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ESTIMATION OF GENETIC PARAMETERS USING ANIMAL MODEL FOR FIRST LAMBING AND LIFETIME PRODUCTION TRAITS OF RAHMANI SHEEP

Farrag, F.H.H.[1]; N.A. Shalaby[1] and H.R. Metawi[2]

1- Animal Production Department, Faculty of Agriculture, Mansoura University, El-Mansoura, Egypt. E-mail: zedan121@yahoo.com

2- Animal Production Research Institute, Ministry of Agriculture, Dokki Giza, Egypt.

ABSTRACT

A total of 1968 records for 706 Rahmani ewes were collected from El-Serw Experimental Station (North Nile Delta) belonging to Animal Production Research Institute, Ministry of Agriculture, Egypt, during the period from 1991 to 2001.

Genetic parameters and breeding values for the first lambing and lifetime production traits were investigated. The studied traits of the first lambing included number of lambs born per ewe lambing (NLB), number of lambs weaned per ewe lambing (NLW), litter weight at birth (LWB) and litter weight at weaning (LWW). While, total number of lambs born (TNLB), total number of lambs weaned (TNLW), total birth weight of lambs (TLWB) and total weight of lambs weaned (TLWW) per ewe over six lambing opportunities were used as lifetime production traits. Traits studied were analyzed by using single-trait animal model analyses. The overall means and standard deviations (SD) obtained in the current study for NLB, NLW, LWB and LWW in first lambing were 1.13, 1.09 lamb, 3.35 and 16.17 kg, respectively. While, the overall means of TNLB, TNLW, TLWB and TLWW were 3.38, 3.08 lamb, 10.59 and 46.72 kg, respectively.

Heritabilities for NLB, NLW, LWB and LWW in the first lambing obtained in the current study were 0.13±0.06, 0.08±0.06, 0.15±0.09 and 0.09±0.06, respectively. The estimates obtained in the current study were 0.11±0.06, 0.08±0.06, 0.13±0.07 and 0.10±0.08 for TNLB, TNLW, TLWB and TLWW, respectively. The genetic correlation among the first lambing traits ranged between 0.63 and 0.95, while it ranged between 0.95 and 0.99 among lifetime production traits, but the genetic correlation between different first lambing and different lifetime production traits were ranged from 0.12 and 0.45. The breeding values of first lambing (EBV) for all animal were 0.40, 0.22 lambs, 1.01 and 2.82 kg for NLB, NLW, LWB and LWW, respectively, while the corresponding values for sire were 0.34, 0.22 lambs, 0.78 and 2.5ᴗ kg, respectively. Spearman rank correlations among first lambing traits were ranged between 0.39 and 0.82 for all animals and from 0.47 to 0.81 for EBV of sires. Also, higher rank correlations among different lifetime production traits were recorded.

The obtained low to moderate heritability estimates, high coefficient of variations and the wider range of animals and sires breeding values for different traits studied in the present study, especially lifetime production traits, indicating potential for genetic improvement of lifetime traits of Rahmani sheep.

Keywords: Egypt, Rahmani, sheep, lifetime production traits, animal model, genetic parameters, breeding value.

INTRODUCTION

Improving female reproductive performance is an important objective for increasing the profitability of sheep. There is great potential for increasing both biological and economic efficiency of lamb production through genetic improvement in reproductive rate than through improvement in growth rate or body composition (Dickerson, 1978). The sheep population reached about 4.6 million head in Egypt (Galal *et al.*, 2002). The local sheep breeds are characterized by extended breeding seasons, high fertility and low prolificacy. Therefore, to increase efficiency of sheep production, selection based on female production, reproduction, growth of lambs and wool production would be valuable. This led to an increase in the number of marketed lambs which offers greatest opportunity for increasing efficiency of lamb and mutton production. A major factor that affects profitability in sheep production is the number of lambs born per ewe (Iman and Slyter, 1993). Thus, the productivity of a ewe can be measured by litter size at birth and at weaning, as well as litter weight of lambs at birth and at weaning. High yield of lifetime lamb production associated with longer productive life means good health and fertility. This allow the animal to achieve its maximum productive capacity, contributes to reducing replacement and treatment cost and increases the scope of voluntary culling (Jairath *et al.*, 1994). Therefore, lifetime lamb production seems to be interest trait for animal breeders. This indicates that there are many more studies needed in this field. Farrag *el al.* (2002) studied some predictors traits for lifetime lamb production of Rahmani sheep. So, the objectives of the current study were to evaluate the lamb production in the first lambing and lifetime lamb production, to estimate the genetic parameters for the first lambing and lifetime lamb production using REML with animal models, to estimate the genetic correlations between lamb production traits in the first lambing and total lifetime lamb production of ewes. Also, estimate the rank correlation coefficients among breeding values of different traits in the first lambing and lifetime lamb production traits in Rahmani sheep.

