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FACTORS AFFECTING BIRTH AND WEANING WEIGHTS OF NATIVE FARAFRA LAMBS IN UPPER EGYPT

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ABSTRACT

A total of 3151 birth weight (BW) and weaning weights (WW) of Egyptian Farafra lambs was used to investigate the possibility of incorporating these traits in a selection program. Data was collected during the period 1995-2009 for animals raised in Mallawi Animal Production Research Station, (latitude 28º 07 and longitude 30º 33 E), of the Animal Production Research Institute (APRI). Al-Menya Governorate, north of Upper Egypt.

Fixed effects were year of birth, season of birth, age of dam at lambing, type of birth and sex of the Lamb. The heritability (h^2), additive maternal effect (m^2), genetic (r_g) and phenotypic (r_p) correlations and permanent environmental effect (c^2) were estimated using the Multiple Trait Derivative Free Restricted Maximum Likelihood program (MTDFREML) (**Boldman *et al*. (1995**)). The results showed that all the fixed effects contributed significantly (P<0.01) to the variation of the studied traits. Direct genetic heritability of BW and WW were 0.25±0.02 and 0.21±0.03, respectively. The corresponding additive maternal effect (m^2) estimates were 0.40±0.01 and 0.19±0.01, respectively. Phenotypic and genetic correlations between BW and WW were 0.52±0.01 and 0.37±0.03, respectively. Maternal genetic correlation estimate between BW and WW was 0.16± 0.05 while, the estimate of permanent environmental effect (c^2) for BW and WW, as a proportion of total phenotypic variance, was 0.38±0.02 and 0.20±0.04, respectively. Improvement of birth and weaning weights of Farafra sheep seems feasible with selection programs, as some of the related traits are moderately heritable and those traits specially are well correlated, which could suggest that these traits are useful in selection programs.

Keys words: *Farafra lambs, Genetic and non-genetic factors, heritability, correlation, maternal and permanent environmental effect.*

INTRODUCTION

Birth weight of lambs has an important role in a good sheep production **(Petrovic *et al*., 2011)**. Information on factors influencing birth weight is of interest to farmers as well as the animal breeders, because birth weight is of great economic importance and knowing factors influencing early weight gain may be of value in better planning for herd management **(Bermejo *et al*., 2010**). Birth weight has received limited consideration in sheep breeding programs, but is a trait of potential economic importance through its effects on pre-weaning growth and hence, increases the economic success of producing slaughter animals (**Al-Shorepy, 2001).** Birth and weaning weights for lambs could be considered as selection criteria. Accurate estimates of genetic parameters for these traits are essential for selection to be effective. It is very important to estimate the genetic parameters for lamb birth and weaning weights and the correlations among these traits as they needed to design a selection programs for Farafra sheep. The genotype of the dam affects phenotype of the young through a sample half of her direct additive genes for growth as well as her genotype for maternal effects **(Prakash *et al*., 2012)**.

Several studies have shown that growth traits of sheep are affected not only by the animals' genetic potential for growth but also by maternal effects including maternal genetic and permanent environmental effects. Principles of Multiple Trait-Derivative Free Restricted Maximum Likelihood (MTDFREML) have been described by **Smith and Grases (or Graser- check with the reference) (1986)** and **Meyer (1998)** and reviewed by **Boldman and Van Vleck (1991)**.

The aim of this work was to study the effect of environmental effects (year and season of lambing, age of ewe at lambing, type of birth, sex of lamb) as well as to estimate genetic parameters (heritability, variance and co-variance due to direct and maternal genetic effects and permanent environmental effects) on birth and weaning weights of Farafra lambs bred in Mallawi experimental station belonging to the APRI, Al-Menya Governorate, Upper Egypt.

MATERIALS AND METHODS

Data

Data, from 1995 to 2009, was collected in Mallawi experimental station (Al-Menya Governorate, Upper Egypt) of the Animal Production Research Institute (APRI), Ministry of Agriculture and Land Reclamation, on Farafra sheep breed. A total number of 3151 Farafra lambs' records, progeny of 106 sires and 1072 dams, were available for this study. Farafra sheep is a native fat-tailed breed that dominates in El-Farafra Oasis of the Egyptian western desert. It has been introduced to Mallawi Animal Production Research Station since 1992 and kept under intensive management system (**Ali *et al*., 2009**). A description of the data used in the analysis is presented in Table 1.

