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Responses to Adding Fat to Corn-Based Diets Supplemented with Urea and Soybean Meal for Finishing Steers

Abstract

Yearling steers were fed corn-based diets supplemented with urea or soybean meal plus urea, and none, 2%, or 4% fat. All steers were implanted with Revalorâ-S and fed for 118 days. Adding fat did not improve performance of the steers in the feedlot or improve carcass characteristics. Feeding soybean meal increased rate of gain, improved feed efficiency, increased carcass weight, and tended to improve carcass quality grades compared with feeding urea. Adding 4% fat decreased feed intake, suggesting that corn-based diets may contain enough oil to approach the quantity of fat that can be utilized effectively in a ruminant diet.

Keywords

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Responses to Adding Fat to Corn-Based Diets Supplemented with Urea and Soybean Meal for Finishing Steers

A.S. Leaflet R1341

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Summary

Yearling steers were fed corn-based diets supplemented with urea or soybean meal plus urea, and none, 2%, or 4% fat. All steers were implanted with Revalor[®]-S and fed for 118 days. Adding fat did not improve performance of the steers in the feedlot or improve carcass characteristics. Feeding soybean meal increased rate of gain, improved feed efficiency, increased carcass weight, and tended to improve carcass quality grades compared with feeding urea. Adding 4% fat decreased feed intake, suggesting that corn-based diets may contain enough oil to approach the quantity of fat that can be utilized effectively in a ruminant diet.

Introduction

In two previous cattle-feeding experiments, addition of 4% of ration dry matter as fat to corn-based diets did not improve performance of finishing steers (A.S. Leaflet R1143). Addition of fat to a soybean meal-supplemented diet seemed to depress feed intake and gain of steers. It was suggested that adding 4% fat to a corn-based diet might result in too much fat considering the oil already in the corn. This experiment was conducted to study the effects of adding 2% or 4% fat to corn-based diets supplemented with urea or soybean meal plus urea for finishing steers.

Materials and Methods

Seventy-two 16- to 17-month-old steers with an average weight of 700 pounds were purchased at an Iowa auction in early September. They were predominantly black and black white-face steers that had been grazed during the summer months. Upon arrival at the feedlot, the steers were given loose hay and a mixed diet containing about 60% grain and supplement and 40% ground corn cobs. The hay was gradually removed from the diet during the first week. The steers were fed the mixed receiving diet while they were immunized and treated for internal and external parasites before beginning the experiment. Six steers were allotted at random from weight-outcome groups to each of 12 pens, and two pens were allotted at random to each of the diets shown in Table 1. The steers then were fed the experimental diets, initially in limited quantities, until they adjusted to the greater concentration of grain. All diets were formulated to contain 13.3% crude protein and to provide adequate minerals and vitamins to meet established requirements of the steers. The fat used in this experiment was a blend of animal fat and vegetable oil containing 30%

saturated fatty acids and 70% unsaturated fatty acids. The fat was delivered to the farm in 55-gallon drums. The fat was melted in the drums with an electric barrel heater, and the warm fat was pumped from the drums with a hand pump and weighed into the feed mixer. All ingredients were fed in a total mixed diet.

All steers were implanted with Revalor[®]-S at the beginning of the trial and were not reimplanted. The steers were weighed individually in the morning, before feeding, on two consecutive days at start and end of the experiment and at 28-day intervals throughout. All cattle were fed twice daily and had free access to water. Steers were sold when judged by visual appraisal to grade Low Choice. All the steers were slaughtered 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 by using the standard yield grade equation. The experiment was started in September and lasted 118 days.

Data were analyzed as a factorial design by analysis of variance with level of fat and source of supplemental nitrogen as main effects. Standard error of the means and least significant difference ($p < .05$) between means also were calculated.