MATERIALS AND METHODS

The data used in the present study were collected from 706 Rahmani ewes with a total of 1968 records, during the period from 1991 to 2001. These animals were maintained at El-Serw Experimental Station (North Nile Delta) belonging to Animal Production Research Institute, Ministry of Agriculture, Egypt. The numbers of sires and daughters per sire (k) used in this study were 72 and 11.9, respectively.

Intensive production system of three matings (May, January and September) per two years (mating every eight months) was followed in the experimental farm. The corresponding lambing seasons took place in October, June and February.

Ewes and rams were mated for the 1st time at about 18 months of age. At mating, ewes were randomly divided into groups of 30-35 ewes each. Ewes of each group were exposed to a fertile ram for 35-45 days as a mating period in separate mating pens. Ewes were weighed before mating season and at lambing. Rams were tested for libido and semen quality before mating season. Ram was substituted by another ram if the ram was unable to serve the ewes.

During the period from December to May, the flocks were grazed Egyptian clover (Berseem) *Trifolium alexandrinum*. In summer and autumn seasons, the ewes were fed on hay, or by grazing stubble or green fodder if [illegible] in addition to the pelleted concentrate feed mixture. Allowances [illegible] were offered twice daily at 7 a.m. and 4 p.m. Drinking water was [illegible] twice daily during winter and three times during summer. Mineralized salt blocks were available to all ewes. The animals were housed in semi-open sheds and freely allowed to exercise. Animals were subjected to the routine vaccination program against infection diseases. Animals were [illegible] twice a year, in March and September. Two weeks before the beginning of mating season, 0.25 kilograms concentrate supplement were fed to each ewe/day and also during the last 2-4 weeks of pregnancy. At lambing, new born lambs were identified and recorded according to their type of birth, sex and pedigree. Lambs were weaned at approximately eight weeks of age. Weights were recorded within twenty four hours of birth and at 30 days intervals.

Reproductive traits studied included number of lambs born per ewe lambing (NLB), number of lambs weaned per ewe lambing (NLW), litter weight at birth (LWB) and litter weight at weaned (LWW) in the first lambing. In addition, total number of lambs born (TNLB), total number of lambs weaned (TNLW), total birth weight of lambs (TLWB) and total weight of lambs weaned (TLWW) per ewe over six lambing opportunities were used as lifetime production traits. Animal models were used for all analyses of data. The statistical analyses were performed using the MTDFREML (multivariate derivative free restricted maximum likelihood, Boldman *et al.*, 1995) using single- and multi-trait analyses. Variance components for each trait were estimated from single-trait analyses. A series of two-trait pairwise analyses were conducted to estimate the genetic correlations between traits studied.

Models for single and multiple traits evaluations for lamb production traits in first lambing were as follows:

$$\mathbf{Y_{ijkl} = \mu + A_i + YR_j + S_k + ß_1\ age + e_{ijkl}} \quad \text{.................................... (1)}$$

Where, μ is overall mean, A_i is the random additive genetic effect of i^{th} animal, YR_j is the fixed effect of k^{th} year of lambing (k=1,2....11; 1=1992.....11=2001), S_k is the fixed effect of k^{th} season of lambing (l= 1, 2 and 3; 1=October, 2=June and 3=February), $ß_1$ is the regression coefficient for age at first lambing and e_{ijkl} is measurement error. While, the lifetime lamb production traits were analyzed by the following model:

$$\mathbf{Y_{ijkl} = \mu + A_i + YR_j + S_k + ß_1\ age + ß_2\ trait + e_{ijkl}} \quad \text{..................... (2)}$$

