Table 18 (Continued)

Av. feed per cwt. gain, lbs:			
Soybean oil meal	62.3	62.5	61.3
Corn	644.8	654.5	634.3
Sorghum silage	580.4	613.5	572.6
Salt	2.2	2.1	2.5
Salt and bonemeal mix	3.7	3.3	3.6
Feed cost per cwt. gain	$ 16.69	16.96	16.43
Feed cost per animal	$ 57.58	58.34	57.67
% shrink to market	2.8	2.5	2.6
Dressing %, feedlot wt.	59.4	60.3	60.4
Dressing %, pay wt.	61.1	61.8	61.9
Av. carcass wt., lbs.	482	488.7	492.8
Av. finish: Thickness[1]	3.4	3.7	3.4
Distribution[2]	3.8	3.6	3.7
Degree of marbling[3]	6.6	6.8	6.6
Size of ribeye[4]	4.3	4.4	4.6
Degree of firmness[5]	3.5	3.6	3.3
Carcass grades:			
Top choice	..	..	..
Av. choice	2	3	..
Low choice	2	..	4
Top good	4	5	4
Av. good	2	2	2
Av. carcass value (choice 41.5¢) .... (good 39.0¢)	$193.07	194.46	196.81

1. Based on 2, thick; 3, moderate; 4, modest.

2. Based on 2, uniform; 3, moderately uniform; 4, modestly uniform; 5, slightly uneven.

3. Based on 4, slightly abundant; 5, modest; 6, moderate; 7, small amount.

4. Based on 3, moderately large; 4, modestly large; 5, slightly small; 6, small.

5. Based on 2, firm; 3, moderately firm; 4, modestly firm; 5, slightly firm.

The Value of Enzyme Preparation Added to Cattle Rations (Project Com. 5-662)[1]

D. Richardson, B. A. Koch, E. F. Smith, F. W. Boren, and J. K. Ward

Feed is stored nutrients. The value of the feed depends on the nutrients contained and the ability of animals to obtain these nutrients for their bodies to use. Enzymes are organic catalysts that have the primary responsibility of breaking down food in the digestive tract so it can be absorbed and used. The more efficiently this process is done, the greater the value of the feed. This test was conducted to study the value of added commercial enzyme preparations to cattle-fattening rations.

Experimental Procedure

Three lots of 10 heifer calves each were fed the same ration except for the added enzyme preparations. Ingredients and average daily consumption are shown in Table 19. Lot 1 served as the control. The enzyme preparations were added to the soybean oil meal at the following rates per ton: Lot 2, 2.5 lbs. amylase (acts on carbohydrates); Lot 3, 2.5 lbs. amylase plus 6 lbs. protease (acts on proteins). Rumen samples were obtained to determine the concentration of volatile fatty acids and percentage distribution of acetic, propionic, and butyric acids in the rumen fluid.

Results and Discussion

Results of the feedlot test are shown in Table 19. Rate of gain was affected by severe weather conditions and cases of founder and foot

1. We wish to acknowledge Rohm & Haas Company, Philadelphia, Pennsylvania, for partial support of this project and for supplying the enzyme preparations.

Table 19

Enzymes in beef cattle fattening rations.

December 10, 1959, to July 11, 1960—215 days.

Lot number	1	2	3
Added enzyme preparation	None	Amylase	Amylase+ Protease
Number heifers per lot	10	10	10
Av. initial wt. per heifer, lbs.	466	466	467
Av. final wt. per heifer, lbs.	829	792.5	811
Total gain per lot, lbs.	3630	3265	3440
Av. gain per heifer, lbs.	363	326.5	344
Av. daily gain per heifer, lbs.	1.69	1.52	1.60
Total feed consumed per lot, lbs.:			
Soybean oil meal	2150	2150	2150
Corn	21915	20905	21860
Alfalfa hay	2080	2080	2080
Sorghum silage	21010	20685	20985
Salt	92	67	57
Salt and bonemeal, ½ and ½ mix	137	107	107
Av. daily feed per head, lbs.:			
Soybean meal	1	1	1
Corn	10.2	9.7	10.2
Alfalfa hay	1.0	1.0	1.0
Sorghum silage	9.8	9.6	9.8
Salt	.043	.031	.030
Salt and bonemeal mix	.064	.050	.050
Av. feed per 100 lbs. gain, lbs.:			
Soybean meal	59.2	65.8	62.5
Corn	603.9	640.4	635.5
Alfalfa hay	57.0	63.7	60.5
Sorghum silage	578.8	633.7	610.2
Salt	2.5	2.1	1.7
Salt and bonemeal mix	3.8	3.3	3.1
Feed cost per 100 lbs. gain*	$ 16.22	17.35	17.04
Feed cost per animal	58.88	56.65	58.62
% shrink to market	3.4	3.5	2.9
Dressing %, feedlot wt.	59.6	61.0	59.8
Dressing %, pay wt.	61.7	63.2	61.6
Av. carcass wt., lbs.	493.7	483.6	485.2
Finish:			
Thickness[1]	3.4	3.7	3.7
Distribution[2]	3.9	3.3	3.8
Degree of marbling[3]	5.9	6.6	6.3
Size of ribeye[4]	4.6	4.4	4.3
Degree of firmness[5]	3.2	3.4	3.2
Carcass grades:			
Top choice	1	1	..
Av. choice	1	..	3
Low choice	4	3	2
Top good	2	4	5
Av. good	2	2	..
Av. carcass value (choice 41.5¢) .... (good 39.0¢)	$200.13	193.54	195.25
Av. carcass value less feed cost	$141.25	136.89	136.63

* Not including enzymes.

