

Table 22 (Continued).

Feed per 100 lbs. gain:					
Milo grain	603.4	641.2	762.9	789.3	744.3
Corn					
Alfalfa hay	603.4	223.3	267.0	180.3	351.3
Days to reach ratio	0	11.0	11.0	18.0	
Feed cost per 100 lbs. gain ²	\$20.21	\$20.57	\$20.60	\$20.35	\$21.00
Percent shrink to market	4.94	5.18	4.75	3.80	4.24
Av. dressing percent (including cooler shrink)	59.48	60.58	61.98	59.61	59.83
Carcass grades:					
Top choice		2	2	1	
Average choice	2	1	2	2	2
Low choice	4	3	4	1	2
Top good	3	3	2	4	4
Average good		1		2	2
Degree of marbling:					
Moderately abundant				1	
Moderate		2	2		
Slightly abundant				1	
Modest	2	2	4	1	2
Small amount	4	3	2		1
Slight amount	3	2	2	5	6
Traces		1		2	1

1. One animal died from bloat.

2. Corn \$1.60 per bu.; milo \$2.35 per cwt.; alfalfa hay \$20 per T.

Table 23

Average Daily Gain per Head Based upon Wintering Ration with 10 Animals per Lot.

	Prairie hay, 3 lbs. milo grain, 1 lb.	Corn cobs, 2.5 lbs. milo grain, 1.5 lbs.	Alfalfa hay, 4 lbs. milo grain,	Atlas sorgo silage, 2 lbs. milo grain, 1 lb. S.B.O.M.	Atlas sorgo silage, 3 lbs. spec. supplement
Previous treatment	S.B.O.M.	S.B.O.M.			
Av. daily gain during 125-day fattening period, lbs.	2.32	2.52	2.02	2.27	2.27

Ratio of Roughage to Concentrate for Fattening Beef Cattle—Summary PROJECT 222

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

Four tests, one with steer calves and three with heifers, were conducted to study the ratio of roughage to concentrate in beef cattle fattening rations. Beef cattle are naturally large consumers of roughage and serve as one of the principal means of marketing this product. Since a large amount of roughage normally is produced in Kansas, it is desirable to have information concerning the maximum roughage that can be used in fattening rations, consistent with maximum production and economical gains which, at the same time, produces the kind of carcass desired. This information should help plan the best way to use one's available feed supply.

Experimental Procedure

The rations used in each test were the same except for the variation in quantities of roughage and concentrate. The ingredients used were primarily alfalfa hay and milo grain or corn. The rations used were:

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(1) One part roughage (50%) to one part concentrate, (2) one part roughage (25%) to three parts concentrate, (3) one part roughage (16%) to five parts concentrate, (4) changing ratio—the amount of grain was increased each 28 days. The chopped hay and coarsely ground grain were mixed and fed in a self-feeder. The concentrate was increased as fast as advisable until animals in each lot were on their proper ratio. Water, limestone, and salt were available at all times.

Hereford steer calves and heifers were used in this experiment. Animals were divided into lots as equally as possible on the basis of weight, conformation, and previous treatment. Yearling Hereford steers were used in the digestion study. Carcass data were obtained on each animal at time of slaughter.

This experiment was planned to secure information on the effects of different levels of roughage on (1) digestibility of nutrients, (2) average daily gain, (3) feed required per unit of gain, and (4) carcass quality. For further details on individual tests, refer to the 40th, 41st, 42nd, and 43rd Annual Livestock Feeders' Day Reports, Kansas Agricultural Experiment Station Circulars 297, 308, 320, and 335.

Results

Table 24 gives the results of digestion studies with 11 yearling Hereford steers. This shows the effect of various levels of roughage upon the digestibility of the nutrients in the ration.

Table 25 gives the feed-lot results with Hereford steer calves and Table 28 gives the results of three tests with Hereford heifers.

Table 24

Average digestion coefficients of 11 yearling steers on different ratios of roughage to concentrate.

Ratio of alfalfa hay to milo grain	Crude protein	% Apparent Ether extract	Digestibility of Crude fiber	N-free extract	% total dig. nutr.
1 to 1	64.6	50.8	51.7	75.0	61.7
1 to 3	66.1	64.0	57.5	79.6	69.0
1 to 5	63.2	62.3	49.2	78.9	68.5

Observations

1. Greatest digestibility of all nutrients was obtained with a ratio of 1 part roughage to 3 parts grain (25% roughage). One part roughage to 5 parts grain (16% roughage) was next with the 1 to 1 ratio of roughage to grain (50% roughage) being the lowest. This indicates that there is an optimum level of roughage that promotes greatest digestibility of the nutrients in the ration. When this level is greatly increased or decreased in cattle rations, the digestibility of the nutrients will be decreased.

2. Animals receiving 1 part roughage to 1 part concentrate ate more total pounds of feed; however, there was very little difference in the other ratios. At the ratio of 1 to 5 the daily grain consumption increased over the 1 to 3 ratio; however, the difference was not so great as the increase at the 1 to 3 ratio over that consumed at the 1 to 1 ratio. The results indicate that there is a limit to the amount of concentrate an animal will consume even under conditions of restricted roughage consumption.

