and carcass data from yearling heifers fed soybean meal (SBM), wet distillers grains with solubles (WDG), or wet condensed distillers solubles.

	Diets							
Item	1.07% Urea	10.0% SBM	6.5% Sol	16.0% WDG	28.0% WDG	40.0% WDG	SE[a]	LSD[b]
No. heifers	24	24	24	24	24	24		
Starting weight, lbs	792	790	790	788	764	768	14.8	44.0
Ending weight, lbs	1163	1185	1219	1202	1165	1165	23.2	68.9
Avg No. days	127	121	123	120	120	121		
Feedlot								
Daily gain, lbs	2.96	3.37	3.55	3.55	3.26	3.21	.11	.32
Feed, lb DM	19.9	20.5	20.8	20.6	19.5	19.4	.47	1.39
Feed/gain	6.72	6.10	5.86	5.84	6.05	6.11	.18	.52
Liver abscesses	3	3	3	3		3		
Carcass								
Carcass wt, lbs	713	728	755	737	724	713	13.5	40.3
Dressing %	61.3	61.4	61.9	61.3	62.2	61.2		
Ribeye area, in^2	14.1	14.2	14.5	13.7	14.4	13.9	.35	1.04
Fat cover, in	.38	.40	.40	.46	.39	.40	.04	.11
KHP fat, %	2.3	2.2	2.2	2.4	2.4	2.4	.14	.42
% Choice	62.5	52.2	45.8	37.5	58.3	45.8	13.2	27.7
No. Choice	15	12	11	9	14	11		
No. Select	9	11	13	15	10	13		
Yield grades								
1	8	9	10	9	11	7		
2	13	11	12	9	11	13		
3	3	2	2	5	2	4		
4		1		1				
Calculated yield	2.12	2.14	2.16	2.49	2.12	2.23	.22	.46
NEg diet, Mcal/lb	.64	.70	.75	.75	.73	.74		
NEg WDG, Mcal/lb				1.34	1.00	.93		
Neg Sol, Mcal/lb			1.35					

[a]Standard error of the mean.
[b]Least significant difference among means ($p < .05$).