Value of High-Oil Corn Grain for Finishing Steers

A.S. Leaflet R1718

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Summary

Rolled high-oil corn in comparison with rolled isogenetic control corn was fed to finishing steers as 33%, 66% and 100% of the corn grain in their diet in a 134-day feeding trial. During the first 75 days of the trial, steers fed high-oil corn had numerically lower rates of gain and tended to have poorer feed conversions compared with the control corn. At the end of the trial, there were not statistically significant differences in performance or carcass measurements of the steers fed the different amounts of high-oil or control corns. The results of this study indicated that the steers did not respond to the higher energy content of high-oil corn.

Introduction

Plant breeders have been modifying corn to enhance its nutritional value for livestock. One change has been to increase the energy concentration in the grain by increasing the oil content. A feeding trial conducted last year with yearling steers (A.S. Leaflet R1631, 1999) indicated that feeding all the corn in the ration as high-oil corn did not significantly improve feedlot performance, but tended to improve carcass quality grades. The purpose of this study was to evaluate high-oil corn in another feeding test. The experimental design of the study was changed to evaluate diets where 0%, 33%, 66% and 100% of the total corn fed was high-oil in comparison with an isogenetic control corn.

Materials and Methods

One hundred forty-four Angus steers were purchased predominantly from one ranch. The steers had been weaned and had been fed the finishing ration containing typical corn for about 10 weeks before being allotted to the diets compared in this study. The steers weighed 850 lbs when allotted in early February. Six steers were allotted to each of 24 pens at random from outcome groups based on frame score (calculated from hip height and age) and backfat as measured by ultrasound. Six pens were assigned at random to each of the four diets shown in Table 1. The steers were fed Rumensin® (28 gm/ton at 90% dry matter) and implanted with Component®-ES 30 days before being allotted to the dietary treatments. They were reimplanted with Component®-TES 75 days after allotment. Steers were weighed in the mornings before feeding, on two consecutive days at the beginning and end of the study and at about 34-day intervals throughout.

The four treatments compared in the 113-day experiment were control corn, 33% high-oil corn, 66% high-oil corn and 100% high-oil corn. The control corn used in this study was isogenetic with the high-oil corn. The dry matter, crude protein and ether extract concentrations in the corns were 89.5, 8.47 & 3.76% and 89.3, 8.62 & 6.72% of dry matter for the control and high-oil corns, respectively. Both corns were processed in a roller mill to break or crack a majority of the kernels. Because the grains used this year contained similar quantities of protein, the quantity of soybean meal to supplement the diets was similar for both corns. The concentrate portion of the diet was prepared as a mix and weighed separately from the silage. The two feeds were mixed before being placed in the bunks. The steers were started on the finishing rations shown in Table 1 by limiting intake. Feed offered the steers was gradually increased until they were being fed to appetite. The steers were fed two times per day. Periodic samples of the mixed feeds and silage were taken for determination of dry matter. Feed removed from the bunks was weighed and sampled for determination of dry matter. The corns were sampled during the trial for measurement of dry matter, protein and fat. Dry matter was determined by drying in a convection oven at 85°C. Total nitrogen in the corns was measured by the Kjeldahl method and multiplied by 6.25 to obtain crude protein. Oil content of the corns was measured by extracting with ether and weighing ether soluble materials extracted.

The steers were sold in two groups one week apart to facilitate collection of carcass data. All the steers within a pen were sold together. The steers were fed an average of 134 days. Weights of hot carcasses were taken after slaughter, and measurements on the carcasses were obtained after a 48-hour postmortem chill. The federal grader called marbling and yield grades. Ribeyes between the 12^{th} and 13^{th} ribs on the left side of the carcass were photographed with a digital camera and fat thickness and muscle area measured using a calibrated computer software program. Yield grade was calculated from carcass measurements using the standard yield grade equation and 2.5% kidney, heart and pelvic fat for each carcass.

Pen means were used as the experimental unit in the statistical analysis. Data were analyzed by analysis of variance. Treatment means and probabilities of difference due to rations are presented.

Table 1. Ration composition (% of dry matter).

Ingredient	Ration			
	Control	33% HOC	66% HOC	100% HOC
Rolled control corn	78.18	52.12	26.06	
Rolled high-oil corn		26.06	52.12	78.18
Corn silage	12.00	12.00	12.00	12.00
Molasses	0.75	0.75	0.75	0.75
Soybean meal	6.50	6.50	6.50	6.50
Urea	0.63	0.63	0.63	0.63
Potassium chloride	0.23	0.23	0.23	0.23
Limestone	1.26	1.26	1.26	1.26
Sodium chloride	0.30	0.30	0.30	0.30
Trace minerals	0.024	0.024	0.024	0.024
Vitamin A premix[a]	0.08	0.08	0.08	0.08
Rumensin® premix[b]	0.0195	0.0195	0.0195	0.0195
Elemental sulfur	0.0202	0.0278	0.0278	0.0278

[a]Provided 1,400 IU of vitamin A activity per pound of dry matter.
[b]Provided 15.6 mg sodium monensin per pound of dry matter.

