the total feed intake might be low in some of the lots. It is likewise recognized that 10 percent molasses may not be necessary for maximum gains; however, it was included in these rations to control the dustiness of the finely ground feeds.

Observations

1. The cattle fed the coarsely cracked corn and chopped hay (Lot 1) made significantly faster gains than the cattle fed the finely ground or the pelleted rations. Likewise, the cattle of Lot 1 had higher carcass grades, dressing percentages, and marbling scores than the cattle of the other two lots.

2. Despite their lower rate of gain, the feed efficiency of the cattle fed the pelleted ration was as high as that of the cattle fed the coarsely cracked corn and chopped hay.

3. It was apparent that the low feed consumption certainly contributed to the lower gains of the cattle fed the finely ground and pelleted rations.

4. The absence of rumination (cud-chewing) was quite evident among the heifers of Lots 2 and 3, which were fed the finely ground and the pelleted rations, respectively. In the later stages of the test the heifers of both Lots 2 and 3 exhibited a strong desire for coarse roughage. They chewed vigorously on the wooden fences and ate every sprig of bedding that was placed in their pen.

Table 41.—A study of the preparation of rations for fattening heifers.
(July 3-October 23, 1954—112 days)

Lot number	1	2	3
Management	Chopped hay and coarsely ground grain ration	Finely ground ration	Pelleted ration
Number heifers per lot	10	10	10
Initial wt.	590	590	592
Final wt.	869	797	811
Gain per heifer	279	207	219
Daily gain per heifer	2.49	1.85	1.96
Daily ration per heifer, lbs.:			
Corn	11.88	9.28	9.14
Cottonseed meal	.98	.77	.76
Molasses	1.96	1.55	1.52
Alfalfa hay	6.62	5.53	5.48
Salt	.01	.02	.03
Lbs. feed required per cwt. of gain:			
Corn	474.84	502.15	467.65
Cottonseed meal	39.57	41.84	38.97
Molasses	79.14	83.69	77.94
Alfalfa hay	265.66	302.71	280.01
Salt	.43	1.21	1.78
Feed cost per cwt. gain	$22.77	$24.42	$23.57
Initial cost of heifer @ $18.00	$106.20	$106.20	$106.56
Feed cost per heifer	$63.53	$50.55	$51.62
Heifer cost plus feed cost	$169.73	$156.75	$158.18
Market wt., lbs.	844	780	795
Necessary selling price per cwt.	$20.11	$20.10	$19.90
Selling price per cwt.	$23.50	$22.50	$22.50
Dressing %	60.9	59.5	59.1
Carcass grades:			
Choice	6	2	1
Good	4	8	9
Marbling score:			
Moderate	1		
Modest	5	1	
Small	1	5	4
Slight	2	4	4
Traces	1		2

Table 41 (Continued).

Feed prices: corn, $2.70 per cwt.; cottonseed meal, $80 per ton; alfalfa hay, $22 per ton; molasses, $2 per cwt.; salt, $15 per ton; mixing feed, $4 per ton; pelleting, $2 per ton; grinding, $5 per ton.

Fundamental Nutrition Studies of Sorghum Roughages and Grains.

A Comparison of Rolled, Coarsely Ground, and Finely Ground Milo Grain for Fattening Yearling Heifers, 1954.

PROJECT 222

F. H. Baker, E. F. Smith, R. F. Cox, and D. Richardson

Thirty light yearling Hereford heifers were used in this experiment. The heifers were purchased in the fall of 1953, used in wintering tests until May 1, 1954, and grazed on native grass pasture from May 1 to July 1, 1954. In allotting the heifers for this test, consideration was given to weight, feeder grade, and previous treatment.

The rolled milo was dry rolled and appeared satisfactory upon emergence from the roller; however, after sacking and when finally fed, it was in small particles and somewhat powdered. The coarsely ground or cracked milo was the product of a burr mill. A hammer mill was used to prepare the finely ground milo, which was ground to a coarse, mealy mixture.

The heifers were hand-fed twice daily, according to appetite, until they were on full feed (35 days). During the remainder of the experiment, 5 pounds of alfalfa hay was fed once daily and the grain was self-fed. Fresh water and salt were available at all times.

Observations

1. The daily consumption of finely ground milo by the heifers in Lot 1 was slightly lower than consumption of coarsely ground and rolled milo by heifers of Lots 2 and 3, respectively. The heifers in Lots 1 and 3 used the feed more efficiently than did the heifers of Lot 2.

2. The gains of the heifers fed finely ground milo and of those fed rolled milo were materially higher than those of the heifers fed coarsely ground milo.

3. The selling price, dressing percentage, marbling scores, and carcass grades of the heifers fed coarsely ground milo were slightly lower than either those fed finely ground or rolled milo.