Where, μ is overall mean, A_i is the random additive genetic effect of i^{th} animal, YR_j is the fixed effect of k^{th} year of birth (k=1, 2....11; 1=1991.....11=2002), S_k is the fixed effect of k^{th} season of birth (l= 1, 2 and 3; 1= May, 2 = January and 3=September), $ß_1$ is the regression coefficient for age at first lambing, $ß_2$ is the regression coefficient for the same trait in the first lambing (NLB) when analyze the corresponding trait of lifetime lamb production (TNLB) and e_{ijkl} is measurement error. The vector presentation of this model is: $Y = X\beta + Zu + e$, where Y is the vector of lamb production; X the incidence matrix for fixed effects; β the vector of an overall mean and fixed effects in the model; Z the incidence matrix for random effects; u the vector of random effect (animals additive genetic effect) associated with the incidence matrix Z; and e the vector of random errors normally and independently distributed with $(0, I\sigma^2 e)$.

Mixed-model equations in the analyses were solved iteratively based on the variance of the log-likelihood function values, the convergence criterion was 1×10^{-8}. In addition, several restarts were necessary until changes in the log-likelihood function values were less than 1×10^{-5}. Restarts were performed for all analyses, using the final results of the previous analysis, in order to locate the global maximum for the log likelihoods. Starting values for variance components for two-trait analyses were obtained from single-trait analyses on individual traits. Best linear unbiased predictions (BLUP) of estimated breeding values (EBVs) were obtained by back-solution using the MTDFREML program for all animals in the pedigree file for single-trait. Additionally, Spearman rank correlations between EBVs for traits studied from single-trait were estimated

RESULTS AND DISCUSSION

The overall means and standard deviations (SD) (Table 1) obtained in the current study for number of lambs born per ewe lambing (NLB), number of lambs weaned per ewe lambing (NLW), litter weight at birth (LWB) and litter weight at weaned (LWW) in the first lambing were 1.13±0.35, 1.09±0.30 lamb, 3.35±0.90 and 16.17±4.01 kg, respectively. In this respect, Almahdy (1987) reported that the number of lambs born per ewe joined were 0.99 and 1.00 in Ossimi and Rahmani ewes, respectively. Rao and Notter (2000) showed that the mean adjusted to an adult (4-yr-old) of litter sizes were 1.69 for Targhee, 1.95 for Suffolk, and 2.09 for Polypay. The LWW of Rambouillet ewes were reported to be 43.16 kg by Bromley *et al.* (2001). Cloete *et al.* (2003) found that the NLB and NLW were 1.47 and 1.07 lambs, respectively for South African Mutton Merino ewes and the corresponding values were1.23 and 1.01 lambs, respectively for Dohne Merino ewes. The NLB, NLW and LWW of Dormer ewes were reported to be 1.49, 1.22 lambs and 25.9 kg, respectively (Van Wyk *et al.*, 2003). The overall means of NLB, NLW, LWB and LWW of Turkish Merino were 1.42, 1.36 lambs, 6.69 and 41.58 kg, respectively (Eküz *et al.*, 2005). These results indicated that the Rahmani sheep are characterized by low prolificacy comparing with other breeds in different countries.

Regarding the lifetime lamb production traits, the obtained overall means of TNLB, TNLW, TLWB and TLWW were 3.38, 3.08 lambs, 10.59 and 46.72 kg, respectively. Aboul-Naga and Aboul-Ela (1987) showed that the total weaning weights over nine lambings were 18.77 and 22.71 for Ossimi and Rahmani ewes, respectively. Younis *et al.* (1988) showed that TNLB, TNLW and TLWW were 3.07, 2.54 lambs, and 39.9 kg, in Barki ewes over six production years, respectively. Othman (1991) found that the overall means of TNLB, TNLW and TLWW over nine lambing were 4.23, 3.73 lambs and 46.98 kg in Ossimi ewes, respectively and 4.47, 3.74 lambs and 48.09 kg in Rahmani ewes, respectively. Iman and Slyter (1996) noted that total number of lambs weaned in the lifetime production over five years production were 5.39 and 4.48 in Finn-Dorset-Targhee and Targhee ewes, respectively. Snyman *et al.* (1997) reported 2.22, 1.88 lambs and 121.97 kg for TNLB, TNLW and TLWW over three lambing opportunities, respectively.

