Evaluation of Wet Distillers Grains in Finishing Diets for Yearling Steers

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Summary

A feeding trial was conducted with 940-lb yearling steers fed 113 days to determine the feeding value of distillers grains relative to corn grain. Replacing corn and urea with wet distillers grains for 20% of the diet dry matter tended to increase gain with no increase in feed consumption, resulting in improved feed conversion. Replacing 40% of diet dry matter with wet distillers grains decreased feed intake without affecting gains, and improved feed efficiency. The overall average estimated net energy value of wet distillers grains was 1.20 Mcal NEg per pound dry matter. This experiment confirmed the observations in previous cattle feeding experiments, that for finishing cattle wet distillers grains have a high energy value compared with cracked corn grain. Another objective of the study was to determine if cattle being fed wet distillers grains could be suddenly changed to a different diet if the supply of wet feed was suddenly disrupted. It was found that if intake is managed during the change, that distillers grains portion of the diet can be suddenly changed from wet to dry and then changed back to wet after a week, without sacrificing performance of the cattle.

Introduction

In previous cattle feeding experiments, wet distillers grains from the dry milling of corn for fuel ethanol production were found to have a high apparent net energy value compared with dry cracked corn. It was suggested that coordination of cattle feeding with dry-mill corn processing would be beneficial to both. Over time there will be periods when the corn processing plants might not have wet feed to deliver to the feedlots because of interruptions at the plant, necessitating a sudden change in the diet fed to the cattle. The purpose of this experiment was to confirm the high apparent energy value of wet distillers grains when fed to finishing cattle and to evaluate suddenly changing the diet of cattle being fed wet distillers grains.

Table 1. Composition of diets (dry basis).

Ingredient	Diet 1.07% Urea	Diet 20.0% WDG	Diet 40% WDG
Crude protein, %	12.0	14.0	14.0
Cracked corn	83.63	64.85	45.51
Dehydrated alfalfa	12.00	12.00	12.00
Cane molasses	2.00	1.60	1.17
Distillers grains		20.0	40.0
Urea	1.07	.40	
Dicalcium PO_4	.14		
Limestone	.48	.55	.70
NaCl	.30	.30	.30
KCl	.22	1.8	.18
Elemental sulfur	.034	.012	
Trace minerals	.024	.024	.024
Vitamin A[a]	.08	.08	.08
Rumensin®[b]	.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

Ninety-six 12- to 14-month-old steers with an average weight of 940 pounds were selected from a group of one-hundred steers purchased from an Iowa cattle producer who had backgrounded the calves after preconditioning and weaning. The steers were predominantly offspring from Charolais bulls bred to Angus crossbred cows. The steers were purchased in March and started on experiment in early April. Six steers were allotted to each of 24 pens at random from outcome groups based on ultrasound scans of subcutaneous fat and ribeye area. Four pens were allotted at random to each of four diets shown in Table 1. Wet distillers grains 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. The grain mix portion 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.

All steers were implanted with Revalor S® after they had been on feed one month. The steers were housed in an open-front shed with feed bunks under the roof of the shed. The steers were weighed individually in the morning, before feeding, on two consecutive days at start, and also when the cattle were sold, and at approximately 14-day intervals throughout. 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. After the cattle had been on feed for 57 days, four pens of steers were changed from the diet containing 40% wet distillers grains to the same diet but with dry distillers grains substituted for wet grains on an equal dry matter basis. The dry matter offered the cattle at the time of the change was reduced about 10%, and cattle were then offered more feed according to appetite. The cattle were fed the diet containing dry distillers grains for eight days and then switched back to the diet containing wet grains. Again the total dry matter offered the cattle was reduced at the time of the change and the cattle were offered feed according to appetite.

Table 2. Feedlot performance and carcass data from steers fed wet distillers grains (WDG) or wet distillers grains changed to dry distillers grains.

	Diets					
Item	1.07% Urea	20.0% WDG	40% WDG	40.0% WDG[a]	SE[b]	LSD[c]
No. steers	24	24	24	24		
Starting weight, lbs	938	940	948	941		
Ending weight, lbs	1278	1320	1281	1279		
Avg No. days	113	113	113	113		
Feedlot						
Daily gain, lbs	3.03	3.36	2.94	3.06	.12	.37
Feed, lb DM	19.7	19.2	17.7	17.5	.45	1.4
Feed/gain	6.50	5.75	6.04	5.73	.12	.37
Liver abscesses	3	3	3	3		
Carcass						
Carcass wt, lbs	785.6	813.4	790.8	790.4	9.2	29.4
Dressing %	61.0	61.6	61.8	61.3	.30	.96
Ribeye area, in^2	14.5	15.0	14.4	14.5	.19	.60
Fat cover, in	.37	.42	.35	.32	.02	.07
KHP fat, %	2.6	2.6	2.5	2.1	.15	.48
% Choice	35.0	29.2	16.7	0	8.0	25.4
No. Choice	8	7	4	0		
No. Select	13	16	14	15		
No. Standard	2	1	6	8		
Yield grades						
1	7	7	8	8		
2	14	13	13	14		
3	2	3	3	1		
4		1				
Calculated yield	2.28	2.40	2.27	2.13	.10	.31
NEg diet, Mcal/lb	.64	.76	.78	.83		
NEg WDG, Mcal/lb		1.30	1.04	1.16		

[a]Steers changed to a diet containing dry distillers grains in place of wet distillers grains for an eight-day period.
[b]Standard error of the mean.
[c]Least significant difference among means ($p < .05$).

