Estimation of Genetic Parameters for body weights of Kurdish Sheep in different ages using multivariate Animal models

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Introduction

- The sheep population in Iran is composed mainly of fat-tailed carpet-wool native breeds

- A high percentage of the sheep population is managed under a migratory system, utilizing the ranges as the major source of feed

- The Kurdish sheep is a fat-tail breed indigenous to the Kurdistan and Khorasan provinces of Iran, and highly valued for their meat production.

- To determine optimal breeding strategies to increase the efficiency of sheep production, knowledge of genetic parameters for weight traits at various ages and also the genetic relationships between the traits is needed.

- The aim of this study was to estimate the variances and covariances for direct and maternal genetic effects on lamb weights at different ages using multivariate animal models.

Materials and Methods

- The data used in the present study, collected at one research flock in Kurdistan of Iran, included 2476 animals, during the period from 1992 to 2002 (11 years).

- Five traits were considered: birth weight (BW), weaning weight (WW), 6-month weight (W6), 9-month weight (W9), and yearling weight (YW).

- Variance and covariance components and genetic parameters were estimated using the DFREML program *by fitting six single-trait animal models.*

1) $Y = Xb + Z_1a + e$

2) $Y = Xb + Z_1a + Z_2c + e$

3) $Y = Xb + Z_1a + Z_3m + e$

$Cov(a,m) = 0$

4) $Y = Xb + Z_1a + Z_3m + e$

$Cov(a,m) = A\sigma_{am}$

5) $Y = Xb + Z_1a + Z_2c + Z_3m + e$

$Cov(a,m) = 0$

6) $Y = Xb + Z_1a + Z_2c + Z_3m + e$

$Cov(a,m) = A\sigma_{am}$

- A log likelihood ratio test was used to choose the most suitable random effects model for each trait. The reduction in –2logL when a random effect was added to the model was calculated.

- Model 6 was selected as the most appropriate.

- The SAS statistical package (SAS 1985) and the method of unequal subclass analysis of variance was used to test the significance of the fixed effects of year of birth (5 levels), sex (male and female), type of birth (single and twin), and age of dam (2, 3, 4, and 5 years of age or older).

- **Result and Discussion**

Characteristics of the data structure

Trait	No. Records	Mean (Kg)	St. Dev. (Kg)	Coef. Of Var. (%)
BW	**2245**	**3.69**	**0.47**	**12.73**
WW	**2193**	**19.45**	**3.22**	**16.55**
W6	**1947**	**25.32**	**3.95**	**15.60**
W9	**1576**	**26.74**	**5.21**	**16.97**
YW	**1059**	**29.47**	**4.12**	**13.38**

- BW has the smallest CV which is an indication of the smaller effect of environment on birth weight than on the other traits.
- This is in agreement with previous studies

- All the fixed effects (year of birth, age of dam, birth type and sex) were significant for lamb weight at all ages.

Estimates of genetic parameters for body weights from single-trait analyses

Trait	σ^2_a	σ^2_c	σ^2_m	σ_{am}	σ^2_e	σ^2_p	h^2_a	C^2	M^2	r_{am}
BW										
1	0.1597	……..	…..	…….	0.2189	0.3786	0.4218	…….	…….	……..
4	0.0546	……..	0.0923	0.0047	0.2151	0.3667	0.1488	…….	0.2517	0.0662
6	0.0586	0.0116	0.0865	0.0025	0.2051	0.3643	0.1608	0.0318	0.2374	0.0351
WW										
1	3.5412	……..	……..	……..	8.3141	11.855	0.2987	……..	……..	……..
4	2.3291	……..	0.8745	0.5739	7.8576	11.653	0.2001	……..	0.0751	0.4623
6	2.7652	0.0748	0.2785	0.5187	8.1942	11.831	0.2337	0.0063	0.0235	0.5911
W6										
1	5.3452	……..	……..	…….	9.4080	14.753	0.3623	……..	……..	……..
4	3.6843	……..	0.2894	0.7357	9.8804	14.589	0.2544	……..	0.0198	0.7124
6	3.7694	0.4863	0.2157	0.6697	9.3482	14.489	0.2601	0.0335	0.0148	0.7427
W9										
1	3.9861	……..	……..	……..	19.139	23.125	0.1723	……..	……..	……..
4	1.5643	……..	1.1857	0.4264	19.721	22.897	0.0683	……..	0.0517	0.3130
6	2.0654	1.2476	0.1032	0.3679	19.005	22.789	0.0906	0.0547	0.0045	0.7968
YW										
1	5.0736	……..	……..	……..	15.305	20.379	0.2489	……..	……..	……..
4	4.4762	……..	0.3987	0.3564	15.233	20.465	0.2187	……..	0.0194	0.2679
6	2.4894	0.2615	0.0843	0.2627	15.284	20.371	0.1222	0.0128	0.0041	0.5735

Estimates of correlations between various weights from two-trait analyses

Trait 1	Trait 2	r_{a1a2}	r_{m1m2}	r_{e1e2}	r_{p1p2}
BW	WW	0.6701	0.5641	0.2436	0.3854
BW	6W	0.3842	0.3972	0.1768	0.3276
BW	9W	0.3158	0.4238	0.2139	0.3542
BW	YW	0.3624	0.4509	0.2688	0.3349
WW	6W	0.7953	0.7414	0.4369	0.7237
WW	9W	0.5908	0.6953	0.3952	0.6421
WW	YW	0.6145	0.7166	0.4027	0.5832
6W	9W	0.5773	0.6481	0.5039	0.6041
6W	YW	0.5439	0.7602	0.5371	0.5928
9W	YW	0.4812	0.6741	0.4928	0.6376

Conclusion

It is reasonable to suggest that the traits to be included in the sheep recording scheme could be confined to the traits expressed early in life of the lambs, such as their birth weight and weaning weight in which both the direct and maternal effects are involved.


Thanks!