Table 1: Arithmetic means, standard deviations (SD) and coefficients of variation (CV%) of lamb production in the first lambing (NLB, NLW, LWB and LWW) and lifetime lamb production traits (TNLB, TNLW, TLWB and TLWW) of Rahmani ewes.

Trait	Mean	SD	CV %
Lamb production traits in first lambing			
NLB (LAMB)	1.13	0.35	31.0
NLW (LAMB)	1.09	0.30	26.9
LWB (KG)	3.35	0.90	24.8
LWW (KG)	16.17	4.01	26.4
Lifetime lamb production traits over six lambing opportunity			
TNLB (LAMB)	3.38	2.09	61.8
TNLW (LAMB)	3.08	1.97	64.0
TLWB (KG)	10.59	6.34	59.9
TLWW (KG)	46.72	28.18	60.3

Duguma *et al.* (2002) showed TLB, TLW and TWW per ewe over four lambing opportunities of Merino ewes to be 5.2, 4.1 and 92.6 kg, respectively. Ekiz *et al.* (2005) found that the means of TLB, TLW, TWB and TWW per ewe over four lambing opportunities of Turkish Merino sheep were 5.48, 5.25 lambs, 25.61 and 162.47 kg, respectively.

In general, the differences between the overall means of lifetime production traits obtained in the present study and those reported by the other investigators mainly due to the different methods of calculation of lifetime ewe productivity in different length of longevity, breeds, production systems, climatic conditions, number of animals and methods of the statistical analysis.

With respect to coefficient of variations (CV), the high coefficient of variation obtained in the present study ranged between 24.8 and 31.0 % for the first lambing traits and varied between 59.9 and 64.0% for lifetime production traits. The mean CV for number of lambs born was 58% (Fogarty, 1995). Rao and Notter (2000) reported that the mean coefficient of variation for litter size was 36%, while Duguma *et al.* (2002) studied lifetime production traits of Merino ewes. They found that the CV for TLB, TLW, TWW and TWW were 19.4, 28.2, 29.1 and 22.7%, respectively. The higher estimates of coefficients of variation for different traits in the present study showed the high variation exists for traits studied; indicating that potential genetic improvement through selection is possible.

Heritability

Heritability estimates and their standard errors (Table 2) for the first lambing and lifetime production traits of Rahmani ewes were calculated using REML procedures (Boldman *et al.*, 1995). The heritabilities for NLB, NLW, LWB and LWW in the first lambing obtained in the current study were 0.13±0.06, 0.08±0.06, 0.15±0.09 and 0.09±0.06, respectively. The present estimates were within the range of those reported in literature. In this respect, Puntila and Nylander (1998) analyzed data from a Finnsheep nucleus. They reported estimates of 0.08 and 0.03 for litter size at birth and at weaning, respectively. Okut *et al.* (1999) demonstrated that previous estimates of heritability for prolificacy traits in sheep have not been consistent. They also found that the h^2 of litter size at birth of Columbia, Polypay, Rambouillet and Targhee ewes in young age were 0.12, 0.12, 0.14 and 0.01, respectively, while the h^2 litter size at weaning were 0.10, 0.05, 0.01 and 0.00, respectively. Rao and Notter (2000) reported that heritability using single-trait analyses of litter size for Suffolk, Polypay and Targhee sheep were 0.09, 0.09 and 0.11, respectively. Snowder *et al.* (2001) reported low to moderate heritability estimates for litter weight weaned, ranging from 0.08 to 0.22 for Colombia, Polypay, Rambouillet and Targhee. Hanford *et al.* (2002) reported that the heritability of litter size at birth and at weaning were 0.09 and 0.06, respectively. Van Wyk *et al.* (2003) estimated heritabilities to be 0.059, 0.026, 0.107 and 0.038 for NLB, NLW, LWB and LWW, respectively. Hanford *et al.* (2005) found that heritability estimates from single-trait analyses were 0.09 for litter size at birth and 0.06 at weaning.

