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Effects of Protein Levels and Withdrawing Supplemental Protein on Performance of Growing and Finishing Steers

J. G. Riley, K. F. Harrison, and G. Fink

Summary

In one growing trial and two finishing trials we used 264 steers. Rations containing 13.2% crude protein during the 105-day growing trial significantly ($P<.05$) improved rate of gain compared with 11.3% crude protein rations. Withdrawing supplemental protein at approximately 750, 850, or 950 pounds live weight did not significantly affect rate of gain; however, gain was slowest by steers without supplemental protein.

Introduction

Previous research here (1973, 1974) indicated that steers on growing rations gained faster and more efficiently when fed more crude protein than is now recommended by the National Research Council. The earlier research also demonstrated that supplemental protein could be removed from the ration when animals reached approximately 950 pounds without significantly depressing performance. Ohio State and Texas Tech researchers found that supplemental protein could be withdrawn when animals reached 750 or 850 pounds. Trials reported here were to get more information relating to protein withdrawal and carcass characteristics of growing and finishing steers.

Experimental Procedure

We randomly allotted 168 mixed-breed steers averaging 501 lb. to four pens of 42 steers each. Two pens were fed a 13.2% crude protein ration and two, an 11.3% crude protein ration for a 105-day growing trial. Then we reallocated the steers according to previous growing ration into 4 trial groups: supplemental protein withdrawn at: (1) approximately 750 lbs; (2) at 850 lbs; (3) at 950 lbs; (4) protein fed continuously until slaughter. The same four treatments were used in finishing trial 2 on 96 Angus and Angus X yearling steers. Compositions of rations fed are shown in table 16.1, and of the withdrawal supplement in table 16.2. Periodic samples of each ingredient used in the rations were taken and proximate analyses obtained. Average crude protein was calculated as shown at the bottom of table 16.1. All rations were mixed twice daily and fed free-choice. Initial and final weights were taken after 15 hours without access to feed or water. Individual slaughter and carcass data were collected at Wilson and Company, Kansas City, MO. Performance data are adjusted to an equal dressing percentage basis.

Results and Discussion

Steers fed rations containing 13.2% crude protein gained significantly faster ($P<.05$) than those on 11.3% crude protein rations (table 16.3). Daily dry matter consumption and efficiency also were better for steers getting 13.2% crude protein.

Withdrawing supplemental protein for the duration or the last two-thirds of the trial slightly depressed gains and lowered daily dry matter intake (table 16.4). However, during trial 2 (table 16.5) withdrawing supplemental protein the final two-thirds or the final third of the finishing period resulted in similar gains and efficiency to those by steers that were fed supplemental protein to slaughter weights. Withdrawals were at approximately 750, 850, or 950 pounds of live weight for the two trials. The results suggest that British breeds of cattle do not need supplemental protein in high concentrate rations when they reach 950 pounds, and that supplemental protein may be withdrawn with minimal effects when British breeds on high concentrate rations reach 750 or 850 pounds.

Table 16.1. Composition of Final Rations Fed Steers During Indicated Feeding Phases.
(%, dry matter basis)

Ingredient	Growing		Finishing Trial 1		Finishing Trial 2	
	11% C.P.	13% C.P.	Basal	11% C.P.	Basal	11% C.P.
Sorghum silage	55.0	55.0	20.0	20.0	15.0	15.0
Grain sorghum	20.0	18.0	40.0	37.0	60.0	56.0
Corn	15.0	12.0	37.5	34.5	23.0	22.0
Cottonseed meal	7.5	12.5	--	--	--	--
Soybean meal	--	--	--	6.0	--	5.0
Supplement	2.5	2.5	2.5	2.5	2.0	2.0
Crude protein content ^a	11.3	13.2	8.7	11.2	9.3	11.2

^aCalculations based on periodic sampling of each ingredient during the trials.

Table 16.2. Composition of Supplement Withdrawn from Basal Rations During Finishing Trials 1 and 2.