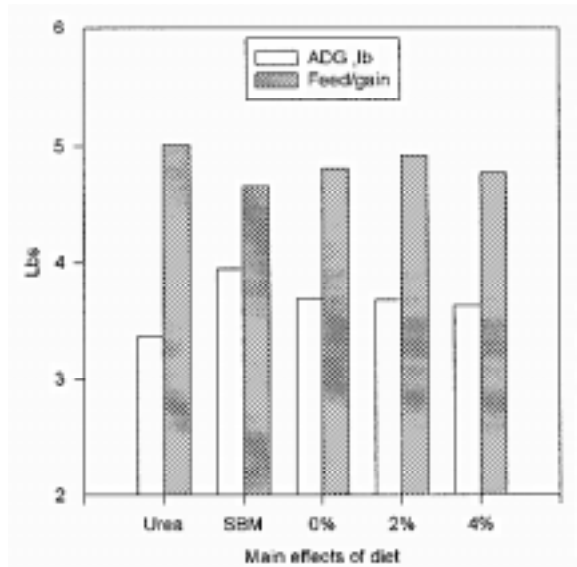
Results and Discussion

Performance of the steers is summarized in Table 2. Adding fat did not improve gain or feed efficiency of the steers fed the urea-supplemented diet. Adding 4% fat to the urea diet decreased feed intake 4.7% and gain 7.6%. Addition of fat to the soybean meal diet tended to improve gains and feed efficiency, but the differences were not statistically significant. Overall gain and feed efficiency responses to the main dietary differences, urea vs. soybean meal, and levels of added fat are shown in Figure 1. Steers supplemented with soybean meal gained 18% faster, consumed 10% more feed, and were 7% more efficient. Adding fat had no effect on gain or feed efficiency, but decreased feed intake when added at 4%.

The carcass data are summarized in Table 3. Weight of the carcasses followed the differences in rate of gain. Supplementing fat to the urea diet tended to decrease carcass weights, but had no effect in steers fed the soybean meal-supplemented diet. There were no differences in dressing percentage, quality grades, yield grades, fat cover, or area of ribeye due to feeding fat. The overall effects of feeding soybean meal or fat on carcass weights and percentage of carcasses grading Choice are shown in Figure 2. There was no effect of feeding fat on carcass weight or percentage of Choice carcasses. Steers fed soybean meal

had heavier carcasses, tended to have more Choice grade carcasses, and larger area of ribeye. Steers fed soybean meal were somewhat fatter, having more kidney-heart-pelvic fat and slightly higher yield-grade scores.

Figure 1. Overall effects of feeding soybean meal (SBM) or urea and feeding 0%, 2%, or 4% added fat on rate of gain and feed efficiency of yearling steers fed corn-based diets.



The lack of response to added fat observed in this experiment is similar to that observed in two previous experiments (A.S. Leaflet R1143). Seemingly, cattle fed diets containing high concentrations of corn and low concentrations of effective fiber-- ground cobs, or an oat byproduct were fed as roughage in these experiments-- do not respond to additions of fat. In all the experiments, addition of 4% fat tended to depress feed intake. In one trial, adding fat to the urea-supplemented diet tended to improve performance, but then depressed performance in this experiment. Likewise, adding fat to the soybean meal-supplemented diet depressed gain in the earlier trial, but had no effect in this experiment. The differences among experiments probably are the result of experimental variation. The decrease in feed intake observed with feeding 4% fat may have been the steers responding to the high energy content of fat, or the diets may have contained enough oil from the corn grain to approach the limit on the quantity of fat that can be effectively utilized in a ruminant diet. The final conclusion from the three experiments is that additions of fat do not benefit diets containing 90% concentrate, primarily from corn, when fed to finishing steers. Diets containing less grain, other sources of grain, or other forms of roughage might benefit from additions of fat when fed to finishing cattle.

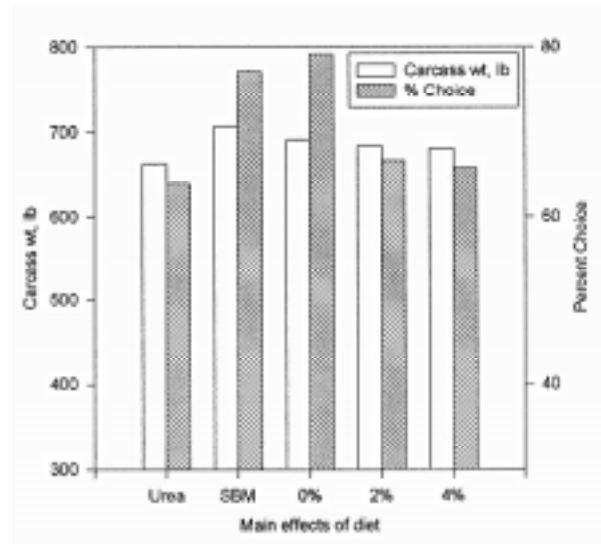
The steers fed in this experiment that had a high potential for rate of gain and were implanted with estradiol

and trenbelone acetate responded to receiving some of the supplemental nitrogen as soybean meal rather than urea. This confirms observations made with similar kinds of cattle in several previous experiments. Older steers with some compensatory gain seem to have a greater response to supplemental protein as observed in this experiment. Even though these steers had high rates of gain when supplemented with soybean meal, they did not respond to additional intake of energy in the form of added fat.