In addition, the range of heritability estimates reviewed by Fogarty (1995) gave a range of <0 to .34 with a weighted mean of .10 (53 estimates) for litter size and <0 to 0.54, with a weighted mean of 0.08±0.08 for lambs born per ewe joined. He also added that REML estimates of heritability from an animal model were lower, but might be regarded as more reliable than earlier estimates for these traits. Visscher and Thompson (1992) stated that the use of an animal model to obtain genetic parameters combines information from paternal half-sib, maternal half-sib and dam-offspring effects.

Although the first lambing traits in the present study had low to moderate heritability estimates, the higher coefficient of variations indicates the possibility of genetic improvement in litter size of Rahmani sheep.

With regarding to heritability estimates for lifetime production traits over six lambing opportunities, the estimates obtained in the current study were 0.11±0.06, 0.08±0.06, 0.13±0.07 and 0.10±0.08 for TNLB, TNLW, TLWB and TLWW, respectively (Table 2). The h^2 estimates for lifetime production traits were higher than those obtained in the first lambing traits (Table 2) and fall within the range of those reported in literature. The obtained results in the current study were in accordance with the report of Othman (1991) who found that heritability estimates of TNLB, TNLW and TLWW were 0.013, 0.031 and 0.142, respectively for Ossimi ewes and the corresponding estimates for Rahmani ewes were 0.113, 0.154 and 0.142, respectively. Snyman *et al.* (1997) reported that heritability estimates for TLWW (over three to four lambing opportunities) were 0.06, 0.22 and 0.17 for Hyfer, Merino and Afrino sheep, respectively. The h^2 of TNLB, TNLW and TLWW of Merino sheep were reported to be 0.23, 0.17 and 0.19, respectively (Olivier *et al.*, 2001). Duguma *et al.* (2002) found that lifetime lamb production over the four parities of Merino for TNLB, TNLW and TLWW traits were 0.23, 0.17 and 0.20, respectively. The estimates obtained in the present study were lower than those reported by Cloete and Heydenrych (1987). They recorded estimates ranging from 0.29 to 0.36 for total number of lambs born and weaned per ewe conceived over four lambings opportunities for the Tygerhoek Merino flock using half-sib analysis.

The obtained low to moderate heritability estimates especially lifetime production traits (ranged from 0.08±0.06 to 0.13±0.07) and high coefficient of variations (ranged from 59.9 to 64.0%) for different traits studied in the present study, indicating potential for genetic improvement of lifetime traits of Rahmani sheep.

Table 2: Heritability estimates ± SE (on diagonal), genetic ± SE (above diagonal) and phenotypic (below diagonal) correlations among the first lambing and lifetime production traits of Rahmani ewes.

Trait	NLB	NLW	LWB	LWW	TNLB	TNLW	TLWB	TLWW
NLB	0.13±0.06	0.81±0.09	0.87±0.08	0.78±0.10	0.28±0.11	0.25±0.13	0.18±0.11	0.20±0.12
NLW	0.60	0.08±0.06	0.69±0.11	0.95±0.08	0.31±0.12	0.42±0.09	0.12±0.10	0.36±0.14
LWB	0.69	0.45	0.15±0.09	0.63±0.09	0.27±0.13	0.21±0.11	0.29±0.11	0.32±0.12
LWW	0.45	0.90	0.43	0.09±0.06	0.20±0.09	0.42±0.10	0.26±0.12	0.45±0.13
TNLB	0.15	0.12	0.14	0.12	0.11±0.06	0.98±0.09	0.97±0.09	0.96±0.10
TNLW	0.13	0.26	0.14	0.27	0.95	0.08±0.06	0.95±0.12	0.99±0.09
TLWB	0.09	0.09	0.18	0.12	0.96	0.93	0.13±0.07	0.96±0.12
TLWW	0.09	0.23	0.13	0.29	0.93	0.98	0.92	0.10±0.08

Comparing the heritability estimates of the traits studied with those reported in the literatures, it could be noticed that the estimates varied widely for the same traits. This variation might be due to the different methods for estimation of lifetime production traits, number of observation used, as well as method of statistical analysis, breed and genetic structure of the herd.