Ingredient	%
Rolled milo	69.0
Dical	4.8
Dyna-K	2.5
Limestone	12.3
Salt	7.2
Aureomycin (10 gms/lb.)	1.4
Trace minerals (Z-5) ^a	1.5
Soy oil	1.0
Vitamin A (30,000 I.U./gm)	.3

^aCalcium Carbonate Company.

Table 16.3. Effects of Protein Levels on Performance of Growing Steers, 105 Days, Aug. 23-Dec. 6, 1973.

Item	% crude protein			
	11	11	13	13
No. of steers	42	42	42	42
Initial wt., lb.	495.5	500.6	507.4	498.0
Final wt., lb.	725.5	723.2	752.1	738.5
Avg. gain, lb.	230.0	222.6	244.7	240.5
Avg. daily gain, lb.	2.19 ^a	2.12 ^a	2.33 ^b	2.29 ^b
Daily dry matter, lb.	18.66	18.63	18.96	19.08
Dry matter/lb. gain, lb.	8.52	8.79	8.14	8.33

^{a,b}Means in same row with different superscripts differ significantly ($P < .01$).

Table 16.4. Effects of Withdrawing Supplemental Protein from Finishing-Steer Rations, 151 Days, Trial 1. Dec. 6, 1973-May 7, 1974.

Item	Days	% crude protein			
	0-49 50-91 92-151	Basal ^a Basal Basal	11 Basal Basal	11 11 Basal	11 11 11
No. of steers	42	42	42	42	42
Initial wt., lb.	725.4	728.1	736.3	736.5	736.5
Final wt., lb.	1033.3	1036.3	1059.8	1066.8	1066.8
Avg. gain, lb.	307.9	308.2	323.5	330.3	330.3
Avg. daily gain, lb.	2.04	2.04	2.14	2.19	2.19
Daily dry matter, lb.	19.31	19.46	20.84	20.56	20.56
Dry matter/lb. gain, lb.	9.47	9.54	9.74	9.39	9.39

^aBasal ration ranged from 8.7-9.1% crude protein, based on periodic sampling during trial 1.

Table 16.5. Effects of Withdrawing Supplemental Protein from Finishing-Steer Rations, 108 Days, Trial 2. June 11-Sept. 27, 1974.

Item	Days	% crude protein			
	0-38 39-73 74-108	Basal ^a Basal Basal	11 Basal Basal	11 11 Basal	11 11 11
No. of steers	24	24	24	24	24
Initial wt., lb.	749.7	754.6	749.9	774.9	774.9
Final wt., lb.	1082.0	1100.0	1088.3	1118.4	1118.4
Avg. gain, lb.	332.3	345.4	338.4	343.5	343.5
Avg. daily gain, lb.	3.08	3.20	3.13	3.18	3.18
Daily dry matter, lb.	24.73	25.01	24.09	25.05	25.05
Dry matter/lb. gain, lb.	8.03	7.82	7.70	7.88	7.88

^aBasal ration ranged from 8.9-9.3% crude protein during trial 2.

Table 16.6. Effects on Carcass Characteristics of Withdrawing Supplemental Protein from Finishing Steers, Trials 1 & 2.

Item	Days		% crude protein			
	Trial 1	Trial 2				
	0-49	0-38	Basal	11	11	11
	50-91	39-73	Basal	Basal	11	11
	92-151	74-108	Basal	Basal	Basal	11
Fat thickness, in.						
Trial 1			.53	.66	.58	.57
Trial 2			.75	.73	.76	.78
Loin eye area, sq. in.						
Trial 1			12.1	11.7	11.3	11.5
Trial 2			10.8 ^a	11.3 ^{a,b}	11.1 ^{a,b}	11.9 ^b
U.S.D.A. grade ^c						
Trial 1			12.0	12.3	12.4	12.1
Trial 2			12.3	12.3	12.1	12.3
U.S.D.A. yield grade						
Trial 1			3.0	3.6	3.5	3.4
Trial 2			4.0	3.8	4.0	3.8

^{a,b}Means on same row with different superscripts differ significantly ($P < .05$).

^cChoice = 13, low choice = 12, high good = 11.