

Table 47 (Continued)

Degree of marbling ^a	8.0	7.6	7.9
Size of rib eye (visual est.) ^b	3.7	3.3	4.1
Size of rib eye (sq. in.)	10.29	10.50	9.91
Degree of firmness ¹⁰	2.2	2.5	3.0

8. Based on modest amount 6, small amount 7, slight amount 8, traces 9, practically devoid 10.

9. Based on very large 1, large 2, moderately large 3, modestly large 4, slightly small 5.

10. Based on very firm 1, firm 2, moderately firm 3, modestly firm 4, slightly firm 5, soft 6.

Table 48

Results of Implanting 24 and 36 Mgs. of Stilbestrol and Synovex Pellets with Beef Steer Calves on Fattening Ration.

February 12 to July 12, 1957—150 days.

Treatment	Control	24 mgs. stilbestrol	36 mgs. stilbestrol	Synovex ¹
Number of calves per treatment	9	9	8	9
Av. initial wt., lbs.	618.9	614.4	611.3	610.0
Av. final wt., lbs.	910.5	995.0	957.5	945.6
Av. daily gain, lbs.	1.94	2.54	2.31	2.22
Carcass data:				
Av. hot carcass wt., lbs.	548.8	592.4	574.7	569.8
Av. hot carcass dressing % based on final feed lot wt.	60.3	59.5	60.0	60.3
Av. carcass grade: ²				
Before ribbing	12.6	11.8	11.5	12.7
After ribbing	13.1	11.6	11.8	13.0
Av. finish:				
Fat thickness ³	3.6	3.7	3.9	3.6
Fat distribution ⁴	2.0	2.6	2.5	2.8
Degree of marbling ⁵	7.0	8.3	7.9	6.9
Size of rib eye (visual est.) ⁶	3.8	3.7	3.9	3.4
Size of rib eye (sq. in.)	9.79	10.64	10.26	10.21
Degree of firmness ⁷	1.9	3.0	3.1	2.2

1. 1000 mgs. progesterone and 20 mgs. estradiol benzoate.

2. Based on top choice 15, av. choice 14, low choice 13, top good 12, av. good 11, and low good 10.

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

4. Based on very uniform 1, uniform 2, moderately uniform 3, modestly uniform 4, slightly uneven 5.

5. Based on modest amount 6, small amount 7, slight amount 8, traces 9, practically devoid 10.

6. Based on very large 1, large 2, moderately large 3, modestly large 4, slightly small 5.

Fundamental Studies of Sorghum Roughages and Grains. A Study of the Value of Pelleting Sorghum Grain (Project 222).

D. Richardson, E. F. Smith, B. A. Koch, F. W. Boren and R. F. Cox

A preliminary test indicated that the efficiency of utilization of sorghum grain by beef cattle may be increased by grinding the grain very fine and making it into pellets. Digestion, nitrogen balance, digestible energy and feedlot tests are being conducted. This report is on the wintering phase of the feedlot test.

Experimental Procedure

Forty Hereford steer calves from one herd were divided as equally as possible on the basis of weight and conformation into four lots of 10 animals each. Two additional steers became available about 10 days after the test started and they were added to lot 3. The daily ration con-

sisted of 1 pound soybean oil meal, 5 pounds grain, 2 pounds alfalfa hay, and all the sorghum silage they would clean up. Salt and a mineral mixture of two parts steamed bonemeal and 1 part salt were fed free-choice. Water was supplied by electrically heated automatic water fountains. The grain used was as follows: lot 1, rolled sorghum grain; lot 2, cracked corn; lot 3, finely ground and pelleted sorghum grain; lot 4, finely ground sorghum grain.

Results and Observations

Results of the wintering phase of this test are shown in Table 49. Rate of gain and feed efficiency were exceptionally good in all lots. The lower rate of gain in lot 4 was caused primarily by two animals which became lame and had to be treated. They have apparently recovered. These data do not indicate any real differences between corn and sorghum grain or method of preparation of sorghum grain in the wintering ration of beef steer calves. The fattening phase of this test is now in progress.

Table 49

Comparative Results with Cracked Corn, Rolled Sorghum Grain, Finely Ground Sorghum Grain and Finely Ground Pelleted Sorghum Grain in Beef Steer Calf Wintering Rations.

December 7, 1957, to March 17, 1958—100 days.

