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ESTIMATION OF GENETIC PARAMETERS AND BREEDING VALUES FOR GROWTH TRAITS ON ROMANOV LAMBS IN EGYPT.

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ABSTRACT

Records of weights for 442 Romanov lambs were used to estimate genetic parameters and breeding values for growth traits of lambs .Traits studied were birth weight (BW), weaning weight (WW) and average daily gain from birth to weaning (ADG). Lambs weaned at approximately three months of age. Variance components were estimated by using Multivariate Derivative Free Restricted Maximum Likelihood (MTDFREML) program .The model Included year, sex, and type of birth as a fixed effect, and random effects for the direct genetic effect of the animal. Genetic and environmental correlations were estimated. Estimates of the variances of random effects (h^2) as a proportion of phenotypic variance were 0.17, 0.20 and 0.19 for BW, WW and ADG, respectively. Estimate of genetic correlation was 0.24 between BW and WW, 0.63 between BW and ADG and -0.10 between WW and ADG. Estimates of environmental correlation was -0.35 between BW and WW,-0.16 between BW and ADG and 0.32 between WW and ADG.

Results suggest that, selection should be effective for WW and ADG, but less effective for BW. The estimate of genetic correlation showed a large genetic antagonism between BW and ADG. The wider range of animals and sires breeding values, indicating potential for genetic improvement for different traits studied in the present study.

INTRODUCTION

The Romanov is a native breed of Russia, was introduced to France in 1963, and was first imported to Egypt from France by the Ministry of Agriculture in 1985; the genetic characterization of this breed is of paramount importance not only for conservation purpose but also for the definition of breeding objectives and breeding programs.

Actually, Lamb meat production depends on capacity of lambs for growth, the selection objectives of increasing meat production deal primarily with these traits. Therefore, Lamb weight and average daily gain are important for market production, but birth weight has received limited consideration in sheep breeding programs. Although, it is a trait of potential economic importance through its effects on preweaning growth and hence increasing the economic success of producing slaughter animals.

Studies of various sheep breed have shown that, genetic influence was importance for Lamb weight (Maria *et al* 1993, Tosh and Kemp 1994, Nasholm and Danell 1996 and Alshorepy and Notter 1998). To take advantage of different systems of breed utilization, the genetic parameters involved should be know (Boujenane and Bradford, 1991). The heritability of growth traits and relation between them must be known for effective selection and designing culling program (Clark and Hohenboken 1983).

Therefore, the objectives of this study were to estimate heritability (h^2) as well as environmental and genetic correlations of lamb weight at birth and at weaning and average daily gain from birth to weaning and to estimate breeding values for growth traits on Romanov lambs in Egypt.

MATERIALS AND METHODS

Data:

Data were used in the present study were collected during the period from 1988 to 2001, these animals were raised at Mahallet Mouse Experimental farm (North Delta) belonging to Animal Production Research Institute, Ministry of Agriculture, Egypt. A total number of 442 Romanov lambs were available for the present study.

The data represent the birth weight within 24h of birth (BW), weaning weight (weight at three months) of age (WW) and average daily gain from birth to weaning (ADG) for both male and female lambs.

Management of animals:

Ewes entered one mating season per year in September, ewes and rams were first mated at about 18 months of age, lambs weaned at about three months of age. Animal were sheared twice a year in March and September.

Lambs were crept from the fifth week of age until weaning on a concentrate ration (83% corn, 15% soybean, 2% salts and vitamins). From weaning to yearling age, lambs were fed on concentrate feed mixture (35% Corn, 30% undecorticated cotton seed cake , 25% Wheat bran, 6% molasses 30% limestone and 1% mineral salts) together with corn, berseem hay, wheat bran and soybean in quantities proportional to lambs weights, animals were allowed to drink twice or thrice a day.

Before the beginning of mating season 0.25 kilograms concentrate supplement were fed each animal/day. Concentrate mixture given for two weeks during the last 2-4 weeks of pregnancy. Some chemical materials add in water dipping to remove of external parasites. Rams were tasted for libido and semen quality before mating season. The animals were vaccinated against the common diseases as scheduled in the farm. The animals were housed in separate semi- open sheds.

Statistical method:

Variance component and genetic parameters were estimated for all data set using MTDFREML (Multivariate Derivative Free Restricted Maximum Likelihood, Boldman *et al* 1995) program.

Model for Multivariate analysis was as follow:-

$$Y_{ijklm} = \mu + A_i + S_j + YR_K + T_l + e_{ijklm}$$

Where, Y is the observation of birth weight ,weaning weight, and average daily gain for the $ijklm^{th}$ lamb, μ is over all mean, A_i is the random additive genetic effect of i^{th} animal, S is the fixed effect of j^{th} sex (i=1,2), YR is the fixed effect of K^{th} year of birth K = (1, 2,…,...,14) 1= 1988, 14 = 2001, T_1 is the fixed effect of i^{th} type of birth (1= single, 2 = twin 3 = triple) and e_{ijklm} is the measurement errors.