3. Rate of gain varied between and within individual tests. Rate of gain tended to increase as concentrates increased with the heifers; however, the reverse was true with the steer calves. It is suggested that length of feeding period be considered in determining the amount of roughage to be used. Roughage should be more restricted for short feeding periods than longer lengths of time, if maximum gains are to be obtained. Increasing the grain each 28 days does not seem to be beneficial. Results indicate that it is best to determine the level of grain one wants to feed, increase the quantity up to this level, and then prevent further change in the feed insofar as possible. Gains were

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satisfactory on the 1 to 1 ratio; however, there was a tendency toward growth and not enough finish.

4. The ration containing the most roughage required the most feed per 100 pounds gain. There was a tendency for the total feed to decrease as the concentrate was increased in the ration.

5. There were no differences in carcass quality of animals fed 1 to 3 and 1 to 5 ratios as measured by carcass grade, degree of marbling, and dressing percentage. Animals that received the changing ratio graded slightly lower. Carcass values were lowest for the animals on the 1 to 1 ratio. They failed to put on enough finish because of their limited supply of grain.

Table 25

Ratio of Roughage to Concentrate for Fattening Steer Calves.
December 22, 1951, to July 12, 1952—203 days.

Ration (ratio of lbs. alfalfa hay to 1 concen- milo grain)	1 hay to 1 concen- trate	1 hay to 3 concen- trate	1 hay to 5 concen- trate
Number steers per lot	10	10	91
Av. initial wt., lbs.	502	503	505
Av. final wt., lbs.	934	949	933
Av. gain per steer, lbs.	432	446	428
Av. daily gain per steer, lbs.	2.13	2.20	2.10
Av. total feed per head, lbs.:			
Alfalfa hay	2480	1351	1031
Milo grain	2240	2878	2902
Av. daily feed per head, lbs.:			
Alfalfa hay	12.22	6.66	5.08
Milo grain	11.03	14.18	14.30
Av. feed per 100 lbs. gain:			
Alfalfa hay	574	303	241
Milo grain	519	645	678
Av. dressing percent (includes cooler shrink)	58.6	60.0	60.3
Carcass grades:			
Prime		1	
Top choice		6	2
Av. choice	2		5
Low choice	6	1	2
Top good	1	2	
Av. good	1		

1. One died, cause unknown.

Comparison of Corn and Milo Grain in Fattening Ration of Beef Cattle—Summary, 1956.

PROJECT 222

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

Kansas is surpassed only by Texas in total sorghum acreage and production. A large part of this acreage consists of the type that has a short stalk and is, therefore, suitable for harvesting the grain with a combine. This means that there is a large amount of the grain available for feeding livestock.

This experiment was planned to study the relative value of corn and milo grain in the fattening ration of beef cattle. Rate of gain, feed consumption, economy of gain, dressing percentage, carcass grade, and degree of marbling were used to make comparisons.

Experimental Procedure

Three tests were conducted with Hereford heifers over a period of three years (see Table 26 for time). Twenty heifers were used in each

test. They were divided as equally as possible into lots of 10 animals each on the basis of previous treatment, weight, and conformation.

The ration consisted of chopped hay and coarsely cracked grain mixed and self-fed. Good-quality alfalfa hay was the roughage in each test except test 1 in which equal parts of alfalfa and brome grass hay were used. After starting the animals on feed, grain was increased until they were receiving 1 pound of hay to 3 pounds of grain. Salt and water were available at all times.

The animals were marketed and slaughtered at the end of each test. Dressing percentage, U.S. Government Grade, and degree of marbling were obtained at the packing plant.

Results

A summary of the three tests is given in Table 26. Note that results for each test and an average of the three are given.

Observations

1. Rate of gain varied in individual tests. There appears to be some difference in favor of corn, but it is doubtful that there is any practical difference in rate of gain between the two grains.

2. The average daily consumption of milo grain was greater than corn in all tests. Milo grain seemed to be more palatable and the animals seemed to go on full feed faster with fewer digestive disturbances.

3. Less corn was required per 100 pounds of gain. This indicates that corn is more efficient on a pound-for-pound basis. However, one must not lose sight of economy of gain from the standpoint of cost. At present prices (corn \$1.40 per bu. and milo grain \$2 per 100 lbs.), the gains were more economical with milo grain, even though a greater quantity was needed per pound of gain.

4. There was no difference in dressing percentage.

5. There were no differences in carcass grade or degree of marbling. The statement is sometimes made that carcass grades and marbling are not so good with cattle fed milo grain as with cattle fed corn. The results of this experiment indicate no practical differences.

Table 26

Summary of Three Tests Comparing Corn and Milo Grain in Beef Cattle Fattening Rations.

Test 1—May 14 to August 13, 1953—91 days.

Test 2—May 7 to October 8, 1954—154 days.

Test 3—May 17 to September 19, 1955—125 days.

	Test number	Grain used—	
		Corn	Milo
Number of heifers per lot	1	10	10
	2	10	10
	3	10	10
Av. initial wt. per heifer, lbs.	1	639	639
	2	511	512
	3	702	712
	Av.	617	621
Av. final wt. per heifer, lbs.	1	818	845
	2	860	815
	3	997	987
	Av.	892	882
Av. gain per heifer, lbs.	1	179	206
	2	349	303
	3	295	275
	Av.	274	261
Av. daily gain per heifer, lbs.	1	1.97	2.27
	2	2.27	1.97
	3	2.36	2.20
	Av.	2.20	2.18