Lot number	1	2	3	4
Number calves per lot	10	10	12	10
Av. initial wt., lbs.	431	432	426.3	432
Av. final wt., lbs.	636	628	623.3	620
Av. daily gain per calf, lbs.	2.05	1.96	2.00	1.88
Av. daily ration, lbs.:				
Sorghum silage	19.2	17.6	17.7	17.8
Alfalfa hay	2.0	2.0	2.0	2.0
Soybean oil meal	1.0	1.0	1.0	1.0
Rolled sorghum grain	5.0	....	....	....
Corn .....	....	5.0	....	....
Pelleted sorghum grain .....	....	....	5.0	....
Finely ground sorghum grain ..	....	....	....	5.0
Lbs. feed per cwt. gain:				
Sorghum silage	938	897	870	945
Alfalfa hay	97.6	102	100	106.4
Soybean oil meal	48.8	51.0	50.0	53.2
Rolled sorghum grain	243.9	....	....	....
Corn .....	....	255.1	....	....
Pelleted sorghum grain .....	....	....	250	....
Finely ground sorghum grain ..	....	....	....	266
Feed cost per cwt. gain, \$ ¹	10.57	11.54	10.76	11.26

1. Based on ingredient prices given on inside of back cover.

Self-Feeding Molasses Mixed with Urea, Phosphoric Acid and Water with or without Ethyl Alcohol to Beef Heifers. I. Feedlot and Carcass Study (Project 536).

D. Richardson, Ed F. Smith, B. A. Koch and R. F. Cox

Phosphoric acid has been found to be an excellent source of phosphorus when used in beef cattle rations. Urea, a non-protein-nitrogen compound, has long been recognized as a satisfactory source of protein equivalent for ruminants. Recently, the idea has been advanced that small amounts of ethyl alcohol would be beneficial in ruminant rations. Because of the labor-saving aspect, the practice of self-feeding liquid supplements seems to appeal to many people. All of the above ingredients can be mixed easily and thoroughly with molasses. This test was conducted to study the value of self-feeding a mixture of molasses, urea, phosphoric acid

and water with and without ethyl alcohol in the wintering and fattening ration of beef heifers.

Experimental Procedure

Thirty-three Hereford heifer calves from the same herd, averaging about 435 pounds each, were divided as equally as possible on the basis of weight and conformation into three lots of 11 animals each. During the wintering phase, all lots received all the sorghum silage the animals would clean up each day. The remainder of the ration was as follows:

Lot 1—Control, 1 pound soybean oil meal and 2 pounds sorghum grain.

Lot 2—Free-choice mixture, 77 percent blackstrap molasses, 3 percent phosphoric acid, 10 percent urea, and 10 percent water (approximately 30 percent protein equivalent).

Lot 3—Free-choice mixture, 71 percent blackstrap molasses, 3 percent phosphoric acid, 10 percent urea, 10 percent water, and 6 percent ethyl alcohol (approximately 30 percent protein equivalent).

At the end of the 112-day wintering phase, the fattening phase was started by adding sorghum grain to the ration. The animals were worked up to a full feed of grain. It was necessary to change the roughage from silage to prairie hay. After reaching a full feed of grain, hay and grain were self-fed free choice. Lot 1 animals continued to receive 1 pound of soybean oil meal per head daily, and lots 2 and 3 continued to receive their respective molasses mixtures free choice. Lot 1 had salt and a mixture of 2 parts bonemeal and 1 part salt fed free choice. Lots 2 and 3 had salt and a mixture of equal parts salt and limestone fed free choice. Electrically heated automatic water fountains provided drinking water at all times. The calves were started on test without any preliminary feeding of the molasses mixtures. All animals were weighed at 28-day intervals. Carcass data were obtained on each animal at slaughter. Wholesale rib cuts were obtained from five animals in each lot for further study on carcass evaluation.

Results and Observations

Results of this test are shown in Table 50.

Wintering phase. It was the second day before the animals started consuming any of the molasses mixture. There was no noticeable variation in consumption after they started eating it and no unusual behavior or toxic effects were observed. Total feed consumption tended to be about the same in all lots; however, there were small differences. Rate of gain was satisfactory in lots 2 and 3; however, it was considerably better in lot 1. Based upon the cost of feedstuffs at the time of the test, lot 1 produced the most economical gains.

