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Abstract

Performance data from a Polled Hereford herd selected for improved feed conversion were used to calculate a variety of genetic parameters. Heritabilities were .14 for weaning wt, .18 for maternal weaning wt., and .19 for milk production. The genetic correlations were -.10 between weaning weight and maternal weaning weight and 0 between weaning weight and milk production. However, the genetic correlation between maternal weaning weight and milk was . 99, indicating they are essentially the same trait. Milk EPDs published by most breed associations are calculate d as the maternal weaning weight. Our study strongly supports this method of estimating an animal's genotype for milk production.

Keywords

Cattlemen's Day, 1995; Kansas Agricultural Experiment Station contribution; no. 95-357-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 727; Beef; Weaning weight; Maternal weaning weight; Milk production; Heritabilities; Genetic correlations

RELATIONSHIPS BETWEEN WEANING WEIGHT, MATERNAL WEANING WEIGHT, AND MILK PRODUCTION IN POLLED HEREFORD CATTLE

J. B. Glaze, Jr. and R. R. Schalles

Summary

Performance data from a Polled Hereford herd selected for improved feed conversion were used to calculate a variety of genetic parameters. Heritabilities were .14 for weaning wt, .18 for maternal weaning wt., and .19 for milk production. The genetic correlations were –.10 between weaning weight and maternal weaning weight and 0 between weaning weight and milk production. However, the genetic correlation between maternal weaning weight and milk was .99, indicating they are essentially the same trait. Milk EPDs published by most breed associations are calculated as the maternal weaning weight. Our study strongly supports this method of estimating an animal's genotype for milk production.

(Key Words: Weaning Weight, Maternal Weaning Weight, Milk Production, Heritabilities, Genetic Correlations.)

Introduction

Today, beef producers have a wide array of information to assist them in making sound selection decisions. Heritabilities provide information regarding the variation in traits due to inheritance, as well as information about expected response from selection. Genetic correlations indicate how traits are genetically related or how the same genes affect more than one trait. Our purpose was to estimate the heritabilities and genetic correlations of weaning weight, maternal weaning weight, and milk production.

Experimental Procedures

Performance data were collected on 1459 animals from a Polled Hereford herd at Kansas State University, from 1967 through 1979. Foundation animals were donated by breeders from several states and were a representative sample of the Polled Hereford breed. Animals from the original herd were used to establish a selection herd. Following establishment of the selection herd, the original herd then was used as an unselected control. Replacements were selected from within each herd. Two bulls were selected based on individual feed conversion and used for 2 consecutive years in the selected herd. In each year, the first bull born, sired by the oldest herd sire in the control herd, was selected to replace his sire. These bulls were used in the control herd for approximately 6 years. Cows in both herds were maintained on native pasture throughout the year and were supplemented in the winter. Cows were bred to calve in March and April. Calves were weaned in the fall at an average age of 196 days. Bull calves were individually fed for 140 days postweaning, which allowed selection for feed conversion (feed/gain). Heifers were group-fed and, thus, were not selected on individual feed conversion. Cows were culled according to the following: (1) open at the end of the breeding season, (2) severe structural problems, and (3) horned. Milk produced by a sample of 59 cows at the end of the study (weigh-suckle-weigh technique) was measured each month preweaning, during a 3 year period. The numbers of observations,

means, and standard deviations for weaning weight and milk production are presented in Table 1. A multiple-trait derivative-free, restricted maximum likelihood (MTDFREML) procedure, incorporating a full numerator relationship matrix, was used to analyze the data. The mixed linear animal model included age of dam (2, 3, 4, 5-10, and >10 yr) and contemporary group (sex and year of birth) as fixed effects for weaning weight. Year of milking and age at milking (2, 3, 4, 5-10, and >10 yr) were included as fixed effects in the milk production model. Weaning weights were regressed to the average weaning age. Individual animal effect was included as a random effect for weaning weight and milk production, with maternal effect and permanent environmental effect being included for weaning weight.

Results and Discussion

Heritabilities and genetic correlations for weaning weight, maternal weaning weight, and milk production are presented in Table 2. The heritability for weaning weight (.14) is lower than estimates previously reported, whereas the heritabilities for maternal weaning weight (.18) and milk production (.19) are similar to others. The strong positive genetic correlation of .99 between maternal weaning weight and milk indicates that the same genes affect both traits. Maternal weaning weight commonly is used as an indication of milk production by breed associations publishing milk EPDs. This study agrees with others, by indicating that maternal weaning weight is a good predictor of milk production.

Table 1. Number of Observations (n), Means, and Standard Deviations (SD) for Each Trait Analyzed

Trait	n	Mean	SD
Weaning wt, lb	1284	383.82	68.24
Milk, lb/lactation	115[a]	2498.63	859.93

[a]Number of milk records produced by 59 cows.

Table 2. Heritabilities and Genetic Correlations [a] for Each Trait Analyzed

Trait[b]	WWT	MWWT	MILK
WWT	**.14**		
MWWT	-.10	**.18**	
MILK	.00	.99	**.19**

[a]Heritabilities are on the diagonal; genetic correlations are below the diagonal.
[b]WWT = weaning weight; MWWT = maternal weaning weight; MILK = milk production.