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Length of Feeding Interval Influences Accuracy of Selection for Growth

Robert M. Koch, Larry V. Cundiff, and Keith E. Gregory^{1,2}

Introduction

Rapid growth is an important trait for market beef production. Faster growth rate increases the proportion of feed intake that is used for building body tissues and reduces total input/unit of weight gain. This happens because over one-half of the feed energy and nearly two-thirds of the total cost for growing the beef animal goes to maintain normal life processes.

Selection for increased growth rate has been directed largely at postweaning gain because it is highly heritable. Performance tests to evaluate postweaning gain generally vary in length from 112 to 252 days with initial dates beginning at weaning or 30 to 60 days after weaning. The optimum length is determined by the heritability of gains, by cost, and by availability of records early enough to make selection decisions before the first breeding season. Heritability is the fraction of the observed differences between animals caused by average genetic effects, and selection accuracy increases as heritability increases.

A study was made to determine whether the interval length for postweaning adjustment and gain evaluation influenced the heritabilities and genetic correlations of gains evaluated for different time periods.

Procedure

The data included postweaning gains over a 224-day interval of (1) 2,410 crossbred steers from 313 sires representing 16 breeds and (2) 3,088 Hereford bulls from 180 sires. The crossbred steers were part of the germ plasm evaluation program at MARC. Records on the 3,088 Hereford bulls were collected over a 15-year period as part of a long-term selection experiment at MARC.

Weaning weight and eight postweaning weights obtained at 28-day intervals were used to calculate daily gains for all possible intervals of 28 days to 224 days.

Results

Heritabilities of 28- to 224-day gains. Heritabilities for the gain intervals are reported in Table 1. Heritabilities (h^2) in these data are useful primarily for describing the relative expression of average genetic effects for different lengths of feeding intervals in these two cattle populations. Heritabilities estimated from the germ plasm evaluation (GPE) data were higher than

those estimated from the selection experiment. Although the difference in heritability for the two data sets is not pertinent to the primary objective of the study, it may be worth speculating on reasons for the differences other than sampling error.

Average genetic effects in the GPE data are from steers and an average of sire differences within 16 sire breeds as expressed in cross combination with Hereford or Angus dams. Gains of crossbred progeny would be increased by heterosis and this could produce a scaling effect for increased genetic variation, if variation is proportional to the mean level of performance. An increased tolerance to environmental differences among crossbreds could reduce the relative expression of environmental vs genetic effects and, therefore, increase heritability. Sires in GPE came from many herds and were unselected for growth rate. It has been reported that heritability of gain was 35 percent higher when calculated among progeny of sires from different herds than among progeny of sires within herds. The selection experiment data involved bulls from four closed lines of one breed. Intense selection for growth rate among Hereford bulls in the selection experiment would reduce sire variation. Calculations based on the expected impact of selection intensity in the experiment indicate that the heritability estimate of .24 (224 days) in Table 1 should be adjusted upward to .30.

As length of the feeding interval increased from 28 to 224 days, the average heritability for these intervals increased, but at a declining rate. Heritability averages increased from .12 to .55 for steers in the GPE data and increased from .09 to .24 for bulls in the selection experiment data. The trend for heritability to increase more in steers than in bulls as length of feeding interval increased may be due to sexual behavior of puberal bulls interacting with appetite to reduce genetic variation in gain relative to that of steers which are not sexually aggressive. Thus, breeders should choose the longest interval that is practical for management and breeding decisions.

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²A detailed discussion of procedures was described in the Journal of Animal Science 55:1310-1318, 1982.

Table 1.—Heritabilities of gains from 28 to 224 days

Data source	Length of postweaning interval, days							
	28	56	84	112	140	168	196	224
GPE	.12	.27	.35	.40	.46	.49	.52	.55
Selection experiment	.09	.13	.16	.19	.21	.21	.21	.24