Table1. Description of the data set.

Item	Trait	
	BW	WW
Number of records	3131	2714
Number of sires	106	106
Number of dams	1072	728
Mean(kg)	3.58	11.93
Minimum(kg)	1.7	3.58
Maximum(kg)	5.6	24.2
Standard Deviation	0.68	2.82
Standard Error	0.01	0.05
Coefficient of variability	15.79	20.61
R^2	0.32	0.24

Management

The sheep flock was managed under an accelerated lambing system with 3 mating seasons per year (January, May, and September). The average atmospheric temperature and humidity in the three breeding seasons were 23.3±0.5 ◦C and 53.0±1.2% in fall; 13.8±0.7 ◦C and 67.0±1.2% in winter; and 35.2±0.5 ◦C and 50.0±1.8% in late spring, respectively.

An accelerated lambing system of a crop every eight months was practiced. Mating seasons were January, May and September therefore, lambing seasons were June, October and February, respectively. Ewes joined mating for the first time when they reached 31 kg weight. Ewes were randomly divided into mating groups of 20 to 25 ewes. Each group was exposed to a fertile ram about 18 months age in a separate mating pen for a period of 35 to 45 days.

Late pregnant ewes were kept in lambing pens for better care up to lambing and lambs were kept together with their dams in individual boxes and were weighed and ear tagged within 24 to 48 hours from birth. Information on birth weight, sex, type of birth, date of birth, dam weight, and their pedigree were recorded. Lambs were kept with their dams in nursery facility all the time up to weaning (at eight weeks age). Lambs were weighed monthly until 18 months age.

In the morning, lambs were fed wheat straw or rice stubbles ad libitum, in addition to a concentrate mixture consisting of 24% yellow corn, 38% cotton-seed meal, 34% wheat bran, 3% molasses and 1% salt, which is provided gradually by increasing quantities to reach ad libitum at weaning. During November to May, lambs grazed on Egyptian clover pasture (Trifolium

Alexandrinum). In the rest of the year, animals grazed on crop stubbles and green fodder, if available. Additionally, clover hay and silage is offered. Mineral mixture blocks were freely available all the day. Extra supplementary concentrate feeding of 250 g per head per day was offered one week before and one week after the beginning of mating season for flushing the ewes and also during the last two to four weeks of pregnancy and through the first four weeks of lactation. Sheep were allowed to drink fresh water twice or triple daily. Animals were sheared twice a year in March and August.

Data Analysis:
Studied traits

1. (BW): Birth weight (Kg) of lamb born.
2. (WW): Weaning weight (Kg) of lamb weaned at eight weeks age.

Statistical analysis
Estimation of non-genetic parameters

A linear model was used to identify fixed effects on variation of birth and weaning weights of lambs. The following fixed model was performed using SAS program (2004) to test the significance of studied fixed effect: year of birth (Yr) (every year including three successive lambing seasons), season of birth (Sn) (February, June or October), age of dam at lambing (Lage) was classified into five classes 10 – 22, 23 – 31, 32 – 43, 44 – 64 and 65 – 153 months, type of birth (Tb) (single, twin or triple) and sex (male or female).

Data was analyzed by the GLM and least square means procedures of SAS (SAS, 2004: Version 9).SAS Institute Inc, Cary, NC, USA, according to the following model:

$$\mathbf{y_{ijklmn} = \mu + Y_i + S_j + A_k + N_l + X_m + e_{ijklmn}}$$

Where:

y = observed records on the traits;

μ = overall mean;

Y_i = Effect of year of birth: 15 levels corresponding to years from 1995 to 2009;

S_j = Effect of season of birth: 3 levels (February, June or October);

A_k = Effect of age of ewe at lambing: 5 level (10-22, 23-31, 32-43, 44-64, 65-135 months);

N_l = Effect of type of birth for lamb: 3 levels (single, twin or triple);

X_m = Effect of sex of lamb: 2 levels (male or female) and

e_{ijklmn} = Residual random error.

Estimation of genetic parameters

Estimates of variance components and genetic parameters were calculated using the Multiple Trait-Derivative Free Restricted Maximum Likelihood program **(MTDFREML; Boldman *et al.*, 1993**), a set of programs employing the simplest procedure to locate the maximum of the log likelihood (-2loglik-) for each parameter.