Genetic and phenotypic correlations

The genetic and phenotypic correlations among the first lambing and lifetime production traits of Rahmani ewes obtained in the current study were positive (Table 2). The genetic correlation among the first lambing traits ranged between 0.63 and 0.95, while it ranged between 0.95 and 0.99 among lifetime production traits, but the genetic between different first lambing and different lifetime production traits ranged from 0.12 and 0.45.

Regarding the genetic correlations among the first lambing traits, the estimate of genetic correlation between NLB and NLW in the current study showed large and positive value (0.81). This estimate was in good agreement with that (0.77) reported by Hanford *et al.* (2003), (0.84) by Hanford *et al.* (2002), and (0.76) by Hanford *et al.* (2005), and it was within the range of estimates (0.29–1.00) reviewed by Safari and Fogarty (2003). But the current estimate was less than the weighted average of 0.91 from the review of Fogarty (1995).

The estimate of genetic correlation value(0.45) between litter size at birth (NLB) and litter weight at weaning (LWW) was positive and moderate in the present study and within the range from 0.42 to 0.65 for Columbia, Polypay, Rambouillet and Targhee sheep as reported by Bromley *et al.* (2001) and similar to the average of estimates reported by Fogarty (1995). The present results suggest that selection to increase either litter weight weaned or litter size at birth would result in a moderate (combined trait) positive response for the other trait (as a total). In the contrary to these results, Ligda *et al.* (2000) found a high negative genetic correlation between litter size and mean litter weight at weaning (-0.77). They explained their results by the lower weights of lambs at weaning which born in large litters.

With respect to genetic correlation among lifetime production traits, the obtained genetic correlation between TNLW and TLWW was 0.99 (Table 2). The present estimate was in accordance with that of 1.219 for Ossimi and 0.939 for Rahmani sheep reported by Othman (1991). Olivier *et al.* (2001) estimated similar values (0.97 and 0.98) for the Grootfontein and the Carnarvon Merino flocks. Duguma et al. (2002) found that the estimated genetic correlation between TNLW and TLWW was very high and positive. However, the present estimate was slightly higher than that (0.84) reported by Snyman *et al.* (1998) for Afrinos sheep.

Regarding the genetic correlations between the first lambing and lifetime production traits, the highest value (0.45) obtained between NLW (in first lambing) and TLWW (over six lambing). The obtained results were lower than those reported for the Carnarvon Merino flock, Grootfontein Merino and Carnarvon Afrino flocks (Snyman *et al.*, 1997). A high genetic correlation (The unity genetic correlation or nearly) between LWW and TLWW were recorded by Snyman *et al.* (1997) and Duguma *et al.* (2002) over different lambing opportunities. The present result indicated that total kilograms weaned weight of lambs per ewe at the first lambing had highly significant effect on total kilograms weaned weight of lambs per ewe over six lambing (lifetime). Thus, significant improvement by selection can be achieved in this flock.

Estimated breeding values (EBV)

Estimates of all animals and sires breeding values, standard deviations (S.D) and range of estimated breeding values (EBVs) for different traits studied are presented in Table (3). Ranges of the breeding values of the first lambing of EBV for all animals were 0.40, 0.22 lambs, 1.01 and 2.82 kg for NLB, NLW, LWB and LWW, respectively, while the corresponding values for sire were 0.34, 0.22 lambs, 0.78 and 2.58 kg, respectively. The wider range of animals and sires breeding values indicated that there are high genetic variations among animals or sires, which could be possible to genetically improve the first lambing traits, specially litter size and weight at birth which had relatively higher heritability estimates.

Hanford *et al.* (2005) reported that breeding value estimates for litter size at birth and at weaning increased about 0.4 lambs in their study period (49 years), and they added that the average estimates of breeding value from the seven-trait analysis was 0.2 lambs greater than from the single-trait analysis. Similar results reported by Hanford *et al.* (2002) and Hanford *et al.* (2003) for the Targhee sheep.

