

Selection of YEARLING BEEF BULLS

A report on experiments aimed at selection of animals being fed an essentially roughage ration

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Heritability estimates reported in the literature for gain and for final weight, when bulls are full fed on a high concentrate ration, have generally been high enough to recommend these traits as selection criteria. Recent selection experiments reported by Virginia, Texas, Cornell, and the University of California have supported the previously reported heritability estimates in essence if not in detail. Conformation has also been reported sufficiently heritable to use as a selection criterion. Experiments at Cornell and U. C. afford some verification of the reported heritability estimates of conformation.

Many other traits also enter into the complete bull testing picture, either as criteria for selecting the bull or as carcass traits of the resulting progeny. The latter class of traits is obviously of importance since the final objective is to produce a carcass of given specifications. A fairly comprehensive list of such traits follows:

| TRAITS TO BE MEASURED OR CONSIDERED | |
|--------------------------------------|--------------------------------------|
| <i>During the life of the animal</i> | <i>After slaughter of the animal</i> |
| Gain in weight | Dressing per cent |
| Weight for age | Area of ribeye |
| Efficiency of feed conversion | Marbling |
| Feed capacity | Thickness of fat cover |
| Conformation | Tenderness |
| Earliness of maturity | Flavor |
| | Ratio of lean to bone |
| | Yield of prime cuts |

Experiment stations and various segments of industry are engaged in studying the relationships amongst the traits listed. The multitude of such relationships can be meaningfully grouped into three operational classes characterized by the questions: Are the various traits that might be used as criteria in bull selection positively, negatively, or not correlated? Is a trait deemed desirable in bulls positively, negatively, or not correlated with desirable carcass traits in their progenies? Are various desirable carcass traits positively, negatively, or not correlated?

The California experiment

One of the main reasons for the California experiment was to find out if yearling bulls could be effectively selected after being group-fed an essentially roughage ration. All of the previously reported studies have dealt with bulls fed a high concentrate ration.

"Effective selection," as here employed, refers to selecting those bulls that will produce the type of feeder steer which gains efficiently, reaches slaughter condition at the proper weight, and yields a carcass meeting the demands of the trade.

From 1953 through 1960 all bulls in the U. C. Rover line were performance tested. No bull calves were castrated. All bulls of a calf crop were tested concurrently under the same conditions.

Pairs of concurrently tested bulls were loaned to cooperating cattlemen to produce progenies of 10 steer calves per bull which the University acquired at weaning time for testing at Davis.

The chart depicts the relation between the growth data taken at Davis.

During the four-month period from weaning to 12 months of age (referred to as the growing period) the bulls were group-fed an essentially roughage ration of alfalfa. During wet cold weather, or when the hay was of poor quality, some

grain was fed. No close check was kept to ascertain that each bull was actually full fed. It might be said that the bulls were managed during this time in a way that would be practical for a small breeder. The bulls were in drylot.

During the next four months the bulls were individually fed a fattening ration of 65% concentrates and were about in low choice condition at the end of the test. No feed additives, such as stilbestrol, were used either for bulls or steers. The steers were fed in a manner similar to that used for the bulls except that they were fed by sire groups rather than individually.

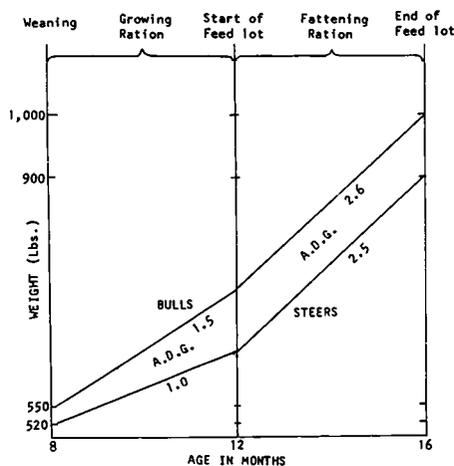
This discussion deals with the selection of bulls based only upon their performance to the end of the growing period, not the feedlot period, but makes use of performance data of the steer progenies obtained from both the growing and feedlot periods, and from the carcass studies.

Three bull selection criteria were studied: Weight for age at the end of the growing period, gain during the growing period, yearling conformation grade. Bulls were selected on the basis of each of the above criteria and then progeny-tested. The design of the experiment is such that evaluation of these selection criteria could be made on the basis of the performance of the steer progenies. The evaluations follow:

Weight for age at the end of the growing period appears to be a good criterion by which to select bulls. Bulls selected in this way produced larger, faster growing and earlier maturing steers. This was reflected in liveweight and in carcass studies using energy-corrected carcass weights.* The average of the carcass grades was between top good and low choice. The average slaughter weight was 900 pounds. (See table.)

Note that the steer progenies of the

*Energy corrected carcass weight, a measure developed by U. C. nutritionists, Meyer, Lofgreen and Garrett, takes into account not only weight of the carcass but also the amount of protein and fat it contains. J. Animal Sci. 19:1123.



Design of U. C. Beef Progeny Test.

Rest and Dormancy IN POTATOES

Potatoes are subject to two types of dormancy, a rest period, in which growth stops even when environmental conditions are favorable, and external dormancy, which occurs when environmental conditions are unfavorable.

