

Genetic Parameters of Growth Traits in Awassi Sheep

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ABSTRACT:

Records of 4282 birth weight (BW), 1011 weaning weight (WW), 1011 daily gain from birth to weaning (DBW), 705 daily gain from weaning to yearling (DWY) and 705 yearling weight (YW) for Awassi sheep kept at the Baiji Sheep Station were utilized to estimate heritabilities and genetic and phenotypic correlations among the mentioned traits.

The paternal half-sib estimates of heritability for BW, WW, DBW, DWY and YW were 0.44, 0.10, 0.51, 0.51 and 0.10, respectively. Genetic correlations were all positive except those between DBW and each of BW and YW. The genetic correlations varied between -0.02 and 0.85. Phenotypic correlations ranged between -0.16 and 0.54.

Key words : Awassi, Correlation, Growth, Heritability

INTRODUCTION

Genetic improvement is considered very important in raising the level of animal production both quantitatively and qualitatively. In any breeding programme, the relative economic value of the trait(s), to be improved and accurate estimates of genetic parameters, such as heritability, genetic and phenotypic correlations, are needed.

Genetic gain from selection for a single trait is dependent on the estimate of heritability and selection differential. When the selection is carried out for more than one trait, genetic and phenotypic correlations are the additional parameters to be used in establishing selection and improvement programmes.

The purpose of this study is to estimate heritability, genetic and phenotypic correlations for birth, weaning and yearling weights, as well as daily gain from birth to weaning and weaning to yearling in a flock of Awassi sheep.

MATERIALS AND METHODS

In this study, weights of Awassi sheep raised at the Baiji Sheep Station were utilized. They included 4282 birth weight (BW) records over seven years period (1977-1983) and 1011 weaning weights (WW) and 705 yearling weights (YW) records over three years period (1977-1979).

Maximum likelihood (ML) method (Schaeffer, 1967) in a mixed model was used. The general statistical model included fixed effects due to age of dam, sex, type of birth, month or season of birth and regression of (BW), (WW) and (YW) on dam body weight, and random effects due to sire and residual error.

Variance-covariance (VCV) matrices were constructed from sire, and error variance and covariance components for each trait to be tested for positive definiteness (all the eigen values must be positive). The non positive definite matrices were modified using the 'bending' method (Hays and Hill, 1981).

The VCV matrices have to be positive definite in order to obtain reliable estimates of VCV to be used in estimating reliable parameters. Paternal half-sib method was used in estimating heritabilities.

RESULTS AND DISCUSSION

Sire and error variances and covariances for the studied traits have been constructed and tested of being positive definiteness. The results indicate that all VCV matrices were not positive, and consequently modified (bent) Table 1, and used for estimating heritability, genetic and phenotypic correlations.

Heritability :

Paternal half-sib heritabilities for BW, WW, YW, daily gain from birth to weaning (DBW) and daily gain from weaning to yearling (DWY) using the modified VCV are given in Table 2. They considered moderate to high in value. Heritability estimates of 0.19, 0.18, 0.29 and 0.31 for BW of Awassi lambs were reported by Kazzal (1973), Aziz (1977), Al-Hillali (1982) and Aziz et al. (1988). They are lower than the estimate of the present study (0.41) while, Khalifa and Duayfi (1979) reported a higher estimate of 0.80 on the same breed. Previous estimates of heritability for BW using different breeds and different methods of estimation have ranged from 0.02 in Hampshire (Srinivasan, 1969) to as high as 0.54 in Soviet Merino (Kaul and Tomar, 1982).

The heritability estimate for WW (0.10) was much lower than the estimate for BW. This could be attributed to variation in dam's milk supply rather than to differences in genetic merit of the lambs. This estimate is similar to those (0.10 and 0.12) reported by Thrift et al. (1973) and Dzakumah et al.

Table 1. Sire (genetic) and phenotypic variance and covariance for birth (BW), weaning (WW), yearling (YW) weights, daily gain from birth to weaning (DBW) and daily gain from weaning to yearling (DWY) after bending.

	BW	WW	YW	DBW	DWY
BW	0.1651	0.0831	0.0468	- 0.00205	0.00577
	1.5142	0.4932	3.2961	- 0.12845	- 0.07382
WW		0.3408	0.3560	0.01605	0.11285
		12.6498	6.7382	0.11068	- 0.62647
YW			0.7320	- 0.06731	0.29059
			29.1100	0.00837	2.33558
DBW				0.16086	- 0.00001
				1.25948	- 0.00039
DWY					0.16086
					1.25783

Upper line are the sire components

Lower line are the phenotypic components

Table 2. Heritability, genetic and phenotypic correlations for the studied traits.

