Effect of Optimum® High Oil Corn on Performance and Carcass Characteristics of Finishing Yearling Steers

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Summary

Steers fed Optimum® high oil corn had statistically similar live performance as steers fed isogenetic control corn or the control corn + fat. Numerically steers fed high oil corn gained 3% faster during the 107-day study with similar feed conversion. During the first half of the experiment, steers fed high oil corn did not perform as well as those fed control corn. During the second half of the experiment, steers fed high oil corn gained 21% faster and were 17% more efficient. There were no effects of feeding high oil corn on carcass characteristics, except there were more Choice carcasses from the steers fed high oil corn as compared with control corn (57% vs. 43% Choice).

Introduction

Plant breeders have been modifying corn to enhance its nutritional value for livestock. One change is to increase the energy in corn by increasing the concentration of oil. It has been demonstrated in studies that high-oil corn has additional nutritional value for swine and poultry, but only limited results have been reported from studies with cattle. In addition to increased energy, high-oil corn also has increased concentration of protein. The increased protein concentration as well as greater energy should add value to high-oil corn compared with normal corn when fed to finishing cattle. The objective of this study was to evaluate the effects of feeding Optimum® high oil corn compared with isogenetic control corn and the control corn with added fat on feedlot performance and carcass merit of finishing yearling steers.

Materials and Methods

Ninety head of yearling Continental-cross steers (Ave. initial weight 950 lb.) were selected from one hundred sixteen head that had been grazing improved pastures in southern Iowa during the summer of 1997. The steers were purchased in late October and started on experiment in November. Six steers were allotted to each of 15 pens at random from outcome groups based on initial weight. Five pens were assigned at random to each of three diets shown in Table 1. The steers were fed Rumensin® (28 gm/ton at 90% dry matter) and implanted with Component® TE-S at the beginning of the study. Steers were weighed in the mornings before feeding on two consecutive days at the beginning and end of the study and at 28-day intervals throughout.

The three treatments compared in the 107-day feeding trial were high oil corn, control corn (isogenetic to high oil corn and grown on the same farm), and the control corn with added fat (a blend of animal tallow and vegetable oil) to be isocaloric to the ration containing high oil corn. Corn was fed as whole grain. The concentrate portion of the diet was prepared as a mix and weighed separately from the silage. Because the control corn contained less protein, additional soybean meal was fed in the control and control + fat rations to make the rations isonitrogenous with respect to plant sources of protein. 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 cattle 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. Dry matter was determined by drying in a convection oven at 85 ^{0}C.

All the steers were sold at the same time at a commercial beef-packing plant. Weights of hot carcasses were taken after slaughter, and measurements on the carcasses were obtained after a 48-hr postmortem chill. Marbling, yield grade, and percentage of kidney, pelvic, and heart fat (KPH) were called by the federal grader. Ribeyes were individually traced on sheets of acetate paper that were used to measure fat thickness and muscle area using a beef carcass grid. Ribeye area and fat thickness measurements were made between the 12th and 13th ribs on the left side. Yield grade was calculated from carcass measurements using the standard yield grade equation.

Pen means were used as the experimental unit in the statistical analysis. Data were analyzed by analysis of variance. Treatment means and standard error of the means are presented.

Results and Discussion

Steer performance is shown in Table 2. Steers fed the ration containing control corn gained faster (0.27 lb per day) during the first 56 days of the study, whereas those fed high oil corn gained more (0.52 lb per day) during the last 50 days of the study. Over the 107 days, there were no significant differences in performance of steers fed the three rations. The carcass data are shown in Table 3. There were no significant differences in carcass weight due to ration.

Steers fed control corn + fat tended to have higher dressing percentages, higher marbling scores and more backfat compared with steers fed control corn alone. Steers fed control corn had larger ribeyes and higher yielding carcasses. Steers fed control corn + fat and those fed high oil corn had more Choice grading carcasses than those fed control corn (Figure 1).