Table 42.—A comparison of rolled, coarsely ground, and finely ground milo grain for fattening heifers.
(July 3-October 23, 1954—112 days)

Lot number	1	2	3
Management	Finely ground milo	Coarsely ground milo	Rolled milo
Number heifers per lot	10	10	10
Initial wt. per heifer, lbs.	592	588	590
Final wt. per heifer, lbs.	848	818	853

Table 42 (Continued).

Market wt.	827	802	830
Gain per heifer, lbs.	256	230	263
Daily gain per heifer, lbs.	2.29	2.05	2.35
Daily ration per heifer, lbs.:			
Milo	12.74	13.59	13.68
Alfalfa hay	6.34	6.25	6.52
Salt	.03	.03	.02
Feed required per 100 lbs. gain, lbs.:			
Milo	557.19	661.61	582.78
Alfalfa hay	277.58	304.26	277.57
Salt	1.17	1.30	1.03
Cost of feed per 100 lbs. gain	$ 17.55	$ 20.56	$ 18.21
Initial cost of heifer @ $18 cwt.	106.56	105.84	106.20
Feed cost per heifer	44.93	47.29	47.89
Heifer cost plus feed cost	151.49	153.13	154.09
Necessary selling price per cwt.	18.32	19.09	18.56
Selling price per cwt.	23.50	22.50	23.50
Dressing %	60.9	60.2	60.7
Carcass grades:			
Choice	2	1	2
Choice−	5	4	3
Good+	3	2	3
Good		3	2
Marbling:			
Moderate	1		
Modest	1	1	2
Small	6	4	5
Slight	2	4	3
Traces		1	

Feed prices: Milo, $2.60 per cwt.; alfalfa hay, $22 per ton; salt, $15 per ton.

The Value of Ammoniated Hydrol in Beef Cattle Wintering Rations, 1954-55.

PROJECT 537*

D. Richardson, F. H. Baker, and R. F. Cox

Ruminant animals are capable of utilizing many nonprotein nitrogen compounds, when properly fed, as a substitute for protein. Certain of these products are now being used in livestock feeds as a substitute for protein. Natural proteins are desired in livestock rations and usually produce better results. However, with our increasing population and its demand for meat, the supply of natural protein feedstuffs may become a limiting factor in livestock production. We should learn more about proper methods of production of protein substitutes and their utilization as a feed ingredient by ruminants.

In previous experiments at this and other stations, poor results were obtained with ammoniated blackstrap molasses. It is believed that the process of ammoniation was primarily at fault. This experiment was planned to evaluate ammoniated hydrol (corn molasses) as a partial substitute for protein in the wintering ration of beef calves. This product was made by a different process from the one used previously.

* This project was partially supported by Clinton Foods, Inc., Clinton, Iowa.

Experimental Procedure

Twenty Hereford heifer calves were divided as equally as possible on the basis of size, weight, and type into two lots of 10 animals each. Atlas sorghum silage was used as the roughage and the amount fed was adjusted to the amount the animals would clean up daily. The remainder of the ration was kept the same throughout the experiment. The ration at the beginning of the experiment is shown in Table 43. The concentrate part of the ration was mixed with the silage. A mineral mixture of two parts steamed bone meal and one part salt and salt alone were fed free choice. Water was available at all times.

Table 43.—Daily ration used at the beginning of the experiment (pounds).

Lot	Atlas sorghum silage	Milo grain	Soybean oil meal	Ammoniated hydrol*
8 Control	20	2.0	1.0	
4 One-half protein concentrate as protein equivalent from ammoniated hydrol	20	0.9	0.6	2.00

* Contained 11.55 percent protein equivalent.

Results and Discussion

The results of this experiment are shown in Table 44. The average daily gain of the animals receiving ammoniated hydrol was satisfactory; however, it was not so good as the gain of the control animals. For some unknown reason the animals fed ammoniated hydrol did not eat as much silage as the control animals the first 84 days; however, they ate as much during the remainder of the experiment. Blood serum phosphorus taken February 15 showed an average of 9.74 mg. percent for the controls, and 9.91 mg. percent for those receiving ammoniated hydrol. These are normal values.

No craziness (as in animals fed ammoniated molasses in previous tests here) or other ill effects were observed during the entire feeding period. Further studies are being conducted on the blood of animals and digestibility of the ammoniated hydrol.

Table 44.—Results of feeding ammoniated hydrol in the wintering ration of beef heifer calves.
(Nov. 15, 1954, to April 4, 1955—140 days)

Lot	8 (Control)	4 (One-half protein concentrate as protein equivalent from ammoniated hydrol)
Number heifers per lot	10	10
Number days on trial	140	140
Av. initial wt. of heifers, lbs.	430	431
Av. final wt. of heifers, lbs.	647	619.3
Av. gain per heifer, lbs.	217	188.7
Av. daily gain per heifer, lbs.	1.55	1.35
Av. daily ration per heifer, lbs.:		
Sorghum silage	29.46	26.93
Ground milo grain	2.00	1.05
Soybean oil meal	1.00	0.63