RESULTS AND DISCUSSION

Unadjusted means and standard deviations for present traits studied are shown in Table 1. The average birth weight (2.531 kg) was considerably lower than those reviewed for other breeds (3.72kg for Moroccan Timahdit) reported by El Fadili *et al* (2000), (2.8 kg for Sabi sheep reported by Matika *et al* 2003), (4.15kg for Kordian sheep reported by Shiri *et al* 2006), (3.1kg for Naeini sheep, reported by Edriss and Edriss (2006). Also the present mean of weaning weight (12.03kg) was lower than those reported by Matika *et al* (2003) (12.8kg), El Fadili *et al* (2000) (20.37kg), Bedhiaf Romdhani and Djemali (2005) (18.6kg), Shiri *et al* (2006) (25.45kg), but higher than that reported by Gbangboche *et al* (2005) (10.60kg) on Djallonke sheep.

Table 1: Unadjusted means, standard deviations (S.D) and coefficient of variation (C.V %) for birth weight, weaning weight and average daily gain.

Traits	Mean	S.D	C.V%
Birth weight	2.531	6.170	24.40
Weaning weight	12.03	3.490	28.98
Average daily gain	105.5	36.48	34.56

The mean average daily gain of 105.5 gram in this study is lower than that reported by Matika *et al* (2003) (127 gram) for Sabi sheep, Edriss and Edriss (2006) (245 gram) for Naeini lambs.

Heritability:-

Heritability estimates and their standard errors for birth weight, weaning weight and average daily gain are showed in Table 2. Estimates of heritability for birth weight was moderate (0.17), this estimate was similar to that (0.18) reported by Bromley *et al* (2000) and similar to the weighted mean of estimates (0.19) for dual propose breeds reported by Fogarty (1995). However, the present estimate was greater than the weighted mean of estimates (0.13 and 0.12) for wool and meat breeds (Fogarty 1995), (0.09) (Mousa *et al* 1999). Also, Hosseinpour (2006) working on 5913 records of Baluchi sheep in Iran, using single trait animal model with DFREML soft ware, found that heritability estimate for birth weight was 0.14.

On the other hand, the present estimate was lower than the estimate (0.40) reported by Rosati *et al* (2002), (0.27) reported by Safari *et al* (2005) and (0.25) reported by Matika *et al* (2003) for Sabi lambs.

The moderate estimate of heritability for birth weight may by due to the importance of random environmental effect on variability of the observation and due to categorical expression of the trait (Falconer 1989). The obtained low to moderate heritability estimates and high coefficient of variations for different traits studied in the present study, indicating potential for genetic improvement of growth traits of Romanov lambs in Egypt.

Heritability estimate for weaning weight was moderate (0.20), this estimate was higher than heritability estimate for birth weight. The present estimate was higher than estimate (0.17) found by Rosati *et al* (2002), (0.16) reported by Hanford *et al* (2002) working on Swedish fine wool, and (0.13) reported by Fogarty (1995) and Matika *et al* (2003) working on Sabi sheep.

On the other hand, the present estimate was lower than those reported by Snyman *et al* (1995) (0.33) worked on Afrino sheep and Hosseinpour (2006) (0.28) for Baluchi sheep in Iran.

The estimate of heritability for average daily gain from birth to wearing was moderate (0.19), this estimate was similar to estimate (0.17) reported by Matika *et al* (2003) for Sabi sheep. However, the estimate was higher than estimate (0.12) and (0.08 -0.16) reported by Yazdi *et al* (1997) for Baluchi Sheep and Hagger (1998) for various sheep, (0.08) reported by Hosseinpour (2006) for Baluchi sheep in Iran with REML method.

Table 2: Heritability estimates (h^2) and their standard errors (S.E) for birth weight (BW), weaning weight (WW) and average daily gain (ADG) for Romanov lambs.

Traits	H^2 ± S.E
BW	0.17± 0.05
WW	0.20± 0.06
ADG	0.19± 0.06

Generally, the difference between the present estimates and other estimates which are reported by many authors working on different breeds of sheep in different countries could be due to the number of observation used in the analysis, the correction for the non-genetic factors, and the model used in the analysis.

Genetic correlations:-

Estimates of genetic correlations among studied traits are presented in Table (3). The genetic correlation between birth weight and weaning weight was moderate and positive (0.24), this estimate was lower than those estimate reported by Rosati *et al* (2002), El Fadili *et al* (2000) and Safari *et al* ((2005), being 0.33, 0.44, and 0.47, respectively. However, the genetic correlation between birth weight and average daily gain was positive and high (0.63), while, Safari *et al* (2005) found that the genetic correlation between birth weight and average daily gain was low and negative (-0.10).

Environmental Correlations:-

Estimates of environmental correlations between birth weight and weaning weight was negative (-0.35), while Rosati *et al* (2002) worked on (Dorest finnsheep, Rambouillet, Suffolk, Targhee) found that, estimates of environmental correlation between litter mean weight per lamb born and litter mean weight per lamb weaned was (0.48) positive and high, and also Safari *et al* (2005) reported that, the environmental correlation between birth weight and weaning weight was positive and moderate (0.37).