Principles of multi-traits derivative-free restricted maximum likelihood (MTDFREML) have been described by **Smith and Grases (1986)** and **Meyer (1998)** and reviewed by **Boldman *et al*. (1991)**. The convergence criteria used in this analysis was variance of the -2log likelihood in the current simplex used in the derivative free - REML algorithm **(Boldman *et al*., 1995)**. This approach should insure that global, rather than local, maximum likelihood estimate is obtained. All estimates were based on several runs until -2log likelihood does not change to 2 decimal points.

Random effects in this study were additive genetic effect, maternal genetic effect, permanent environmental effect and temporary environmental effect (error) for each trait with the corresponding co-variances matrix between them.

The general representation of the mixed animal model used was:

$$\mathbf{y} = \boldsymbol{X\beta + Z_a a + Z_m m + Z_c c + e}$$

Where

X = incidence matrix for fixed effects;

β = vector of fixed effects;

Z = incidence matrix of random effects;

a, m and c = vector of random effect (animal genetic, maternal genetic, permanent environmental effect and

e = residual effects normally and independently distributed (0, σ^2e)

$$\begin{bmatrix} a_1 \\ a_2 \\ m_1 \\ m_2 \\ c_1 \\ c_2 \\ e_1 \\ e_2 \end{bmatrix} = \begin{bmatrix} A\sigma^2 a_1 & \sigma a_1 a_2 & & & & & & \\ \sigma a_2 a_1 & A\sigma^2 a_2 & & & & & & \\ & & In_1\sigma^2 m_1 & \sigma m_1 m_2 & & & & \\ & & \sigma m_2 m_1 & In_2\sigma^2 m_2 & & & & \\ & & & & In_1\sigma^2 c_1 & \sigma c_1 c_2 & & \\ & & & & \sigma c_2 c_1 & In_1\sigma^2 c_2 & & \\ & & & & & & In_1\sigma^2 e_1 & \sigma e_1 e_2 \\ & & & & & & \sigma e_2 e_1 & In_1\sigma^2 e_2 \end{bmatrix}$$

The variance and co-variance structure for model is as follows:

A	Is the numerator relationship matrix
$In_{1,2}$	Is an identity matrix of order equal to the records of traits 1 and 2
$\sigma^2 a_{1,2}$	Is the direct genetic variance for traits 1 and 2
$\sigma a_1 a_2$	The covariance between direct genetic variance effect for traits 1 and 2
$\sigma^2 m_{1,2}$	Is the maternal genetic variance for traits 1 and 2
$\sigma m_1 m_2$	The covariance between maternal effect for traits 1 and 2
$\sigma^2 c_{1,2}$	Is the permanent environmental variance for traits 1 and 2
$\sigma c_1 c_2$	The covariance between permanent environmental effect for traits 1 and 2
$\sigma e_1 e_2$	The covariance between residual effect for traits 1 and 2

RESULTS AND DISCUSSION

Non genetic factors affecting birth and weaning weight

The influence of year of birth, season of birth, age of dam at lambing, birth type and sex of lamb in this study are presented in Table 2.

The analysis of variance show that all effects had high significant (P<0.001) influence on lamb birth and weaning weights.

The least square mean (±S.E) of lamb body weights at birth and weaning for different levels of non-genetic factors are shown in Table 3.

The differences in birth and weaning weights due to year of birth were significant and ranged from 2.8 to 3.24 kg (the largest is 3.60 kg in 2005) and from 8.71 to 11.78 kg (the largest is 12.31 kg in 2008) for birth and weaning weights, respectively. Similar findings were reported by **Abbasi *et al*. (2012); Petrovic *et al*. (2011); Roshanfekr *et al*. (2011),** in Iranian Baluchi sheep, Svrljig breed and Arabi lambs, respectively.

Least-square means of BW and WW were the smallest at 1995 (2.80±0.14 and 8.71±0.1 kg), respectively. Least-square means for BW was the highest at 2006 (3.53±0.04 kg), while in 2005 (3.53±0.04 kg), but for WW the highest was at 2008 (12.31±0.23 kg). The high variation in values of weights among birth years may result from the changes in management, climate and sample size.

Season of birth affected birth and weaning weights. Lambs born in February to May had the largest BW and WW (3.24±0.03 and 11.12±0.17 kg), respectively, and those born in October to December had the smallest BW and WW (3.10±0.03 and 10.77±0.18 kg), respectively. The season effect may partially be explained by climatic conditions. Usually, winter-born lambs grow in spring and have access to better quality of grass than those born in other seasons. Important influence of season on BW and WW of lambs has been reported for Farafra lambs and Nordus lambs, respectively **(Ali *et al*., 2009 and Yilmaz *et al*., 2007)**.