The lesser performance of the steers fed high-oil corn during the first half of the experiment followed by greater performance during the second half is similar to the response of yearling steers fed inadequate protein observed in previous experiments. Several effects of feeding high-oil corn might have resulted in somewhat inadequate protein during the first half of the study. To make up the difference in protein concentration of the control and high-oil corns more soybean meal was added to the control diet. The protein from corn probably was less available to the rumen microorganisms than protein from soybean meal. High-oil corn contains less starch than control corn, which could reduce fermentation in the rumen and thereby reduce microbial growth. Finally we do not know the effects of the greater intake of oil on the fermentation in the rumen. Each of these effects might have reduced microbial growth in the rumen and the quantity of available metabolizable protein. During the second half of the study when metabolizable protein requirements are less because of the decreased proportion of protein in the gain, the steers fed high-oil corn may have been responding to the increased energy intake.

Table 1. Ration composition (dry matter).

	Diet		
	Control	Control + Fat	High-Oil
Corn	77.37	74.30	78.66
Corn silage	12.0	12.0	12.0
Molasses	1.5	1.5	1.5
Soybean meal	6.35	6.70	5.0
Urea	.85	.86	.85
Fat		2.70	
Potassium chloride	.24	.25	.29
Limestone	1.24	1.24	1.25
Sodium chloride	.30	.30	.30
Trace minerals	.024	.024	.024
Vitamin A premix[a]	.08	.08	.08
Rumensin® premix[b]	.0195	.0195	.0195
Elemental sulfur	.027	.027	.027

[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.

Table 2. Influence of feeding high-oil corn control corn or control corn + fat on feedlot performance.

	Diet				
	Control	Control + Fat	High-Oil	SEM[a]	LSD[b]
Starting Weight, lbs.	953	954	956		
0 to 56 days					
Gain, lb./d	5.28	5.28	5.01	.11	.34
Feed intake, lb. DM/d	23.2	23.4	23.4	.29	.90
Feed/gain	4.40	4.44	4.67	.10	.32
57 to 107 days					
Gain, lb./d	2.44	2.35	2.96	.20	.61
Feed intake, lb. DM/d	29.4	28.9	30.2	.85	2.63
Feed/gain	12.60	12.36	10.40	.93	2.86
0 to 107 days					
Gain, lb./d	3.92	3.88	4.03	.08	.26
Feed intake, lb. DM/d	25.2	25.1	25.7	.50	1.55
Feed/gain	6.43	6.47	6.38	.17	.53

[a]Standard error of the mean.
[b]Least significant difference.

In this experiment the economic value of high oil corn did not result from improved performance, but from adjustments in supplementation of the diet. The steers fed high-oil corn consumed 38 lbs less soybean meal, which resulted in lower feed costs. Using feed costs of $2.66/bu for corn (90% DM), $209/ton for soybean meal (92% DM), $28/ton for silage ((36% DM), $87.50/ton for molasses (75% DM), $240/ton for urea, $0.20/lb for fat and $17.50/cwt. for other supplemental ingredients, feed costs were $104.98, $112.66 and $103.62 per ton for control, control + fat and high-oil corn, respectively. Respective feed costs were $37.10, $40.10 and $36.30 per cwt. gain. Selling the finished steers in a grade and yield or in a quality grade grid market would have resulted in greater returns for the steers fed high-oil corn or control + fat because more of those carcasses graded USDA Choice.

Based on the results of this study, high-oil corn seems to have greater value than control corn when fed to cattle. The study also indicates there are some unknowns with respect to feeding high-oil corn to finishing cattle. Optimum supplementation with protein, especially during the first part of the feeding period, needs more study. How should the corn be processed to obtain optimum response to high-oil corn? The effect of the additional oil on rumen fermentation is not clear, which might result in substituting less than all of control corn with high-oil corn.

Implications

Feeding high-oil corn to finishing yearling steers resulted in similar performance in the feedlot, but reduced feed costs when the supplementation of the high-oil corn diet was adjusted to account for the difference in protein content of the high-oil corn. Feeding additional energy as high-oil corn or as added fat seemed to increase the percentage of USDA Choice carcasses.

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Figure 1. Quality grade distribution.