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Conference paper

GENETIC, PHENOTYPIC AND ENVIRONMENTAL CORRELATION AMONG SOME TRAITS OF BEEF CATTLE

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Abstract

In this study paternal half-sib estimated of genetic, phenotypic and environmental correlation among birth weight, calving difficulty, calf losses, weaning weight moreover postweaning gain, age at puberty, rate of oestrus detected and pregnant heifers moreover daily gain, final weight, some slaughter and carcass traits of steers were computed.

Data of Hereford and Angus crossbred population (no. between 400-500) were analyzed with Least Squares and Maximum Likelihood Computer Program (Harvey 1990):

As a results in general, in the case when the genetic correlation are large, the environmental ones low or negative and the phenotypic ones intermediate. The genetic correlation tended to be higher between birth weight and calving difficulty (r_g = 0.57) calving difficulty and calf losses (r_g=0.66). No genetic but negative environmental correlation (R_e=-0.31) was found between 400-day weight and puberty age of heifers.

Introduction

The phenotypic variation in any polygenetic character is divisible into genetic and environmental components. In the same way, the phenotypic relationship between characters has genetic and environmental parts that is the relationship can be phenotypic, genetic and environmental correlation.

Phenotypic relationship between traits of beef cattle are of both theoretical and practical interest. Knowledge of its genetic part, the genetic correlations is needed for multiple trait evaluation of individuals (Hazel, 1943; Henderson et al., 1976) and prediction of correlated responses to selection (Falconer, 1960; Dickerson et al., 1974; Roberts, 1979). On the other hand the environmental part, the environmental correlation may also play an important

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role in the overall effectiveness of selection for merit. If both correlated characters have high heritabilities the genetic correlations is the more important determinant of phenotypic correlation, but when heritabilities are low the environmental correlation is the major factor.

Phenotypic and genetic relationship of the most important traits of beef cattle have been widely reported (Carter et al., 1959; Cundiff et al., 1982; 1986, Dinkel et al., 1973; Hohenboken et al., 1973; Koch et al., 1973; Bourdon et al., 1982; MacNeil et al., 1984; e.t.c.). However, there is a paucity of estimates for environmental correlations.

The objective of this study was to estimate from experimental data the phenotypic, genetic and environmental correlations between birth weight, calving difficulty, calf losses, weaning weight moreover postweaning gain, age at puberty, rate of oestrus detected and pregnant heifers oreover daily gain, final weight and some slaughter and carcass traits of steers.

Materials and Methods

For the estimation of the relationships data were taken from herd of Hereford and Angus cow population and from their F_1 progeny (no. between 400-500) sired by Simmental and Charolais bulls. Cows were kept on pastures round the year and naturally mated in summer. Calves were born late winter - early spring and weaned in autumn. Heifers were kept on pastures after, weaning and observed for the first oestrus, mated with Hereford sires and controlled for pregnancy. Steers were fattened in feedlots and experimentally slaughtered. Statistical analysis was done with the use of SAS Version 6, and Least Squares and Maximum Likelihood Computer Program (Harvey, 1990).

Results and Discussion

Correlation values of birth weight, calving difficulty and 400-day weight of heifers with some other traits are summarized in table 1 while that of for daily gain and final weight of the fattened steers in table 2.

As it can be seen from the tables the genetic correlation tended to be higher between birth weight and calving difficulty, calving difficulty and calf losses. No genetic but negative environmental correlation was found between 400-day weight and puberty age. Also high correlation values were observed as for the daily gain, final weight with carcass, meat, bone and fat weight, but low eith the percentage values.

Table 1. - GENETIC (r_g), PHENOTYPIC (r_p) AND ENVIRONMENTAL (r_e) CORRELATIONS OF BIRTH WEIGHT, CALVING DIFFICULTY AND 400-DAY WEIGHT OF HEIFERS

Correlated trait	r_g	r_p	r_e
Birth weight and			
calving difficulty	0.57	0.11	0.03
Calvings unassisted	-0.55	-0.13	-0.03
Cesarian section	0.23	0.04	-0.01
Rate of weaned calves	-0.34	0.03	0.11
Weaning weight	0.19	0.22	0.23
200-day weight	0.48	0.35	0.31
Calving difficulty and			
early calf mortality	0.60	0.21	0.18
Late calf mortality	0.29	0.03	0.01
Total calf mortality until weaning	0.66	0.18	0.15
Rate of waned calves	-0.66	-0.18	-0.15
400-day weight of heifers and			
550-day weight	0.91	0.82	0.78
Puberty expresssed	0.05	0.13	0.18
Age at puberty	0.00	-0.16	-0.31
Pregnancy rate	-0.04	0.05	0.07

As a result in general the values of the phenotypic and genetic correlations are similar to the previously calculated from very many different populations cited in the literature. The environmental correlations do not necessarily follow the previous ones. There are traits that have the same sign negative or positive in case of the mentioned three correlation's. In a cases like that the environmental correlation generally appears. There are other traits that have apposite sign negative and positive. In these cases environmental correlatin generally tends to zero.

The results of the study presented here indicates that the knowledge of environmental correlations, besides the phenotypic and genetic correlations, may be useful for future beef cattle breeding.

Table 2. - GENETIC (r_g), PHENOTYPIC (r_p) AND ENVIRONMENTAL (r_e) CORRELATIONS OF DAILY GAIN AND SLAUGHTER WEIGHT

Correlated trait	r_g	r_p	r_e
Daily gain during fattening period and			
final weight	0.97	0.86	0.75
Carcass weight	0.92	0.79	0.69
Dressing percentage	-0.17	-0.04	0.05
Fat thickness	0.18	0.21	0.25
Kidney, pelvic and heart fat pct.	0.20	0.07	-0.13
Rib eye area	0.30	0.31	0.46
Marbling	0.30	0.07	-0.11
Meat weight	0.76	0.74	0.72
Meat percentage	-0.21	-0.21	-0.22
Carcass fat weight	0.53	0.49	0.44
carcass fat percentage	0.23	0.24	0.24
Bone weight	0.68	0.63	0.59
Bone percentage	-0.17	-0.20	-0.22
Slaughter weight and carcass weight	0.96	0.95	0.95
Dressing percentage	-0.16	-0.03	0.07
Fat thickness	0.13	0.03	0.45
Kidney, pelvic and heart fat pct.	0.26	0.12	-0.04
Rib eye area	0.30	0.39	0.48
Marbling	0.27	0.09	-0.03
Meat weight	0.81	0.87	0.93
Meat percentage	-0.16	-0.30	-0.47
Carcass fat weight	0.51	0.63	0.74
Carcass fat percentage	0.18	0.32	0.48
Bone weight	0.72	0.75	0.77
Bone percentage	-0.16	-0.26	-0.33

LITERATURE

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