Results suggested that lambing year and season affect lamb birth and weaning weights of Farafra sheep, which can be largely attributed to the different forage availability, photoperiod (**Misztal**

Table 2. Analysis of variance for birth and weaning weights in Farafra lambs.

S.O.V.[1]	BW				WW			
	D.F.	**M.S.**	***F* value**	***P***	**D.F.**	**M.S.**	***F* value**	***P***
Yr	14	9.90	30.99	0.0001	14	120.94	19.98	0.0001
Sn	2	1.69	5.28	0.0051	2	32.85	5.43	0.0044
Lage	4	10.34	32.38	0.0001	4	80.73	13.34	0.0001
Tb	2	125.42	392.61	0.0001	2	1239.25	204.71	0.0001
Sex	1	28.17	88.17	0.0001	1	471.25	77.85	0.0001
Residual	3107				2690			
R-Square	0.32				0.24			
C.V[2]	15.79				20.61			

[1]Yr: year of birth, Sn: season of birth, Lage: age of ewe at lambing, Tb: type of birth of lamb, Sex: sex of lamb.
[2]Coefficient variability.

***et al*., 2004)** in sheep, hormones (**Zamiri and Khodaei, 2005)** in Iranian fat-tailed rams, and other environmental effects such as temperature and social relationships (**Markley *et al*., 2006)** in goats.

The least square means of birth and weaning weight for lambs increased with age of dam, and the highest means occurred at 44 to 64 months of dam age (3.36±0.03), thereafter, declined. Similar results were obtained by **Abbasi *et al*. (2012); Petrovic *et al*. (2011)** and **Roshanfekr *et al*. (2011)** in Iranian Balichi sheep, Svrljig breed and Arabi lambs, respectively. Due to ewes' body development, enhancement of milk quality and quantity and improvement in maternal ability of the ewes with age, it is expected that litters born in the first parity would have significantly lower weight than those of later parities. For 65-153 months old ewes, tooth decay results in grazing problems followed by milk production and maternal care for lambs. For this reason, lambs from old ewes are lighter than 44-64 months old ewes.

The BW and WW decline with the increase of litter size. Singles had higher values for birth and weaning weights than those of twins. Singles means were (3.69±0.01), twins' means were (3.09±0.02) and triples means were (2.83±0.09).This is in agreement with results of **Abbasi *et al*., 2012; Roshanfekr *et al*., 2011** and **Petrovic *et al*., 2011** in Iranian Baluchi sheep, Arabi lambs and indigenous Serbian breeds of sheep, respectively.

The growth advantage of single born might result from its lower competition to milking and supply from the ewe in gestation period than the multiplex. (At weaning, the difference in weight between single and twin lambs could be attributed to that singles were more capable of suckling their mothers than twins. Lower body weight of twin lambs at weaning may be due to low birth weights and the competition between twins for the limited quantity of milk available in their dam).

Males were heavier than female lambs (3.30±0.03 against 3.11±0.03 and 11.41±0.17 against 10.58±0.17 kg in both birth and weaning weight, respectively). The higher weight of male than female lambs has been described by **Abbasi *et al*. (2012); Petrovic *et al*. (2011); Roshanfekr *et al*. (2011) and Mousa *et al*. (2010)** in Iranian Baluchi sheep, indigenous Serbian breeds of sheep and Farafra lambs, respectively. This is mainly due to the physiological differences between the two genders reported in many studies **(Mousa *et al*., 2010)**. Males are always heavier and grew faster than females.

Genetic factors affecting birth and weaning weights

Heritabilities, variance components and correlations for birth and weaning weights are presented in Table 4.

Direct heritability (h^2a) estimates for body weights in various sheep breeds ranged from 0.04 to 0.39 at birth and from 0.09 to 0.39 at weaning (**Al-Shorepy, 2001**). Direct estimates of heritability for BW in the current study was similar to the published estimate by Matika *et al*. (2003) for Turkish Merino sheep (0.25), and higher than those obtained by **Parkash *et al*. (2012); Rashidi *et al*. (2008); Abbasi *et al*., (2012)** which were 0.21 for Malpura sheep, 0.04 in Kermani sheep and 0.12 for Iranian Baluchi sheep, respectively and lower than those reported by **El-Awady *et al*. (2011); Miraei-Ashtiani *et al*. (2007)** which were 0.40 for Rahmani lambs and 0.33 for Sangsari sheep, respectively.

