PHENOTYPIC AND GENETIC CORRELATIONS BETWEEN AGE AND WEIGHT AT FIRST SERVICE IN LOHI SHEEP

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ABSTRACT

Data on breeding and performance of 1003 ewes sired by 56 rams kept at the Livestock Production Research Institute, Bahadurnagar, Okara were analyzed by using Harvey's Mixed Model Least Squares and Maximum Likelihood Computer Program. Phenotypic correlation between age and weight at first service was 0.304 which was significant indicating that weight at first service will increase with increased age at first service. Genetic correlation of - 0.266 ± 0.193 between age and weight at first service indicated a genetic antagonism between the two traits.

Keywords: Phenotypic and genetic correlations; age and weight at first service.

INTRODUCTION

Pakistan supports over 64 million small ruminants, which are in fact the major source of livelihood for over a million farmers. These animals provide 47 percent of the total meat produced in the country (Anonymous, 2006). There are 28 sheep breeds of Pakistan and the Lohi breed is one of the biggest and most productive of all the breeds in the country. It comprises some 40 percent of the Punjab and 15 percent of the national sheep population. The Lohi breed belongs to the irrigated areas of the central Punjab but is wide-spread in other regions of the Province (Babar, 1994). There is a wide diversity in various production traits of this breed which suggests that there is a great scope for improvement of performance. This diversity in performance could be due to several genetic and environmental influences (Al-Shorepy, 2001).

The estimates of genetic and phenotypic parameters are essential in determining the methods of selection to be employed and in assessing the genetic gains in performance traits. A genetic correlation is a description of the relationship between the sets of genes which are responsible for the genetic part of variance in the corresponding traits (Bosso *et al*. 2003). The genetic correlation between two traits is desired for evaluating correlated response in a trait when selection is based on the other related trait. A study was thus planned on Lohi sheep to measure the phenotypic and genetic correlations between age and weight at first service.

MATERIALS AND METHODS

Data on 1003 ewes sired by 56 rams kept at Livestock Production Research Institute, Bahadurnagar, Okara during I970-2001 were utilized to measure genetic and phenotypic correlations between age and weight at first service. It was assumed that inbreeding in this flock was zero. Procedures used to estimate the two types of correlations is described here under:

(a) Phenotypic Correlation: The phenotypic correlation between two traits can be computed as a simple (linear or product moment) correlation between their observed values.

Kempthorne (1957) described the method of finding components of covariance in halfsib analysis which is practically based on relationship $V(X_1 + X_2) = V(X_1) + V(X_2) + 2Cov.(X_1, X_2)$. The analysis of variance could be run on a set of observations X_1 and X_2 separately and also on a set of compound observations $(X_1 + X_2)$. The covariance between X_1 and X_2 could be worked out as:

$$r_{P_{(X_1)}P_{(X_2)}} = \frac{Cov \cdot (P_{X_1} P_{X_2})}{\sqrt{V_{P_{(X_1)}} \cdot V_{P_{(X_2)}}}}$$

$$Cov \cdot (X_1, X_2) = \frac{V(X_1 + X_2) - V(X_1) - V(X_2)}{2}$$

(b) Genetic Correlation: A genetic correlation between two traits in the same animals is ratio of the genetic covariance between these two traits to the geometric mean of genetic variance. It measures the degree to which additive deviation in different traits are caused by the same determining factors. The method for estimating such a correlation was developed by Hazel *et al*. (1943).

$$r_{G_{(X_1)}G_{(X_2)}} = \frac{\sigma_{s_{(X_1X_2)}}}{\sqrt{\sigma^2_{s_{(X_1)}} . \sigma^2_{s_{(X_2)}}}}$$

The standard error for the genetic correlations was also determined by using the approximate formula given by Robertson (1959):

$$S \cdot E \cdot \quad r_{G_{(X_1)}G_{(X_2)}} = \frac{(1 - r^2_{G_{(X_1)}G_{(X_2)}})}{\sqrt{2}} \sqrt{\frac{S \cdot E \cdot (h_1^2) \cdot \ S \cdot E \cdot (h_2^2)}{h_1^2 h_2^2}}$$

RESULTS AND DISCUSSION

(a) Phenotypic Correlation: The variance and covariance components for age and weight at first service were calculated from 1003 ewe lambs of 56 rams. Within and between sires mean squares and cross products are given in Table 1. Phenotypic correlation between these two traits was calculated to be 0.304 which was statistically significant ($P < 0.01$).

The estimate of phenotypic correlation between age and weight at first service obtained in the present study was in line with the findings of Lande and Arnold (1983), Hall *et al*. (1995), Fossceco and Notter (1995) and Kruuk *et al*. (2001). Landeand Arnold (1983) reported that Phenotypic correlation between age and weight at first service was 0.297. Kruuk *et al*. (2001) calculated the Phenotypic correlation between age and weight at first service in Merino sheep i.e. 0.312. This indicated that with increase in age at first service, the weight of the ewe increased. However, there is a need to put a limit on the age at first service for economic reasons and suggest appropriate weight for first service.

Table 1 Mean Squares and Mean Crossproducts of Age and Weight at First Service

Source of variation	Df	Mean Squares		Mean Crossproduct
		Age at service (X_1)	Weight ar service (X_2)	(X_1X_2)
Between rams	55	89785.19	69.49	-99.12
Progeny within rams	935	30006.47	25.59	332.59

(b) Genetic Correlation: The genetic correlation between age and weight at first service as obtained from the variance and covariance analysis was - 0.266 $\pm$ 0.193. The negative genetic correlation between age and weight at first service indicated that there is genetic antagonism between the two traits.

The estimate of genetic correlation between age and weight at first service obtained in the present study was in line with the findings of Al-Shorepy and Notter (1998), Janssens *et al*. (2000) and Cloete *et al*. (2004). Janssens *et al*. (2000) reported that the estimates of genetic correlation among age and weight at first service was – 0.245 $\pm$ 0.201 in Merino sheep. Thus selection of ewe lambs for higher weights at first service could help to reduce age at first service.

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