

Summary Report

Selection for Increased Weaning and Yearling Weight in Beef Cattle

R. R. Frahm, A. B. Cobb, M. B. Gould and R. H. Mizell

The beef cattle selection study initiated in 1964 at the Southwestern Livestock and Forage Research Station involves both purebred Angus and Hereford cattle. The objective of this study is to determine the direct and correlated genetic responses to selection based on weaning weight and yearling weight, respectively.

The study consists of six selection lines of 50 cows each; two Hereford lines (one selected for increased weaning weight and the other selected for increased yearling weight) and four Angus lines (one selected for increased weaning weight, one selected for increased yearling weight, one selected for increased weaning weight based on progeny test data and one served as an unselected control line).

Detailed analysis of selection progress to date has been conducted only in the two Hereford lines. Thus far the overall growth performances have been quite similar in both lines, which suggests similar genetic changes in total growth response have occurred as a result of selection for either weaning weight or yearling weight. Average conformation scores, both at weaning and yearling ages, have improved slightly in both selection lines. Approximately 80% of the total selection pressure exerted on these lines has been due to sire selection which reinforces the common belief that most genetic improvement achieved in a herd is due to selecting and using genetically superior herd sires. Results to date indicate that overall growth rate has increased at the rate of .5 to 1 percent per year in both lines.

Publications

The following papers have been published from the project during the past year:

- Boston, A. C., J. V. Whiteman and R. R. Frahm. 1975. Phenotypic Relationships Within Angus and Hereford Females. I. Heifer Growth and Subsequent Cow Productivity. *J. Anim. Sci.* 41:16-22.
- Boston, A. C., J. V. Whiteman and R. R. Frahm. 1975. Phenotypic Relationships Within Angus and Hereford Females. II. Repeatabilities of Progeny Weaning Weights. *J. Anim. Sci.* 41:23-32.
- Frahm, Richard, Mike Gould, Todd Stanforth, Burl Cobb and Bob Mizell. 1975. How Rapidly can Growth Rate be Increased in Beef Cattle by Selection? *Okl. Agr. Exp. Sta. Res. Report P-725:20-30.*
- Frahm, R. R. 1975. Weaning Weight or Yearling Weight. *American Hereford Journal*, July pp. 220.
- Stanforth, T. A. and R. R. Frahm. 1975. Selection for Increased Weaning Weight and Yearling Weight in Hereford Cattle. *Ok. Agr. Exp. Sta. Res. Report MP 94:7-17.*
- Stanforth, T. A. and R. R. Frahm. 1975. Selection for Weaning and Yearling Weight in Hereford Cattle. *J. Anim. Sci.* 41:259 (Abstract).
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Radiation Attenuation as an Estimator of Lean Fat Ratios in Ground Beef

L. E. Walters, D. G. Batchelder, E. E. Kohnke and Bruce Lambert

Interests in the possible development of a method for rapid fat analysis in ground meat samples is based on the principle that gamma radiation attenuation appears to be proportional to the density of the material into which a "beam" of radiation is aimed. Since there is appreciable difference in the density of fat and lean, it is believed that the application of such a technique holds promise as a useful method for rapid fat determination in meat samples.

The instrumentation consisting of a 2 currie source of Cesium 137, a radiation detector and a meter, is housed in the Agricultural Engineering Laboratory Annex. Research involving this device, known as a Qualicon, in measuring the density of soil used in tillage studies found that the amount of radiation passing through the sample was inversely re-

lated to the density of the sample and directly proportional to the electrical current developed in the "detector".

Initiatory radiation attenuation studies have recently begun, using the Qualicon and ground meat samples representing a range of beef fat in amounts of 0, 10, 20, 30 and 50 percent added to very lean beef trimmings. Sufficient data have not been generated to assess the potential of the Qualicon as a rapid estimator of lean to fat ratio in ground beef.

Beef Carcass Composition Studies Among Crossbred Cattle

D. M. Stiffler, L. E. Walters and R. R. Frahm

The major tissues in the bovine-muscle, fat and bone are influenced by many factors (i.e. age, sex, breed, nutrition and other environmental and physiological conditions). The value of feeder and market animals is dependent in part upon the economy with which quality lean is produced and the ratio of these major tissues to one another. Likewise, the worth of breeding animals must be justified on the basis of production efficiencies and the composition of the carcasses of their offspring. The objectives of this research were to determine retail cutability and gross composition differences among these steers as influenced by breed, age and post weaning treatment and to study the variation within and among breed groups.

Right carcass halves from one hundred fifty-eight steers representing eight cross-bred groups from herds of the Oklahoma Agricultural Experiment Station were fabricated into total separable lean, fat and bone wholesale cuts, with the exception of the short loin. The short loin was trimmed to an average fat covering of .3 thickness and the bone of the short loin was left intact. Weights of certain major muscles and muscle systems were obtained.