Direct heritability estimate for WW was 0.21 in the current study. This estimate is similar to that reported by **Parkash *et al*. (2012)** which was 0.24 for Malpura sheep of India, and higher than those obtained by **Abbasi *et al*. (2012); Miraei *et al*. (2007); Matika *et al*., (2003)** which was 0.10 for Iranian Baluchi sheep, 0.17 in Sangsari sheep and 0.11 for Sabi sheep, respectively.

Table 3: Least square means (±S.E) for BW and WW of Farafra lamb in various years of birth and seasons, age of ewe at lambing, type of birth and sex of lamb (means with different superscript are different at *P*<0.05)

Item	Trait	
	BW	WW
Year of birth:		
1995	2.80±0.14	08.71±0.10
1996	3.01±0.07	10.97±0.36
1997	3.06±0.05	11.61±0.25
1998	3.15±0.05	11.37±0.25
1999	3.12±0.05	09.99±0.22
2000	3.16±0.04	11.33±0.22
2001	2.85±0.04	10.65±0.21
2002	3.20±0.04	10.57±0.20
2003	3.44±0.04	09.81±0.21
2004	3.46±0.04	11.47±0.20
2005	3.60±0.04	10.28±0.20
2006	3.53±0.04	12.18±0.22
2007	3.21±0.04	11.90±0.24
2008	3.21±0.04	12.31±0.23
2009	3.24±0.08	11.78±0.44
Season of birth (classes):		
1 (1 , 2 , 3 and 4)	3.24±0.03	11.12±0.17^{a}
2 (5 , 6 , 7 and 8)	3.20±0.03	11.09±0.18^{b}
3 (9,10,11and12)	3.10±0.03	10.77±0.18^{b}
Age of ewe at lambing:		
1 (10-22 months)	2.98±0.04	10.22±0.24^{a}
2 (23-31 months)	3.11±0.04^{b}	10.76±0.20^{b}
3 (32-43 months)	3.25±0.03^{a}	11.26±0.19^{b}
4 (44-64 months)	3.36±0.03^{a}	11.47±0.18^{c}
5 (65-135 months)	3.32±0.03^{a}	11.25±0.17^{c}
Type of birth:		
1 (single)	3.69±0.01^{a}	12.46±0.09^{a}
2 (twins)	3.09±0.02^{b}	10.37±0.11^{b}
3 (triplets)	2.83±0.09^{b}	10.15±0.44^{c}
Sex:		
Male	3.30±0.03^{a}	11.41±0.17^{a}
Female	3.11±0.03^{b}	10.58±0.17^{b}

Table 4. Estimation of genetic parameters from multi trait analysis of variance components, heritability for birth weight (BW) and weaning weight (WW), phenotypic and genetic correlations between birth and weaning weight in Farafra lambs (±SE).

Item[1]	BW	WW
$\sigma^2 a$	0.23	1.90
$\sigma^2 m$	0.36	1.75
$\sigma^2 c$	0.35	1.85
σ_{am}	-0.04	-2.90
$\sigma^2 p$	0.9	9.00
σ_{a1a2}	0.15	0.15
r_{am}	-0.37	-0.48
$h^2 a$ ± (S.E)	0.25 ± (0.02)	0.21 ± (0.03)
$h^2 m$ ± (S.E)	0.40 ± (0.01)	0.19 ± (0.01)
c_2 ± (S.E)	0.38 ± (0.02)	0.20 ± (0.04)
σ_{p1p2}	1.8	
r_{p1p2} ± (S.E)	0.52 ± (0.01)	
r_{g1g2} ± (S.E)	0.37 ± (0.03)	
r_{m1m2} ± (S.E)	0.16 ± (0.05)	

[1] $\sigma^2 a$= direct additive genetic variance; $\sigma^2 m$= maternal additive genetic variance; $\sigma^2 c$= relative variance due to permanent maternal environmental effect; σ_{am}= additive and maternal genetic co-variance; $\sigma^2 p$= phenotypic variance; σ_{a1a2}= additive genetic co-variance between the two traits; $h^2 a$= heritability (direct effect); σ_{p1p2}= phenotypic co-variance between the two traits; r_{g1g2}= genetic correlation between the two traits; $h^2 m$= maternal heritability; r_{p1p2}= phenotypic correlation between the two traits; r_{m1m2}=maternal genetic correlation between the two traits and; c_2= variance due to permanent environmental effects of dam as proportion of ($\sigma^2 p$) and r_{am}= direct-maternal genetic correlation.

