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Abstract

Feeding fat increased feed intake and average daily gain, but feed efficiency was not affected. Feeding high levels of calcium (.9%) had no overall effect, but may tend to increase intake when fed with diets that contain primarily vegetable fat or highly unsaturated fat products.

Keywords

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DIETARY FAT AND CALCIUM LEVEL EFFECT ON FEEDLOT PERFORMANCE AND CARCASS MERIT IN STEERS[1]

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Summary

Feeding fat increased feed intake and average daily gain, but feed efficiency was not affected. Feeding high levels of calcium (.9%) had no overall effect, but may tend to increase intake when fed with diets that contain primarily vegetable fat or highly unsaturated fat products.

Introduction

The most commonly reported problems associated with feeding fat to finishing cattle are decreased feed intake and depressed fiber digestibility. Increased calcium levels help alleviate depressed fiber digestibility, possibly because calcium reacts with the fatty acids in the rumen to form calcium soaps. Because these soaps are insoluble in the rumen, the fatty acids cannot interact with rumen microbes. As the soap passes out of the rumen, it becomes soluble, allowing normal fat absorption. By the same mechanism, fats that are high in unsaturated fatty acids (i.e., vegetable oils) would be protected from saturation in the rumen by the microflora. Such protected fats would be absorbed in the unsaturated form and could cause higher levels of unsaturated fatty acids in tissue. Rumen fat-bypass methods that have been studied are encapsulating fats with a formaldehyde-protein complex or feeding calcium salts of long-chain fatty acids; both are fairly expensive. Adding calcium to high fat diets would be cheap and practical. This paper presents the results of a feeding trial that investigated the efficacy of feeding two types of fat (Table 27.1) with two levels of calcium in finishing diets.

Experimental Procedures

The finishing study, conducted at the Southwest Kansas Experiment Station, began on June 1, 1988. One hundred thirty-eight steers were used in a complete block design, with weight as a blocking factor, and allotted to six treatments with four pens per treatment and five to six animals per pen. The heaviest group averaged 855 pounds; the lightest group averaged 743 pounds.

The six dietary treatments were: 1) 0% fat, .5% calcium; 2) 0% fat, .9% calcium; 3) 3.5% tallow, .5% calcium; 4) 3.5% tallow, .9% calcium; 5) 3.5% soybean oil soapstock, .5% calcium; and 6) 3.5% soybean oil soapstock, .9% calcium. Soapstock is a by-product of edible oil refining. The fatty acid composition is very similar to the original oil but is much higher in nonesterified fatty acids.

[1]Appreciation is expressed to Iowa Limestone Co. for providing limestone and funding.

Starting and ending weights were the average of two consecutive, early morning, full weights. Starting weights were obtained 12 days into a 22 day step-up period, after which the cattle were put on the final diet (Table 27.2). The cattle were weighed at 28-day intervals until slaughter (111 days).

Results and Discussion

Neither fat nor calcium affected feedlot performance during the first 28 days (Table 27.3). However, during days 29-56, animals consuming the soybean oil soapstock with .9% calcium had increased intake but decreased efficiency, whereas control and tallow-fed animals on .9% calcium consumed less feed but utilized it more efficiently ($P<.05$). During days 57-84, calcium level and fat interacted ($P<.07$) for average daily gains; soapstock-fed animals gained more, whereas animals fed tallow gained less on the .9% calcium diets. During the last period (days 85-111), calcium had no effect, but fat-fed animals had higher dry matter intakes, corresponding with higher average daily gains and better feed efficiencies. Over the entire trial, average daily gain and dry matter intake were improved ($P<.03$) by added fat. Feed efficiency was not different between treatment groups.

Table 27.4 lists the effects of fat and calcium on carcass characteristics. Fat increased final live weights, hot carcass weights, backfat, and percent carcasses grading Choice. These effects would be expected, considering the increased average daily gain from adding fat to the diet. The increased backfat and Choice carcasses might also be expected from the increased energy density. The higher level of calcium, when fed with tallow, depressed hot carcass weights and corresponding dressing percentages; when fed with soapstock, it increased the percent carcasses grading Choice. The reasons for these effects are not clear.

Table 27.1. Composition of Final Diets[1]

Ingredients	Control	Added Fat
Steamflaked wheat	80.86	80.72
Corn silage	5.00	5.00
Chopped alfalfa hay	5.00	5.00
Supplement	4.14	4.28
Tallow/soybean oil soapstock	----	3.50
Blended molasses	5.00	1.50

[1]Dry matter basis. Formulated to contain 12.5% minimum CP, .35% P, .65% K, and limestone added to provide .5% or .9% Ca of each diet.

Table 27.2 Dietary Fat and Calcium Effect on Feedlot Performance

	Soybean						
	No Fat + Ca%		Soapstock + Ca%		Tallow + Ca%		
Item	.5	.9	.5	.9	.5	.9	SE
Period 1 (0-28d)	3.48	3.33	3.60	3.30	3.80	3.42	.18
DMI, lb	18.57	17.87	18.65	19.17	19.14	18.41	.37
G/F	.188	.187	.194	.174	.200	.185	.01
Period 2 (29-56d)							
ADG[a]	3.53	3.96	4.13	4.27	4.14	4.24	.16
DMI[b]	21.39	20.09	21.28	22.76	21.96	21.23	.53
G/F[b]	.165	.197	.195	.187	.190	.200	.007
Period 3 (57-84d)							
ADG[c]	3.23	3.29	2.85	3.46	3.55	3.01	.23
DMI	21.93	21.44	22.42	22.92	23.35	22.50	.65
G/F	.147	.154	.128	.152	.152	.134	.01
Period 4 (85-111d)							
ADG[a]	2.67	2.66	3.33	3.12	3.02	3.30	.16
DMI[d]	19.69	21.48	21.52	22.03	21.99	21.48	.52
G/F[d]	.136	.125	.156	.141	.137	.154	.007
Overall (0-111d)							
ADG[a]	3.23	3.32	3.48	3.54	3.63	3.49	.08
DMI[a]	20.40	20.21	20.96	21.72	21.61	20.90	.37
G/F	.159	.164	.166	.164	.169	.167	.003

[a]Fat effect (P≤.03)
[b]Fat x Ca interaction (P≤.05)
[c]Fat x Ca interaction (P≤.07)
[d]Fat effect (P<.07)

Table 27.3 Dietary Fat and Calcium Effect on Carcass Characteristics

	Soybean						
	No Fat + Ca%		Soapstock + Ca%		Tallow + Ca%		
Item	.5	.9	.5	.9	.5	.9	SE
No. steers	23	23	23	23	23	23	
Initial wt, lb	810	805	808	806	808	807	1
Final wt, lb[a]	1168	1172	1193	1194	1210	1194	9
Hot carcass wt, lb[ab]	716	732	741	747	760	735	6
Dressing %[b]	61.3	62.0	62.0	62.4	62.7	61.7	.3
Backfat, in[c]	.47	.47	.52	.51	.55	.50	.02
Marbling score[d]	210	202	199	214	218	206	14
Yield grade	2.62	2.87	3.25	3.04	3.21	2.97	.21

[a]Fat effect, P<.01.
[b]Fat x Ca interaction, P<.05.
[c]Fat effect, P<.05.
[d]Small=200-300 or choice quality grade.