The cross breed groups represented in this study were Hereford-Angus, Angus-Hereford, Simmental-Angus, Simmental-Hereford, Brown Swiss-Angus, Brown Swiss-Hereford, Jersey-Angus and Jersey-Hereford. Post weaning treatment consisted of 80 head being put on pasture, until

one year of age prior to the being placed in the feedlot and 78 head going directly into the feedlot following weaning. After being placed on feed, the steers were fed until they reached the choice quality grade, as determined by subjective appraisal.

Table 1. presents the means for certain carcass traits. Some of these data are expressed as weight per one-hundred days of age; thereby, expressing the rate of production relative to the quantity produced. While the statistical analyses of the data have not been completed, certain trends become noticeable from observation of the data. As expected, post-weaning treatment increased the mean days of age to slaughter for those steers placed on pasture following weaning until reaching one year of age as compared to those steers being placed directly on full feed following weaning. This treatment difference should be kept in mind when making any comparisons between cross-breeding groups which were on different post-weaning treatments.

It appears that carcass quality grade was also affected by post-weaning treatment with those steers that were put on feed subsequent to weaning tending to have the higher carcass quality grade at a younger age. As expected, post-weaning treatment influenced the weight/100 days of age for those traits listed in Table 1. Simmental-Angus crosses tended to show an advantage in carcass weight, total lean weight, and individual muscle weights per 100 days of age for those steers that were placed directly on feed following weaning.

A similar trend is indicated for the yearling treatment group of Simmental-Angus crosses, with the exception of total lean/100 days of age. The Jersey crosses tended to have the lowest weights/100 days of age for all traits shown in Table 1, regardless of post-weaning treatment, including fat. The Angus-Hereford and Hereford-Angus crosses appear to

Table 1. Effect of Rumensin on Methane Production and Total Heat Production

Trial		Rumensin Animal		Control Animal	
Number	Duration	Methane Production	Total heat Production	Methane Production	Total heat Production
#	hr	l/min	kcal/hr kg ^{.75}	l/min	kcal/hr kg ^{.75}
1	5.9	.14	6.6	.18	6.3
2	5.7	.12	5.9	.13	5.7
3	4.9	.10	5.8	.14	5.3
4	5.6	.12	5.7	.14	5.7
5	6.0	.12	5.8	.15	5.8
Mean	5.6	.119	6.0	.148	5.8
1A	23.5	.100	5.41	.116	5.43

deposit the greatest quantities of fat/100 days of age, regardless of post-weaning treatment. A more detailed report of the findings will be presented upon completion of the statistical analysis.

The Influence of Heat Stress on Semen Quality and Endocrine Function in Bulls

D. C. Meyhoeffer, R. P. Wettemann, M. E. Wells,
E. J. Turman and G. W. A. Mahoney

The objectives of this research are to determine the effects of elevated ambient temperature on sperm output, morphology and quality and to evaluate the endocrine response in bulls to high ambient temperatures. In each of the two replicates, four yearling Angus bulls will be exposed to either control (74° F) or elevated (88 to 94° F) ambient temperatures for 8 weeks. Then the hot chamber will be returned to 74° and it will be determined how long the previous elevated ambient temperature has an effect on semen quality and quantity.

Preliminary data suggests that semen volume is not influenced by elevated ambient temperature, but semen quality is greatly decreased. Daily water consumption, respiratory rates and rectal temperatures were all greater in the heat stressed bulls.

Rumensin Effects on Methane Production

J. H. Thornton, F. N. Owens, R. P. Lemenager and Robert Totusek

Rumensin addition to cattle rations results in increased efficiency of feed utilization. It is believed that rumensin acts on rumen microorganisms, since rumen volatile fatty acid (VFA) levels are changed and because rumensin is used as a coccidiostat in poultry rations. The altered rumen VFA levels following rumensin feeding included elevated propionate and reduced acetate and butyrate levels. Such an alteration in VFA pattern suggests methane production would be reduced. Trials to test rumensin effects on methane production were initiated.

In five trials, conducted over 5 to 6 hr periods following a meal, rumensin decreased methane production an average of 20% (Table 1). In one trial conducted over 24 hours the rumensin effect decreased with time (Figure 1). In all trials, steers were fed a 60% roughage diet once daily and gas collection began immediately following the meal. Additional trials are planned to determine the effects of level of roughage intake and frequency of feeding monensin or feed on methane production. Such information will aid in predicting rumensin value under varying feeding regimes.