In the rest period, the tubers do not normally sprout while growing on the plant, nor for a period of time after harvest. If held at a favorable temperature, they eventually sprout, but not if the temperature is too low. These rest periods are of considerable economic importance to growers, processors, and retailers. Freshly harvested, resting potatoes cannot be used for replanting; early sprouting prohibits a long market period for certain varieties, and influences processing quality.

Studies are being conducted to determine why potato tubers undergo a rest period. It may be that although the buds (eyes) are able to grow, they are kept from doing so by an excess of naturally occurring growth inhibitors and/or a lack of sufficient growth promoting substances such as gibberellins and auxins. In current experiments, growth substances are extracted from potatoes at different times during the rest period. These substances are partially purified, and applied to plants known to be sensitive to them, for bioassay. From these studies, the relation between levels of growth inhibiting and growth stimulating substances during and after the rest period can be determined. New active substances may also be detected. Future studies will include investigation of biochemical mechanisms in the rest period and chemical identification of growth regulating factors in potatoes.—*Lawrence Rappaport, Dept. of Vegetable Crops, Davis.*

Saliva tests on

BLOATED COWS

Feed utilization by ruminants depends on the amount of saliva available during digestion of feed in the rumen. Recent research shows that cows susceptible to bloating have a lower secretion of saliva and a higher proportion of dry matter in the rumen than do nonbloating cows and consume about 24 per cent less feed.

Knowledge of the importance of saliva can be applied to studies on utilization of roughages, concentrates, and pelleted feeds.—*J. M. Boda, Dept. of Animal Husbandry, Davis.*

| | WEIGHT AT END OF GROWING PERIOD† | WEIGHT AT END OF FEEDLOT PERIOD | AVERAGE DAILY GAIN IN FEEDLOT | ENERGY CORRECTED CARCASS WEIGHT |
|--------------------------------|---|--|-------------------------------------|--|
| | lb. | lb. | lb./day | lb. |
| Steer progeny of better* bulls | 652 | 903 | 2.46 | 585 |
| Steer progeny of poorer* bulls | 628 | 897 | 2.54 | 571 |

* On the basis of the bulls' performance tests for the selection criterion in question, namely, weight for age at the end of the growing period.

† Both groups are the same age.

better bulls were slower gainers in the feedlot than the other group. When one looks at the energy-corrected carcass weights and the weights at the end of the growing period it is obvious that slower gain in the feedlot was due to a higher energy content of the gains.

Gain during the growing period

This does not look promising as a selection criterion. The progenies of bulls selected this way showed no superiority in size, rate of growth, or earliness of maturity.

Why the first, but not the second, appears to be a good selection criterion may possibly be explained as follows: Bulls selected on rate of gain postweaning on a limited feed intake may tend to be slower maturing and/or less well nurtured animals that are expressing their superiority at that period through the mechanism of compensatory growth. In the case of terminal weight for the period in question, such a compensatory growth mechanism might be advantageous to the breeder in adjusting for differential nurturing effects during the suckling period.

Yearling conformation grade

Bulls selected on the basis of this criterion produced progenies with superior carcass conformation. Furthermore, yearling conformation grade was not correlated (genetically) with weight. This means that weight and conformation when used as criteria in a selection program do not act antagonistically.

Two other genetic correlations* of interest that were found†: Conformation was not correlated with earliness of maturity; weight was positively correlated with earliness of maturity.

Recommendations to breeders

The experiment was carefully planned

* A genetic correlation between two traits is a correlation due to common genetic causes.

† The correlations must be considered in terms of the range of conformation existing amongst the bulls used in this study (2- to 2+). In fact, just the opposite conclusion probably holds, in each case, if one considers the whole range from dairy type to improved beef type.

and executed and the results were competently analyzed on the basis of genetic, breeding and statistical principles.

It would be desirable for this sort of experiment to be repeated at other places. With biological populations (and especially those of cattle) being complex and variable, it is desirable to sample them widely before stating results with finality.

It is felt that the results of the present experiment, when viewed with judgment (tempered with statistical objectivity and an over-all knowledge of the field of livestock breeding) warrant the recommendations about to be made albeit there is a calculated risk in doing so.

Select bulls on the basis of weight for age following a four-months group feeding period on roughage.

Some concentrates can be fed.

Can the feeding period be shorter or longer than four months? Probably not much shorter. Longer than this would in part depend upon the level of concentrate feeding. Probably the thing to avoid is carrying the bulls beyond a point where differential rates of fattening might begin to confuse the picture when using weight for age as a selection criterion.

Should conformation grade be used as a selection criterion? It can be used or not as the breeder sees fit. In general, use it in conjunction with weight for age in a selection index of some sort.

The above recommendations have been made with bulls in mind grading 2- and up and of about the same age (say a three-month age spread) and a normal range of condition at the start of the postweaning period.

If there is a wide spread in ages and/or condition, perhaps the calves should be sorted into age and/or condition groups before making selections. The intergroup differences would then have to be evaluated with the help of statistical and/or subjective correction factors.

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The above progress report is based on Research Project No. 1216.