Table 3: Genetic correlations ± S.E (above diagonal) and environmental correlations (below diagonal) among birth weight (BW), weaning weight (WW) and average daily gain (ADG), for Romanov lambs.

	BW	WW	ADG
BW	----	0.24±0.09	0.63±0.11
WW	- 0.35±0.09	--------	-0.10±0.08
ADG	- 0.16±0.08	0.32±0.10	------

Breeding values:-

Estimate of minimum and maximum predicted breeding values (PBV) and their accuracies for BW, WW, and ADG estimated from lamb breeding values (LBV), sire breeding values (SBV) and dam breeding values (DBV) were given in Table (4).

The range of lamb breeding values for BW, WW and ADG was 18.47, 10.10, and 11.97 kg, respectively, and that of SBV for above mentioned traits were 9.693, 3.73, and 4.89, respectively. While, the range of DBV was 17.29, 5.21 and 6.80, respectively for the same traits.

The obtained result showed that, wide range of breeding values for birth weight and other traits. So that selection of lambs for the next generation would lead to higher genetic improvement in Romanov lambs in Egypt.

CONCLUSION

Moderate heritability estimates for studied traits, indicated that, improving programs for these trait must be included improving environmental conditions with genetic improvement to achieved results preferable.

High and positive genetic correlation for birth weight with average daily gain and moderate positive genetic correlation for birth weight with weaning weight indicated that the selection based on birth weight over a long period could result in improve average daily gain and increase weaning weight. The wider range of lamb breeding values for all traits concluded that, selection of lambs for the next generation would lead to higher genetic progress in this herd.

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تقدير المعالم الوراثية لصفات النمو لحملان الرومانوف فى مصر

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اشتملت هذه الدراسه على ٤٤٢ من سجلات الوزن لحملان الرومانوف بمحطه بحوث الأغنام بمحله موسى التابعة لمعهد بحوث الإنتاج الحيواني بوزارة الزراعة خلال الفترة من ١٩٨٨ وحتى ٢٠٠١ . تم تحليل البيانات بواسطة نموذج الحيوان باستخدام برنامج (MTDFREML) واشتمل نموذج التحليل على الحيوان, والأخطاء كعوامل عشوائية, سنه الولادة ونوع الولادة وجنس المولود كتأثيرات ثابتة. وكانت تقديرات المكافئ الوراثى ١٧,. ، ٢٠,. ، ١٩,. لكل من الوزن عند الميلاد والوزن عند الفطام (ثلاثة أشهر) ومعدل النمو من الميلاد وحتى الفطام على الترتيب. وكان الارتباط الوراثى بين الوزن عند الميلاد والوزن عند الفطام ٢٤,. بينما كان ٦٣,. بين الوزن عند الميلاد ومعدل النمو اليومى وكان -١٠,. بين معدل النمو اليومى والوزن عند الفطام . وكان الارتباط البيئى بين الوزن عند الميلاد والوزن عند الفطام -٣٥,. وبين الوزن عند الميلاد ومعدل النمو اليومى -١٦,. وبين الوزن عند الفطام ومعدل النمو اليومى ٣٢,.

وكانت القيم التربوية للحملان كالتالي ١٨,٤٧ و١٠,١٠ و ١١,٩٧ لكل من الوزن عند الميلاد والوزن عند الفطام ومعدل الزيادة اليومية على الترتيب أما بالنسبة للقيم التربوية للآباء فكانت ٩,٦٣٩ , ٣,٧٣ ,٤,٨٩ لكل من الصفات السابقة على نفس ترتبها وبالنسبة للقيم التربوية للأمهات فهى ١٧,٢٩ ,٥,٢١ , ٦,٨ لنفس الصفات أيضا على نفس الترتيب.

نستنتج من ذلك أن الانتخاب لصفة الوزن عند الفطام ومعدل الزيادة اليومية للحملان من الميلاد حتى الفطام يؤدى الى نتائج أفضل بينما الانتخاب لصفة الوزن عند الميلاد تكون نتائجه أقل كفاءة .

Table (4): Rang of predicted breeding values of lambs (LBV), sires (SBV) and dams (DBV) and their accuracy for birth weight (BW), weaning weight (WW) and average daily gain from birth to weaning (ADG).

Traits	LBV				SBV				DBV			
	Min.	Max.	Range	accuracy	Min.	Max.	Range	accuracy	Min.	Max.	Range	accuracy
BW	-10.738	7.736	18.47	0.85-0.86	-4.098	5.536	9.634	0.72-0.79	-8.515	8.775	17.29	0.10-0.50
WW	-3.730	6.371	10.10	0.74-0.75	-1.507	2.228	3.73	0.62-0.65	-1.949	3.260	5.21	0.61-0.67
ADG	-7.364	4.604	11.97	0.80-0.83	-2.390	2.497	4.89	0.64-0.68	-4.003	2.796	6.80	0.64-0.73