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RELATIONSHIPS AMONG CHAROLAIS SIRE EXPECTED PROGENY DIFFERENCES AND ACTUAL PROGENY PERFORMANCE IN COMMERCIAL HERDS

S. C. Clark, D. W. Moser, and R. E. Williams

Summary

Data on Charolais-sired calves were analyzed to evaluate progeny performance related to sire expected progeny differences (EPD) in a large data set of commercial crossbred cattle in several herds across the United States. The traits analyzed were birth weight ($n=3,554$) and weaning weight ($n=3,604$) of crossbred progeny from nationally evaluated sires. Birth weight EPD and weaning weight EPD were evaluated as predictors of crossbred performance. Random regression coefficients were estimated for progeny birth weight on sire birth weight EPD of 1.03 ± 0.09 lb/lb of birth weight EPD, and for progeny weaning weight, 0.66 ± 0.11 lb/lb of weaning weight EPD. Published sire birth weight EPD and weaning weight EPD were averaged and weighted on published accuracy. The average weighted sire birth weight EPD was 0.86 lbs and weaning weight EPD was 16.06 lbs, with an average accuracy of 0.79 and 0.75, respectively. Correlations for effect of sire in commercial herds with published sire birth weight and weaning weight EPD were 0.59 and 0.39, respectively. Sire birth weight EPD and weaning weight EPD were positively related to actual progeny performance. Therefore, selection based upon sire EPD should result in change of crossbred progeny performance. This further validates use of EPD as a selection tool for birth weight and weaning weight in commercial herds. However, weaning weight response was lower than expected, possibly a result of management practices in commercial herds compared to purebred herds.

Introduction

Commercial beef cattle producers are encouraged to use genetic information to select sires to improve performance in their herds. To do this, they rely on expected progeny differences (EPD), which enhance the accuracy of selection decisions by establishing an evaluation of the relative genetic value of a sire within a breed. Today, EPD are widely used and successfully implemented into commercial beef cattle enterprises.

The sire evaluations currently taking place in the beef industry by most breed associations are based on purebred progeny performance. Therefore, sire EPD comparisons are only applicable within a particular breed. However, the environment of purebreds may differ from that of crossbred cattle. In the seed purebred enterprise, the environment may be superior to their commercial counterpart's environmental conditions. Therefore, it is worthwhile to evaluate sire progress for commercial use through crossbred progeny.

Large numbers of actual data under true commercial production conditions in the United States have not been examined. The purpose of this study was to evaluate progeny performance and sire EPD in a large data set of commercial crossbred calves in several herds across the United States using Charolais sires.

Experimental Procedures

The carcass database of the American-International Charolais Association (AICA, Kansas City, MO) was obtained for analysis to provide information on progeny dam breeds, herds, sires, birth weight, and weaning weight records that were collected from 1988 to 2001. The sires used in the study were used in 31 cooperator herds that consisted of commercial crossbred females. The herds were used for carcass data collection only. Therefore, the data used in this analysis were independent of those used in the AICA growth trait EPD calculations.

The final data set consisted of birth weight records on 3,554 animals and weaning weights on 3,604 animals. There were 224 sires with progeny data from 31 herds. The contemporary group for the progeny measurements was defined as animals born in the same year and raised in the same environment. There were 56 contemporary groups used in the data set. Finally, the carcass database was merged to the sire EPD database to provide sire birth weight EPD and weaning weight EPD records that were collected on Charolais sires enrolled in the AICA evaluation program by AICA members. The sires used in the data set had an average weighted sire birth weight EPD of 0.86 lbs and weaning weight EPD of 16.06 lbs, with an average accuracy of 0.79 and 0.75, respectively. The published sire birth weight and weaning weight EPDs were weighted on published accuracy.

The data were analyzed by the mixed procedure in SAS. The statistical model used for birth weight included a fixed effect of contemporary group and a random effect of sire birth weight EPD. The same model was used for WW, substituting weaning weight EPD for birth weight EPD. This model calculated a random regression coefficient for birth weight and weaning weight on sire EPD.

A second analysis was performed to estimate effect of sire. The statistical model used for birth weight and weaning weight included a fixed effect of contemporary group and a random effect of sire. Correlations weighted on number of progeny were obtained between effect of sire and published sire EPD for both birth weight and weaning weight, weighted on accuracy.

Results and Discussion

The means and standard deviations of the progeny and the means and standard deviations of sire birth weight and weaning weight EPD are summarized in Table 1.

The random regression coefficient for progeny birth weight on sire EPD was 1.03 ± 0.09 lb/lb of birth weight EPD, indicating that for each pound of birth weight EPD, you would expect 1.03 lb of actual birth weight. The regression of progeny weaning weight on sire EPD was 0.66 ± 0.11 lb/lb of weaning weight EPD. Therefore, for each pound of weaning weight EPD, you would expect only 0.66 lb of actual weaning weight.

Sire birth weight EPD was positively related to actual progeny performance, suggesting that prediction of birth weight based on published Charolais sire EPD agrees closely with the theoretical value of 1.0 lb/lb of EPD. Therefore, selection based on birth weight EPD should, on average, be effective and consistent with theoretical expectation. However, sire EPD differences for weaning weight were not completely expressed. This may be a result of environmental differences, such as nutritional and management differences between commercial and purebred herds. For instance, the purebred herds have a greater level of labor input and different nutritional programs than their counterparts in the commercial herds. Managers of purebred herds may provide superior management compared to man-

agers in commercial herds. For example, earlier detection and treatment of sick calves may occur in purebred herds versus commercial herds due to the smaller number of cattle, thus improving growth rates in purebred herds relative to commercial herds. Therefore, the genetic potential for weaning weight may not have been fully expressed in the crossbred progeny in our study due to differences in nutrition and management. Thus, commercial producers should expect less response than suggested by sire weaning weight EPD. Overall, selection based upon sire EPD should result in change of crossbred progeny performance. This provides commercial producers with a valuable selection tool for birth weight and weaning weight and further validates use of EPD as a selection tool for birth

weight and weaning weight in commercial herds.

Positive correlations were obtained for effect of sire with sire birth weight and weaning weight EPD. Weighted correlations for effect of sire with published sire birth weight and weaning weight EPD were 0.59 and 0.39, respectively. For our study, random mating was assumed. The moderate birth weight to low weaning weight correlations could be a result of not including dam effects. Dams might have contributed different genetics to their progeny and their ability to produce milk could have varied. This could cause a difference in performance among progeny and affect the correlations for effect of sire with sire birth weight EPD or weaning weight EPD.

Table 1. Numbers of Sires and Progeny Evaluated, Means and Standard Deviations

Item	Number of Records	Mean	Standard Deviation
Progeny:			
Birth weight, lb	3,554	88.42	12.56
Weaning weight, lb	3,604	501.00	110.39
Sire:			
Birth weight EPD, lb	224	0.91	2.51
Weaning weight EPD, lb	224	15.37	12.32