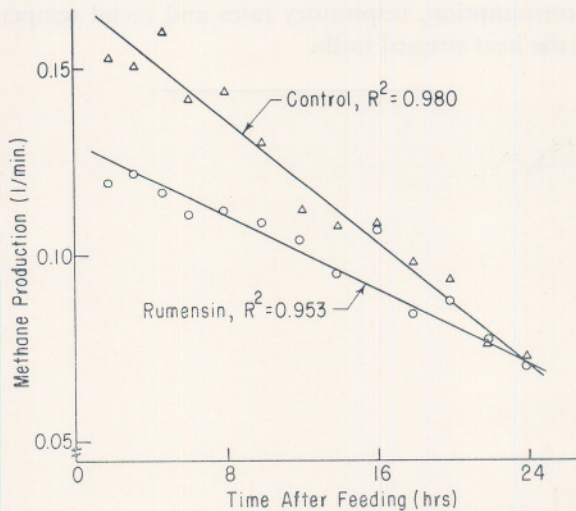


Figure 1. Effect of Rumensin on Methane Production

Table 1. Means for Certain Beef Carcass Traits by Cross-breeding Group

Breed	Post-Weaning Treatment ¹	No. Steers	Age at Slaughter (da)	Quality Grade ²	Carcass Wt. (lbs.)/DA ³	Total Lean (lbs.)/DA ³	Total Fat (lbs.)/DA ³	SM ⁴ (lbs.)/DA ³	LD ⁵ (lbs.)/DA ³
Hereford X Angus	2 3	6 5	559 439	9.8 10.6	54.9 75.7	35.6 46.6	12.1 18.0	2.8 3.5	2.1 2.7
Angus X Hereford	2 3	6 8	526 464	9.8 10.5	56.9 66.4	36.3 41.5	13.1 15.8	2.8 3.1	2.3 2.5
Simmental X Angus	2 3	12 9	539 463	9.6 10.4	62.1 78.1	40.6 51.5	11.8 15.8	3.3 4.0	2.4 3.0
Simmental X Hereford	2 3	11 13	554 474	9.4 9.9	59.5 73.4	39.9 48.8	10.7 14.3	3.3 3.7	2.2 2.8
Brown Swiss X Angus	2 3	11 12	556 476	10.3 10.2	59.8 70.4	39.0 41.8	11.8 14.8	3.0 3.4	2.3 2.6
Brown Swiss X Hereford	2 3	12 11	565 482	9.7 10.6	59.4 72.0	39.1 46.3	10.2 14.6	3.1 3.5	2.2 2.8
Jersey X Angus	2 3	12 10	577 447	9.1 9.8	50.2 65.2	32.8 41.1	9.5 13.9	2.5 3.0	2.0 2.6
Jersey X Hereford	2 3	10 10	546 460	8.8 9.9	48.1 59.0	31.0 36.6	8.7 12.9	2.5 2.8	1.9 2.3

¹Post-weaning treatment (2 = pasture until yearling, 3 = directly to feedlot)

²Quality Grade (Prime+ = 15, Choice+ = 12, Good+ = 9)

³DA (days of age at slaughter ÷ 100)

⁴SM (Semimembranosus muscle of the round)

⁵LD (Longissimus muscle from the rib)

Characteristics of Ensiled High Moisture Corn

J. H. Thornton, F. N. Owens and E. C. Prigge

Since initiation of corn grain storage in pit silos, questions regarding optimal harvest, processing, storage and feeding recommendations have arisen. An index of easily measured characters which would be indicative of ensiled corn grain quality would be useful. To be of most value, such an index should be predictable from harvest and processing conditions as well as foretell animal performance. Current research is accumulating information needed to construct such an index. Efforts this past year were directed towards characterization of corn grain sampled from pit silos.

Samples of ensiled 1974 corn grain were gathered in August 1975 from the face of five feedlot pit silos. Descriptions of ensiled corn are presented in Table I as an average of 1 to 5 samples per silo.

Color, particle size, compaction and dry matter differed between silos. The degree of compaction was measured near the sampling site on the open face of the pit silo with a penetrometer. Compaction increased with depth and with smaller particle size. Color or brightness of the ensiled product did not appear related to either compaction or moisture level. Large differences in soluble nitrogen existed and appeared higher at higher moisture levels.

Pepsin insoluble nitrogen values, a measure of nitrogen remaining in the feedstuff after enzymatic digestion, suggest that nitrogen is more readily digested from the material which had more of the total nitrogen in a soluble form. *In vitro* dry matter digestibility, a measure of ease of digestion, indicated sizeable differences existed between grain samples. Dry matter digestibility increased with soluble nitrogen and pepsin digestible nitrogen. Lactic acid levels varied considerably and also increased with soluble nitrogen.

The range in the parameters measured, especially *in vitro* dry matter digestibility, suggest sizeable differences in feeding value might be expected. An acidosis study with steers indicated that the material from a pit less readily digestible by the above measurements failed to produce sub-clinical acidosis following grain engorgement.

More extensive characterization of additional pit silo samples is currently in progress and animal evaluation for digestion and food intakes of chemically divergent ensiled corn grain will be conducted.

Table 1. Ensiled Corn Grain Characteristics

Sample Description					Composition and Digestibility						
Origin	Color	Depth ²	Mean particle size	Degree of compaction	DM	CP	Soluble		Pepsin insoluble	In vitro	Lactic
<i>silo</i>		<i>ft</i>	<i>mm</i>	<i>penetrometer units</i>	-----%-----		----% of total N ----			%	mg/g
1	light	13	1.2	22	70	9.5	67	42	9	70	9.0
2	light	18	4.1	23	77	9.8	31	22	16	60	3.6
3	darkest	18	1.3	28	73	9.2	52	40	11	67	7.5
4	dark	12	1.8	23	74	9.8	61	42	9	70	6.9
5	highest	10	2.8	18	73	9.1	73	48	7	76	11.1

²Depth of silo to sampling site.

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