1. Based on 2, thick; 3, moderate; 4, modest; 5, slightly thin.

2. Based on 2, uniform; 3, moderately uniform; 4, modestly uniform; 5, slightly uneven.

3. Based on 4, slightly abundant; 5, moderate; 6, modest; 7, small amount.

4. Based on 2, large; 3, moderately large; 4, modestly large; 5, slightly small; 6, small.

5. Based on 2, firm; 3, moderately firm; 4, modestly firm; 5, slightly firm.

rot which appeared to be of equal severity and distribution among lots. Differences in average daily gains appear to be large; however, statistical analysis showed that the differences were not significant. Animals in lot 2 were always slow to clean up their feed. Apparently the amylase depressed the appetite. Those in lot 3 ate well at first but tended to have less desire for feed after about midway in the feeding period. There were no significant differences in carcass characteristics. The rumen fluid did not show any differences in concentration of volatile fatty acids or percentage distribution of acetic, propionic, and butyric acids.

Cobalt Bullets for Beef Cattle[1]

D. Richardson, E. F. Smith, J. R. Brethour, B. A. Koch, W. S. Tsien, F. W. Boren, and B. D. Carmack

Cobalt is a trace mineral element which is essential to the health and well-being of animals. If it is deficient in the ration, it should be supplied. A cobalt bullet, which is placed in the rumen, was developed in Australia for sheep and cattle on cobalt-deficient pastures or rations. These cobalt bullets were found to be effective in preventing cobalt deficiency. Cobalt bullets are now available in this country. The bullet is composed of 90% cobalt oxide and 10% binding agent. The weight is 20 grams for cattle and 5 grams for sheep. The bullet is placed in the rumen with a balling gun. Since it is heavy, it remains in the rumen and allows cobalt to become available to the animal. Bullets were recovered at slaughter in some of these tests after over 300 days.

The results reported in Table 20 were obtained on feedlot and grazing tests conducted at Manhattan and Fort Hays. One half of the animals on each test received a cobalt bullet and the others did not. Feed and pasture samples were analyzed for cobalt content.

A significant difference in gain was produced in only one test. This was with corn in a fattening ration and without alfalfa. No significant difference was obtained when alfalfa was in the ration, when sorghum grain was fed, or when animals were on pasture.

It is generally agreed that 0.1 part per million (PPM) cobalt in forage is sufficient for cattle. If this is correct, both rations or pastures used supply sufficient cobalt. Cobalt content of feeds and pasture is shown in Table 21.

Table 20
Results with cobalt bullets in beef cattle.

	Control	Cobalt bullet in rumen
Number animals	15	15
Number days	215	215
Av. daily gain, lbs.	1.54	1.66
Ration: Sorghum silage, alfalfa hay, soybean oil meal, and corn.		
Number animals	15	15
Number days	215	215
Av. daily gain, lbs.	1.49	1.74*
Ration: Same as above except no alfalfa hay.		
Number animals	20	20
Number days	140	140
Av. daily gain, lbs.	1.75	1.67
Ration: Sorghum silage, alfalfa hay, soybean oil meal, and 2 to 4 pounds sorghum grain.		
Number animals	18	20
Number days	158	158
Av. daily gain, lbs.	1.70	1.72
Ration: Sorghum silage, alfalfa hay, soybean oil meal, and sorghum grain.		
Bluestem pasture (Manhattan)		
Number animals	66	61
Number days (May 4-Sept. 29)	147	147
Av. daily gain, lbs.	1.84	1.86
Fort Hays pastures (Blackwell switchgrass, Caucasian bluestem, Western wheatgrass, and native mixture).		
Number animals	60	59
Number days (May 3-Sept. 30)	150	150
Av. daily gain, lb.	0.88	0.87

* Significantly higher gain.

1. We wish to thank Nicholas International Ltd., Toronto, Ontario, Canada, for supplying the cobalt bullets and partial support in these studies.

Table 21
Cobalt analysis of feedstuffs.

Ingredient	Cobalt content on dry matter basis PPM
Manhattan	
Corn	0.21
Corn	0.25
Corn	0.20
Sorghum grain	0.15
Pelleted sorghum grain	0.17
Soybean oil meal	0.15
Soybean oil meal	0.18
Steamed bonemeal	0.12
Common salt	0.10
Alfalfa hay	0.59
Dehydrated alfalfa pellets	0.58
Grain sorghum silage	0.18
Dehydrated grain sorghum pellets	0.21
Atlas sorghum silage	0.17
Big bluestem, ungrazed tops	0.09
Big bluestem, whole plant	0.08
Little bluestem, ungrazed tops	0.13
Little bluestem, whole plant	0.14
Fort Hays	
Blackwell switchgrass	0.12
Blue grama	0.14
Buffalograss	0.11
Caucasian bluestem	0.14
Western ragweed	0.50
Western wheatgrass	0.14