Fattening phase. Grain was added to the ration after conclusion of the wintering phase. An average of 23 pounds per head daily was being consumed in all lots when the animals reached a full feed of grain. This is a tremendous amount of grain for about 600-pound animals. After reaching a full feed of grain, the grain was self-fed, and consumption tended to level out at a normal rate. No ill effects were observed except the foundering of two animals in lot 1 and one in lot 2. The average molasses mixture consumption was slightly less during the fattening phase than in the wintering phase. Total feed consumption tended to be the same in all lots; however, more grain was consumed by animals in lots 2 and 3. A greater rate of gain was produced by animals in lots 2 and 3; however, considering the winter gains and the fact that there were two foundered animals in lot 1, it is doubtful that there were any real differences. There were no significant differences in shrink to market, dressing percent, carcass grade, covering of fat, degree of marbling, size of rib eye or degree of firmness. The use of ethyl alcohol did not produce any significant differences. The cost per pound of gain for the entire test was least for lot 1.

Table 50

Results of Self-Feeding Molasses Mixed with Urea, Phosphoric Acid and Water with or without Ethyl Alcohol to Beef Heifers.

Wintering phase—December 15, 1956, to April 6, 1957—112 days.

Lot number	1	2	3
Number heifers per lot	11	11	11
Av. initial wt., lbs.	435.0	435.5	434.5
Av. final wt., lbs.	601.4	565.0	567.7
Av. daily gain per heifer, lbs.	1.49	1.16	1.19
Av. daily ration, lbs.:			
Sorghum silage	29.4	30.1	30.5
Soybean meal	1.0	....	....
Sorghum grain	2.0	....	....
Urea-blackstrap molasses No. 1 ¹ .....	....	2.1	....
Urea-blackstrap molasses No. 2 ² .....	....	....	2.3
Bonemeal and salt, equal parts	0.10	....	....
Salt	0.05	0.12	0.16
Limestone .....	....	0.02	0.04
Lbs. feed per 100 lbs. gain:			
Sorghum silage	1978.0	2600.00	2563.00
Soybean meal	67.3	....	....
Sorghum grain	134.6	....	....
Urea-blackstrap molasses No. 1 .....	....	180.6	....
Urea-blackstrap molasses No. 2 .....	....	....	193.3
Bonemeal and salt, equal parts	7.0	....	....
Salt	3.4	10.0	13.2
Limestone .....	....	1.9	3.4
Feed cost per 100 lbs. gain, ³ \$	16.06	21.67	22.12

Fattening phase—April 6, 1957, to August 24, 1957—140 days.

Lot number	1	2	3
Number heifers per lot	11	11	11
Av. initial wt., lbs.	601.4	565.0	567.7
Av. final wt., lbs.	842.3	845.9	860.5
Av. daily gain per heifer, lbs.	1.72	2.01	2.09
Av. daily ration, lbs.:			
Sorghum silage ⁴	27.9	27.9	28.3
Prairie hay ⁵	4.7	4.1	4.2
Sorghum grain	16.0	17.8	18.1
Soybean oil meal	1.0	....	....
Urea-blackstrap molasses No. 1 ¹ .....	....	1.8	....
Urea-blackstrap molasses No. 2 ² .....	....	....	1.7
Bonemeal and salt, equal parts	0.03	....	....
Salt	0.02	0.02	0.04
Limestone .....	....	.03	.06
Pounds fed per 100 lbs. gain:			
Sorghum silage	394	338	329
Prairie hay	206	154	151
Sorghum grain	930	885	863
Soybean oil meal	58	....	....
Urea-blackstrap molasses No. 1 .....	....	87	....
Urea-blackstrap molasses No. 2 .....	....	....	82
Bonemeal and salt, equal parts	1.2	....	....

1. Mixture of 77 percent blackstrap molasses, 3 percent phosphoric acid, 10 percent urea and 10 percent water (approximately 30 percent protein equivalent).

2. Mixture of 71 percent blackstrap molasses, 3 percent phosphoric acid, 6 percent ethyl alcohol, 10 percent urea, and 10 percent urea and 10 percent water (approximately 30 percent protein equivalent).