The obtained results of EBV were lower than those obtained by Olivier *et al.* (2001) since they reported that the breeding value of best sire and worst sire for litter size at birth were 0.4349 and -0.3206, respectively for Grootfontein Merino, but the corresponding values were 0.5834 and -0.4266 lambs, respectively for Carnarvon Merino. Whereas, the breeding value of best sire and worst sire for litter size at weaning were 0.2606 and -0.2606, respectively for Grootfontein Merino, but the corresponding values were 0.6007 and -0.4049 lambs, respectively for Carnarvon Merino. Analla *et al.* (1997) concluded that the highest gain (0.261) in breeding values for litter size expressed in lamb per ewe per lambing when litter size used as a selection criterion, followed by the value obtained with the selection index (0.19). They added that if breeders need to improve litter size alone, the best method is selecting directly on its predicted breeding values.

Table 3: Standard deviations (S.D.) and range of estimated breeding values (EBV) for the first lambing and lifetime production traits cf Rahmani sheep.

Trait	All animals				Sires only			
	SD	Min	Max	Range	SD	Min	Max	Range
NLB	0.05	-0.13	0.27	0.40	0.06	-0.13	0.21	0.34
NLW	0.22	-0.08	0.14	0.22	0.03	-0.08	0.14	0.22
LWB	0.13	-0.47	0.54	1.01	0.16	-0.38	0.40	0.78
LWW	0.33	-1.17	1.65	2.82	0.43	-1.15	1.43	2.58
TNLB	0.09	-0.43	0.34	0.77	0.12	-0.43	0.32	0.75
TNLW	0.20	-0.76	0.71	1.47	0.27	-0.76	0.68	1.44
TLWB	0.31	-1.32	1.03	2.35	0.42	-1.32	1.00	2.32
TLWW	3.36	-12.51	13.00	25.51	4.28	-12.51	9.01	21.52

Table 4: Rank correlation coefficients between estimated breeding values (EBV) of sires (above diagonal) and all animals (below diagonal) for the first lambing and lifetime production traits of Rahmani sheep.

Trait	NLB	NLW	LWB	LWW	TNLB	TNLW	TLWB	TLWW
NLB		0.82	0.49	0.62	0.23	0.25	0.19	0.23
NLW	0.81		0.39	0.67	0.18	0.27	0.14	0.26
LWB	0.57	0.47		0.63	0.22	0.28	0.27	0.27
LWW	0.58	0.64	0.60		0.12	0.21	0.12	0.25
TNLB	0.21	0.20	0.14	0.11		0.91	0.94	0.86
TNLW	0.21	0.23	0.17	0.16	0.91		0.90	0.98
TLWB	0.18	0.17	0.19	0.12	0.96	0.89		0.87
TLWW	0.18	0.22	0.17	0.21	0.87	0.97	0.88	

Regarding the breeding values of lifetime production traits, the present results showed that the ranges of EBV of TNLB, TNLW, TLWB and TLWW were 0.77, 1.47 lambs, 2.35 and 25.51 kg, respectively for all animals, but the corresponding values were 0.75, 1.44 lambs, 2.32, and 21.52 kg, respectively for sires only (Table 3). The standard deviation for EBV for lifetime production traits reflected wider variations in EBV, which could lead to good opportunity for genetic improvement if sires also selected on EBV of lifetime production traits.

Spearman rank correlations among the first lambing traits were ranged between 0.39 and 0.82 for all animals and from 0.47 and 0.81 for EBV of sires (Table 4). Higher rank correlations among different lifetime production traits (from 0.86 and 0.98 for all animals and from 0.87 and 0.96 for sires only) were recorded in the present study. High rank correlations estimated in the current study could be expected due to the fact that these traits studied forms in the calculation of the others and the genetic correlations among the two studied groups traits were high and positive as well.

