

PROJECT 430

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There has long been evidence that forages produced on different types of soil in the same general area give significantly different results when fed to animals. Further information is needed on the composition and nutritive value of forages grown on soils differing in origin, fertility, and other characteristics.

This is a progress report of the wintering phase of the first trial in this study. The study has been designed to measure differences in the results obtained when cattle are grazed on forages growing on limestone or sandstone soils.

Experimental Procedure

Thirty-nine choice Hereford heifer calves purchased from the Williams Ranches in Lovington, N. M., were used in this study. The heifers were spayed before the start of the study to eliminate the possibility of their being bred during the trial. They were then divided into two lots of approximately the same average weight. Twenty of the heifers were wintered on a native sandstone pasture and 19 were wintered on a native limestone pasture. The predominant species in both pastures was bluestem grass. The pastures were located within eight miles of each other in Ellsworth county. Both lots of heifers received 1½ pounds of cottonseed cake daily as protein supplement throughout the winter period. Soil, water, and forage samples were collected during the period for detailed chemical studies. At the end of the winter period the heifers were weighed. Blood samples were also taken from a representative number of each group for chemical analysis.

The cattle will be continued on the two different treatments until they reach market weight. Further observations and blood studies will be made at regular intervals as the trial progresses.

Observations

Both lots of heifers appeared to be in excellent condition at the end of the winter period.

Those on the sandstone pasture gained an average of only 6 pounds during the period, while those on the limestone pasture made an average gain of 63 pounds.

These differences in gain cannot be fully explained at this time.

Complete results of the various chemical studies are not yet available.

Further information will be summarized in future reports.

Ratio of Roughage to Concentrate for Fattening Heifers, 1955

PROJECT 222

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This is the fourth test in an experiment planned to secure information on the effects of different levels of roughage on average daily gain, feed required per unit of gain, and carcass quality. Since Kansas normally produces a large amount of roughage, it is desirable to have information concerning the maximum amount of roughage that can be used in fattening rations which will permit maximum and economical gains and, at the same time, produce a desirable carcass.

Experimental Procedure

Fifty Hereford heifers were divided into five lots as equally as possible on the basis of weight, size, conformation, and previous treatment. The heifers were wintered, 10 per lot, as calves on the following rations: (1) Alfalfa hay and 4 pounds milo grain; (2) Atlas sorghum silage, 2 pounds milo grain, and 1 pound soybean oil meal; (3) Atlas sorghum

grain, and 1 pound soybean oil meal; (5) corn cobs, 2.5 pounds milo grain, and 1.5 pounds soybean oil meal. A mineral supplement of steamed bonemeal and salt was available at all times. Two heifers from each lot on the above wintering rations were allotted to each of the five lots in this experiment. That gave a total of 10 animals per lot. All animals had gained well during the winter and were fairly fleshy at the beginning of this test.

The feeds used were good-quality chopped alfalfa hay and coarsely cracked milo grain and corn. One lot of animals received corn so that a comparison of milo grain and corn could be made. The hay and grain were mixed in a self-feeder and kept before the animals all the time. Water, salt, and ground limestone were also provided free choice at all times.

All animals were started on a ration of equal parts of hay and grain. The grain was increased until each lot was on the ration indicated as follows:

- Lot 1—1 pound of alfalfa hay to 1 pound milo grain
- Lot 2—1 pound of alfalfa hay to 3 pounds corn
- Lot 3—1 pound of alfalfa hay to 3 pounds milo grain
- Lot 4—1 pound of alfalfa hay to 5 pounds milo grain
- Lot 5—Changing ratio, started at 1 pound alfalfa hay to 1 pound milo grain. Each succeeding 28 days the grain was increased until the ratio was 1 pound hay to 5 pounds grain at the end of the test.

Results and Discussion

Table 22 gives a summary of the results obtained in the feed-lot test. The weather was very hot; however, the rates of gain in all lots were very satisfactory. Lot 1 animals on equal parts of hay and grain made better gains and graded higher than on any of the previous tests. Lot 3 contained one animal that was a chronic bloater and another that bloated occasionally. This affected the rate of gain for the lot. Taking this into consideration, there was practically no difference in rate of gain and carcass quality in lots 2, 3, and 4. The gains in lot 5 were just as good; however, the carcasses did not grade quite so high as those of lots 2, 3, and 4. The results of this test agree with those of previous tests in that 1 part hay to 3 parts concentrate or 25 percent roughage gives just as good results as rations containing a greater concentration of grain.

Table 23 gives the average daily gains of animals based upon their wintering ration.

Table 22
Ratio of Roughage to Concentrates for Fattening Heifers.
May 17 to September 19, 1955—125 days.

Lot number	1	2	3	4	5
Ratio of roughage to concentrate	1 hay 1 milo	1 hay 3 corn	1 hay 3 milo	1 hay 5 milo	changing ratio
Number heifers per lot	9 ¹	10	10	10	10
Av. initial wt., lbs.	711	702	712	704	705
Av. gain per heifer, lbs.	276	295	275	290	290
Av. daily gain per heifer, lbs.	2.21	2.36	2.20	2.32	2.32
Total feed per head, lbs.:					
Milo grain	1665.5		2097.9	2289.0	2158.5
Corn		1891.4			
Alfalfa hay	1665.5	658.8	734.3	522.8	1018.7
Av. daily feed per head, lbs.:					
Milo grain	13.32		16.78	18.31	17.27
Corn		15.13			
Alfalfa hay	13.32	5.27	5.87	4.18	8.15

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.

Previous treatment	Prairie hay, 3 lbs.	Corn cobs, 2.5 lbs.	Alfalfa hay, 4 lbs.	Atlas sorgo silage, 2 lbs.	Atlas sorgo silage, 3 lbs. spec. supplement
	S.B.O.M.	S.B.O.M.	milo grain,	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 ratios 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	% Apparent Digestibility of				
	Crude protein	Ether extract	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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