3. Based on following prices: Silage, \$10 per ton; prairie hay, \$20 per ton; sorghum grain, \$2.60 per cwt.; soybean oil meal, \$70 per ton; urea-molasses mixtures, \$95 per ton; bonemeal and salt mixture, \$80 per ton; salt, \$15 per ton; limestone, \$15 per ton.

4. Sorghum silage fed only first 34 days.

5. Prairie hay fed last 106 days.

Table 50 (Continued)

Salt	1.6	1.0	2.0
Limestone .....	....	1.3	2.7
Feed cost per 100 lbs. gain, ² \$	30.28	30.39	29.54
Summary—Wintering and fattening—December 15, 1956, to August 24, 1957—252 days.			
Lot number	1	2	3
Av. total gain, lbs.	407.3	410.4	426.0
Av. daily gain, lbs.	1.62	1.63	1.69
Av. feed cost per 100 lbs. gain, ³ \$	24.47	27.64	27.22
Percent shrink to market	2.0	1.6	1.5
Av. dressing percent (includes 2% cooler shrink)	58.9	59.0	58.7
Av. carcass grade, before ribbing ⁴	11.7	11.5	11.6
Av. carcass grade, after ribbing ⁵	12.9	12.6	12.9
Av. fat thickness at 12th rib, visual est. ⁷	3.6	3.4	3.6
Av. uniformity of fat distribution ⁸	3.4	3.3	3.1
Av. degree of marbling ⁹	6.2	7.2	6.5
Av. size rib eye, visual estimate ¹⁰	3.9	3.8	3.9
Av. size rib eye, sq. in.	9.67	9.54	9.44
Av. degree of firmness ¹¹	3.3	3.6	3.2

3. Based on following prices: Silage, \$10 per ton; prairie hay, \$20 per ton; sorghum grain, \$2.60 per cwt.; soybean oil meal, \$70 per ton; urea-molasses mixtures, \$95 per ton; bonemeal and salt mixture, \$80 per ton; salt, \$15 per ton; limestone, \$15 per ton.

6. Based on: top choice 15; av. choice 14; low choice 13; top good 12; av. good 11; low good 10.

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

8. Based on uniform 2; moderate 3; modest 4; slightly uneven 5.

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

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

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

Self-Feeding Molasses Mixed with Urea, Phosphoric Acid and Water with or without Ethyl Alcohol to Beef Heifers. II. Meat Evaluation Study (Project 536).

D. Richardson, D. L. Mackintosh and R. A. Merkel

The details of management and feeding of animals involved in this test are given in part I of this report. Five wholesale rib cuts from each lot were obtained at the time of slaughter for cooking, palatability, mechanical separation and chemical tests. These tests were conducted to determine the effect of the protein supplement upon the meat produced.

Results and Observations

The average results of this test are presented in Tables 51 and 52. These data show that no differences were produced in the meat by the protein supplements used in this test.

Table 51

Results of Cooking, Palatability, and Mechanical Separation Tests with Rib Roasts from Beef Heifers (Project 536, 1957).

Treatment	Control: Soybean oil meal supplement	Urea, phos. acid, molasses supplement	Urea, phos. acid, molasses, alcohol supplement
Lot number	1	2	3
Number of samples	5	5	5
Av. percent total loss	13.5	13.6	12.4
Av. percent volatile loss	10.1	10.2	10.2

Table 50 (Continued)

Av. percent drip loss	3.5	3.4	2.3
Av. cooking time, minutes per lb.	31.3	29.5	30.2
Av. internal temp. from oven, degrees F.	140	138	139
Av. max. internal temp.	147	146	146
Av. palatability score ¹			
Aroma	5.9	5.8	5.8
Flavor:			
Lean	5.9	5.9	5.7
Fat	5.9	6.0	5.5
Tenderness	6.0	6.3	6.3
Juiciness	5.6	5.7	5.6
Av. shear value, lbs.	14.5	15.4	14.2
Av. press fluid, yield ml./25 gms.:			
Total	8.7	8.7	8.6
Serum	7.5	7.5	6.9
Fat	1.3	1.2	1.7
Mechanical analysis 9-11 rib (av. % of entire 9-11 rib cut):			
Av. percent eye muscle	18.42	17.84	17.64
Av. percent other lean	30.53	29.15	31.54
Av. percent fat	33.04	35.04	32.43
Av. percent bone	17.80	16.64	18.14

1. Range 1-7, higher figure = higher score.