	BW	WW	YW	DBW	DWY
BW	0.44	0.35	0.13	- 0.01	0.04
WW	0.11	0.10	0.71	0.07	0.47
YW	0.54	0.38	0.10	- 0.20	0.85
DBW	- 0.05	0.03	0.00	0.51	0.00
DWY	- 0.05	- 0.16	0.42	0.00	0.51

Values on, above and below the diagonal are the heritabilities, genetic and phenotypic correlations respectively.

(1977), but higher than those (0.06 and 0.08) found by Kazzal (1973) and Abdul-Rahman (1978) and lower than the estimate (0.26) reported by Aziz et al. (1988) on Awassi sheep in Iraq.

In the current work, the heritability estimate for YW (0.10) is in agreement with those of other studies on the same breed (Aziz, 1977; Hossamo and Owen, 1983). On the other hand, Kazzal (1973) and Al-Rawi et al. (1982) reported higher values (0.20 and 0.53) for the same breed. Estimates for DBW (0.51) was higher than previous estimates (0.12, 0.29 and 0.07) reported on same breed (Abdul-Rahman, 1978; Al-Rawi et al., 1982; Kamber, 1987). While the estimates for DWY (0.51) was similar to that (0.52) reported by Ercanbrack and Price (1972) and Stahort et al. (1986) on Targhee, Rambouillet and Columbia sheep.

The heritability estimates of DBW and DWY are of special interest, which indicate that selection would be effective in raising the average daily gain of Awassi lambs. The expected genetic gain per generation under mass selection would be the product of the selection differential and heritability.

Genetic and Phenotypic Correlations :

The genetic and phenotypic correlations for the studied traits were estimated using the modified VCV matrices are presented in Table 2. The genetic correlations ranged from -0.20 between DBW and YW to 0.85 between DWY and YW. While the phenotypic correlations were in the range of -0.16 between DWY and WW to 0.54 between BW and YW. The phenotypic correlation between each pair of the traits was lower than the genetic value of the same pair except the correlation between YW and BW. These findings are supported by Aziz (1986). The positive, but low phenotypic correlations

between traits may occur if the environmental correlations between pairs of traits is small. While the negative phenotypic correlation between pairs of traits might be due to a negative environmental correlation.

The environmental correlations are due to non-indentifiable factors, rather than those included in the model. The remaining environmental factors are likely to be more temporary, and animals are exposed to many transient effects which may be either positive or negative. A possible source of the negative environmental correlation can be attributed to compensatory growth.

ACKNOWLEDGEMENTS

We thank Professor Dr. K. H. Juma, Department of Animal Resources for reading the manuscript.

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المعالم الوراثية لصفات النمو فى الاغنام العواسية

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الخلاصة :

شملت هذه الدراسة تحليلا لسجلات الاغنام العواسية والبالغ عددها ٤٢٨٢ للوزن عند الولادة . ١٠١١ للوزن عند الفطام . ١٠١١ لمعدل الزيادة الوزنية اليومية من الولادة الى الفطام . ٧٠٥ لمعدل الزيادة الوزنية اليومية من الفطام الى عمر سنة و ٧٠٥ للوزن عند عمر سنة والمرباة في محطة تربية الاغنام في بييجي بقصد تقدير المكافى الوراثي والارتباطات الوراثية والمظهرية للصفات انه الذكر.

بلغ تقدير المكافى الوراثي بواسطة الاخوة نصف الاشقاء لكل من الوزن عند الولادة . الوزن عند الفطام . معدل الزيادة الوزنية م الولادة الى الفطام . معدل الزيادة الوزنية من الفطام الى عمر سنة والوزن عند عمر سنة ٠٤٤ . ٠١٠ . ٠٥١ . ٠٥١ . و ٠١٠ على التوالي . كانت جميع الارتباطات الوراثية موجبة باستثناء الارتباط بين معدل الزيادة الوزنية اليومية من الولادة الى الفطام وكل من الوزن عند الميلاد والوزن عند الفطام وتراوح الارتباط الوراثي بين -٠٢ الى ٠٨٥ . كما تراوح الارتباط المظهري بين -٠١٦ الى ٠٥٤ .

كلمات مفتاحية : الارتباط الوراثي . العواسية . المكافى الوراثي . النمو .