With respect to the rank correlations between the first lambing traits in one hand and lifetime production traits in the other, the higher rank correlation observed between LWB in the first lambing and most of lifetime production traits. Thus it is important to conclude, for actual use in the practical field, that direct selection for litter weight at birth may be more appropriate than direct selection for litter size and in the same time selection for LWB will result in indirect selection for lifetime production traits

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المعالم الوراثية باستخدام نموذج الحيوان لصفات الموسم الأول والإنتاج الحياة لأغنام الرحمانى

حسنى حسين فراج[١] ، ناظم عبد الرحمن شلبي[١] ، حلمى رشاد مطاوع[٢]

إنتاج الحيوان- كلية الزراعة-جامعة المنصورة- رقم بريدي ٣٥٥١٦ المنصورة – مصر

بحوث الأغنام والماعز- معهد بحوث الإنتاج الحيواني وزارة الزراعة-مصر

استخدمت فى هذه الدراسة ١٩٦٨ سجل لعدد ٧٠٦ نعجة رحماني، جمعت من محطة السرو التابعة لمعهد بحوث الإنتاج الحيواني، خلال الفترة من ١٩٩١ إلى ٢٠٠١. قدرت المعالم الوراثية التربوية لصفات الموسم الأول وكذلك صفات الإنتاجية خلال الحياة.

كانت الصفات المدروسة فى الموسم الأول هى عدد الحملان المولودة والمفطومة لكل نعجة والدة، وزن الحملان المولودة والمفطومة لكل نعجة والدة. بينما كانت صفات الإنتاجية خلال الحياة هى عدد المولودة والمفطومة لكل نعجة والدة، وكذلك وزن الحملان المولودة والمفطومة لكل نعجة والدة ستة مواسم. حللت الصفات المدروسة باستخدام تحليلات الصفة فرديا بنموذج الحيوان. العامة لعدد الحملان المولودة وعدد الحملان المفطومة ووزن الخلفة المولودة ووزن الخلفة فى الموسم الأول هى ١,١٣، ١,٠٩ حمل، ٣,٣٥ و١٦,١٧ كجم، على التوالي. بينما كانت القيم الستة مواسم هى ٣,٣٨، ٣,٠٨ حمل، ١٠,٥٩ ٤٦,٧٢ كجم، على التوالي. بلغت قيم المكافئ ٠,١٣ ±٠,٠٦، ٠,٠٨ ±٠,٠٦، ٠,١٥ ±٠,٠٩ و٠,٠٩ ±٠,٠٦، لعدد الحملان المولودة وعدد ووزن الخلفة المولودة ووزن الخلفة المفطومة فى الموسم الأول، على التوالي. بينما كانت الوراثى ٠,١١ ±٠,٠٦، ٠,٠٨ ±٠,٠٦، ٠,١٣ ±٠,٠٧ و٠,١٠ ±٠,٠٨ لعدد الحملان المولودة المفطومة ووزن الخلفة المولودة ووزن الخلفة المفطومة فى الستة مواسم.

تراوحت قيم الارتباط الوراثي بين الصفات الموسم الأول بين ٠,٦٣ و٠,٩٥، بينما تراوحت بين ٠,٩٩ بين الصفات الإنتاجية خلال الحياة. أما الارتباط الوراثي بين صفات الموسم الأول وصفات فقد تراوحت من ٠,١٢ الى ٠,٤٥ وقد بلغ مدى القيم التربوية لصفات أول موسم لكل ٠,٤٠، ٠,٢٢ حملا، ١,٠١ ٢,٨٢ كجم لعدد الحملان المولودة وعدد الحملان المفطومة ووزن ووزن الخلفة المفطومة فى الموسم الأول، بينما كانت القيم المقابلة للآباء فقط هى ٠,٣٤، ٠,٧٨ ٢,٥٨ كجم لنفس الصفات على التوالي. بلغ معامل ارتباط الرتب بين صفات الموسم ٠,٣٩ و ٠,٨٢ لكل الحيوانات ومن ٠,٤٧الى ٠,٨١ للآباء فقط. وكانت معاملات الارتباط عالى الإنتاجية المدروسة خلال الحياة أيضا.

النتائج فى هذه الدراسة إلى الانخفاض النسبى لقيم المكافئ الوراثى لصفات الموسم الأول الإنتاجية خلال الحياة، مع ارتفاع قيم معاملات الاختلاف والمدى الواسع للقيم التربوية كان لكل الحيوانات أو للآباء فقط، خصوصا صفات الإنتاج خلال الحياة، مما يشير إلى الوراثي للصفات الإنتاجية خلال الحياة لنعاج الرحمانى.