All the steers were sold at a commercial beef-packing plant. Weights of hot carcasses were taken after slaughter, and measurements on the carcasses were obtained after 48 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 = 16.67 $NEg^{.9116}Wt^{-.6837}$). This equation was a modification of the NRC equation for steers, to predict the gain of the steers 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.

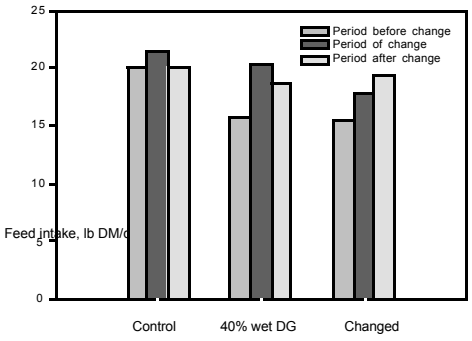
Results and Discussion

The results of replacing corn grain with wet distillers grains on a 20% or 40% of diet dry matter basis are summarized in Table 2. Average daily gain tended to increase at the lower level of wet distillers grains as observed in the two previous experiments, but none of the numerical differences in gain were statistically significant in this experiment. Feed intake was significantly depressed when the diets contained 40% wet distillers grains. The reduction in feed intake may be the result of excessive moisture, but some of the reduction is likely related to the high energy value of the wet distillers grains. The 10% reduction in feed intake of cattle fed 40% distillers grains with no difference in gain resulted in a significant improvement in feed efficiency, 10%. Feed conversion by steers fed 20% wet distillers grains also was significantly improved, about 10%, as a result of greater gains with similar feed intake compared with the corn diet.

The calculated net energy values of wet distillers grains based on performance of the steers were 1.30 and 1.04 Mcal/lb of dry matter when fed at 20% and 40%, respectively. These values are similar to those calculated from performance of the cattle used in the two previous experiments. These three trials give an overall energy value for wet distillers grains that is1.5 times the energy value of cracked corn grain. There has been a trend in the three experiments for wet distillers grains to have a greater energy value when fed at the lower levels, 16% to 20% of diet dry matter. It is not clear why this feed has such a high apparent energy value. It can be partly explained by the retention of the oil originally present in corn with the distillers grains and the high digestibility of the fiber in corn byproducts. In the one previous study, condensed solubles had a high relative energy value for feeding cattle and in the other trial, drying wet distillers grains seemed to reduce the high energy value of wet grains for cattle. It may be that some fraction that is present in solubles and the wet grains is beneficial for rumen fermentation.

Because there were no differences in dressing percentage, carcass weights were a reflection of daily gains. There were no significant differences due to diet in any of the carcass measurements. However, there was a trend for cattle fed 20% wet distillers grains to have larger ribeyes, thicker fat cover and more kidney-heart-pelvic fat. This probably was the result of somewhat greater gain by these cattle resulting in heavier carcasses. Similar trends for more carcass fat were observed in the previous experiments, where increased gains were found when the lower levels of wet distillers grains were fed. The numerical decrease in the percentage of carcasses grading Choice from cattle fed wet distillers grains has been observed in each of the three experiments. The difference was not statistically significant in any of the trials, but the trend for fewer carcasses grading Choice has been consistent. It is not clear if this is a chance observation in the three trials or if there may be an effect on beef marbling by feeding wet distillers grains. If the effect is real, the cause is not obvious.

Figure 1. Feed intake of steers switched from wet to dry distillers grains during the two-week period involving the change, and consumption during the following two-week period after they were changed back to wet grains. Feed intake of control steers and steers continuously fed wet distillers grains are shown for comparison.



When the steers were shifted from wet to dry distillers grains, feed intake did not increase as much as when steers were continued to be fed 40% wet grains (Figure 1). Consequently the steers subjected to the change did not gain as well as controls or steers continuing to be fed 40% wet grains (Figure 2). During the two week period after making the dietary changes, steers subjected to the changes increased feed intake in contrast to a decrease in intake by control steers and

those fed 40% wet grains continuously. During this following period, the steers subjected to the dietary changes gained much faster than control steers or those fed 40% wet distillers grains continuously. At the end of the trial there were no adverse effects of having made the dietary changes when the cattle were increasing feed intake. Based on this study it seems, if managed properly, cattle feeders could accommodate a sudden change in availability of wet distillers grains without sacrificing performance of the cattle being fed wet distillers grains.

Implications

This experiment confirmed the observations in previous cattle feeding experiments, that for finishing cattle wet distillers grains have a high energy value compared with cracked corn grain. If feed intake is well managed, the diets containing wet distillers grains can be suddenly changed to accommodate a disruption at the corn processing plant without sacrificing performance of the cattle.

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Figure 2. Average daily gain of steers switched from wet to dry distillers grains during the two-week period involving the change, and the gains during the following two-week period after they were changed back to wet grains. Gains of control steers and steers continuously fed wet distillers grains are shown for comparison.