Results and Discussion

Performance results for the steers are shown in Table 2. Steers fed high-oil corn gained somewhat less (0.30 to 0.34 lb/d) during the first 75 days of the experiment and 0.14 to 0.25 lb/d less over the 134 days. However none of these differences were statistically significant. The steers fed high-oil corn tended to be less efficient during the first 75 days of the trial. Over the 134 day period there were no significant differences related to source of corn on feed intake or feed utilization. There were no differences in the carcass measurements related to the four diets (Table 3).

The lesser performance of the steers fed high-oil corn during the early portion of the experiment is similar to the response of steers fed high-oil corn in the experiment conducted last year. Digestion studies with steers fed high amounts of high-oil corn indicated that the dry matter and protein of high-oil corn diet tended to be less digestible. Most of the reduction in digestibility seemed to occur throughout the digestive tract rather than in the rumen. Furthermore efficiency of microbial growth in the rumen and flow of microbial mass into the duodenum were similar for control and high-oil corn indicating that microbial digestion in the rumen was not affected by feeding high-oil corn. Digestion of fat in the intestines as a percentage of fat entering the duodenum was reduced, but there was more total fat being digested in the intestines of steers fed high-oil corn. The flow of feed nitrogen to the duodenum and the loss of fecal nitrogen tended to be greater in steers fed high-oil corn suggesting the protein in high oil corn might have been less available. So the reduction in gain of steers fed high-oil corn could be the result of reduced availability of metabolizable protein during the early phase of the finishing period when the steers had high rates of gain.

With feed costs of corn, $2/bu; soybean meal, $200/ton; corn silage, $25/ton; urea, $153/ton; and supplemental ingredients, $200/ton; the feed costs ($/cwt. of gain) were $28.09, $28.40, $29.12 and $29.26 for control, one-third, two-thirds and all high-oil, respectively. Feed costs tended to increase with greater amounts of high-oil corn that related to the slightly poorer feed conversions when high-oil corn was fed. Based on the results of this study, high-oil corn did not have greater value than the isogenetic control corn when fed to finishing steers.

Implications

The greater energy value of high-oil corn was not utilized by steers to improve performance in the feedlot or to improve carcass value.

Acknowledgments

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Table 2. Results of feeding high-oil corn grain on feedlot performance of finishing steers.

Item	Ration				
	Control	33% HOC	66% HOC	100% HOC	Probability[a]
Starting weight, lbs	854	854	859	854	0.91
Ending weight, lbs	1314	1295	1308	1280	0.48
0 to 75 days					
Gain, lbs/d	3.85	3.55	3.54	3.51	0.28
Feed intake, lbs DM/d	21.6	21.0	21.6	21.0	0.85
Feed/gain	5.61	5.89	6.16	5.99	0.07
0 to finish					
Days fed	134	134	134	134	
Gain, lbs/d	3.56	3.42	3.46	3.31	0.42
Feed intake, lbs DM/d	22.2	21.6	22.3	21.4	0.59
Feed/gain	6.25	6.32	6.48	6.51	0.67

[a]Probability that treatment means are different. Statistical difference is achieved when the probability is 0.05 or less.

Table 3. Effects of feeding high-oil corn grain on carcass measurements of finishing steers.

Item	Ration				
	Control	33% HOC	66% HOC	100% HOC	Probability[a]
Carcass weight, lbs	834	824	834	813	0.48
Dressing percentage	63.4	63.6	63.7	63.5	0.94
REA, sq in	13.0	12.5	12.8	12.7	0.23
Back fat, in	0.52	0.52	0.48	0.49	0.69
Marbling[b]	473	470	463	449	0.90
Quality grades					
Prime		1	2		
Choice	31	31	25	26	
Select	5	3	9	8	
Standard		1		1	
Yield grades					
1	1	0	0		
2	11	9	14	13	
3	20	22	19	18	
4	4	5	3	4	
Avg calculated YG	3.28	3.42	3.26	3.24	0.60

[a]Probability that treatment means are different. Statistical difference is achieved when the probability is 0.05 or less.
[b]Marbling score of 300 = Small^0, 400 = Modest^0, etc.