Implications

Additions of fat do not benefit diets containing 90% concentrate, primarily from corn, when fed to finishing steers. In this and previous experiments, high-performing cattle obtained more benefit from improving the protein supplement rather than adding more energy in the form of fat.

Figure 2. Overall effects of feeding soybean meal (SBM) or urea and feeding 0%, 2%, or 4% added fat on carcass weights and percentage of carcasses grading Choice from yearling steers fed corn-based diets.



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Table 1. Composition of diets.

Ingredient	Diet					
	Urea	Urea+2	Urea+4	SBM	SBM+2	SBM+4
Fat		2.0	4.0		2.0	4.0
Cracked corn	82.0	79.9	77.8	74.0	71.9	69.8
Ground cob	10.0	10.0	10.0	10.0	10.0	10.0
Molasses	4.0	4.0	4.0	4.0	4.0	4.0
Soybean Meal				10.0	10.0	10.0
Urea	2.1	2.17	2.23	.63	.70	.75
Dicalcium PO ₄	.32	.36	.40	.10	.14	.17
Limestone	.77	.75	.73	.82	.81	.78
NaCl	.30	.30	.30	.30	.30	.30
KCl	.32	.34	.35			
Elemental sulfur	.067	.069	.071	.020	.022	.024
Trace mineral premix	.024	.024	.024	.024	.024	.024
Vitamin A premix ^a	.08	.08	.08	.08	.08	.08
Rumensin premix ^b	.0175	.0175	.0175	.0175	.0175	.0175

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

^bProvided 14.4 mg sodium monensin per pound of dry matter.

Table 2. Performance of steers fed urea- or soybean meal-supplemental diet containing 0, 2, or 4% added fat.

Item	Diet						SE ^a	LSD ^b
	Urea	Urea + 2	Urea + 4	SBM	SBM + 2	SBM + 4		
No. steers	12	12	12	12	12	11		
Starting wt, lbs	705	706	706	704	709	706	.541	1.87
Ending wt, lbs	1123	1093	1092	1155	1188	1175	8.46	29.3
No. days	118	118	118	118	118	118		
Daily gain, lbs	3.54	3.28	3.27	3.82	4.06	3.97	.075	.26
Feed DM, lbs/d	17.1	17.1	16.3	18.3	18.8	18.1	.106	.37
Feed/gain	4.83	5.21	4.98	4.80	4.63	4.55	.119	.41
Liver abscesses	1	1	1			1		

^aStandard error of the mean.

^bLeast significant difference among means ($p < .05$).

Table 3. Carcass data.

Item	Diet						SEM ^a	LSD ^b
	Urea	Urea + 2	Urea + 4	SBM	SBM + 2	SBM + 4		
Carcass wt, lbs	676.1	659.0	654.1	704.9	708.9	708.4	7.37	25.5
Dressing %	60.2	60.3	59.9	61.1	59.7	60.3	.378	1.31
Ribeye area, in ²	12.2	12.4	12.0	13.2	12.7	12.7	.319	1.10
Fat cover, in	.33	.29	.28	.32	.32	.34	.033	.113
KHP fat, %	2.3	2.0	2.0	2.4	2.2	2.4	.140	.486
Quality grade								
Choice	8	9	6	11	7	9		
Select	4	3	6	1	5	2		
% Choice	66.7	75.0	50.0	91.7	58.3	81.7	11.3	39.1
Yield grade								
1	2	3	5	4	4	3		
2	9	9	6	4	7	6		
3	1		1	4	1	2		
Average	2.45	2.15	2.23	2.41	2.41	2.42	.143	.495

^aStandard error of the mean.

^bLeast significant difference among means ($p < .05$).