Direct heritability estimate for WW in the current study was lower than those reported by **El-Awady *et al*. (2011); Rashidi *et al*. (2008)** which was 0.42 in Rahmani sheep and 0.27 for Kermani sheep, respectively.

The direct heritability for BW was estimated nearly half the maternal heritability but the maternal effect (m^2) for WW is explaining a large proportion of the direct heritability, indicating the importance of the maternal additive genetic effects on the traits of concern. **El-Awady *et al*. (2011)** reported that the maternal heritabilities as 0.47 and 0.17 for birth weight and weaning weight, respectively.

In this study, the permanent environmental effect ($\sigma^2 c$) was more important for both BW and WW traits and the additive maternal effect, correspondingly, reduced from birth to weaning, but they still relatively important. However, the maternal permanent environmental effect was very essential in BW and WW.

The decrease in the estimates of direct and maternal heritabilities by age at weighing in the current study was in agreement with **El-Awady *et al*. (2011).**

The relatively low additive genetic ($\sigma^2 a$) and high residual ($\sigma^2 e$) variances in BW and WW could be explained by the harsh environmental conditions of the range coincided with these ages.

Variance due to permanent environmental effects ($\sigma^2 c$), coded as an effect of the dam (possibly due to uterine capacity, feeding level at late gestation, and maternal behavior of the ewe), was 0.35 of the total variance for BW and 1.85 for WW, respectively. A possible interpretation of differences on ($\sigma^2 c$), between BW and WW could be that suckling lambs are still dependent on mothers, whereas weaned lambs depend more on themselves; furthermore, the influence of the non-permanent environmental factors becomes more important after weaning **(El-Awady *et al.*, 2011)**.

The covariances between direct and maternal genetic effects (σ_{am}) were negative, and not important for BW, but slightly more considerable for WW. **Miraei-Ashtiani *et al*. (2007)** reported a lower co-variances between genetic direct and maternal effects which was (-0.061) and (-0.062) for BW and WW, respectively.

The estimate of phenotypic correlation (r_{p1p2}) between BW and WW were positive (0.52) and generally higher than that of genetic correlation (0.37). The range of phenotypic correlation estimates for BW and WW in literature varied from 0.25 which was reported by **Jafaroghli *et al*. (2010**) to 0.49 which was reported by **Prakash *et al*. (2012)**.

The genetic correlation estimate between BW and WW was (0.37). In general, this result was lower than those reported by **Prakash *et al*. (2012); Roshanfekr *et al*. (2011); Rashidi et *al*. (2008)** which were (0.88) in Malpura sheep, (0.68) in Kermani sheep and (0.0.49) in Arabi lambs, respectively.

Correlation between direct and maternal genetic effects (r_{am}) was negative for both traits probably due to environmental and management circumstances. This is in agreement with the results of **Miraei-Ashtiani *et al*. (2007)** and **Zhang *et al*. (2009)**.

The maternal genetic correlation between BW and WW traits was 0.16 in this study. **El-Awady *et al*. (2011)** illustrated that (r_{m1m2}) was 0.37 for the same two traits.

The moderate estimate of heritability for BW and WW suggests that performance of Farafra sheep can be improved through selection for economic mutton production. These traits, therefore, can be used effectively as a selection criterion in multi-trait selection programs that will lead to an improved biological efficiency of a flock.

CONCLUSION

The results indicated that including the following fixed effects: season, age of dam, type of birth and sex are very important to birth and weaning weight modeling. Heritability estimates were moderate indicating an acceptable response to genetic selection for the studied traits.

Estimates of phenotypic and genetic correlation among birth and weaning weight in the current study were positive and moderate; indicating that selection for any of the two traits could result in genetic improvement in the other trait.

Improvement of body weight of Farafra sheep seems feasible in selection programs, as some of the related traits are moderately heritable and those traits specially are well correlated, which could suggest that these traits are useful in selection programs.

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FACTORS AFFECTING BIRTH AND WEANING WEIGHTS OF NATIVE FARAFRA LAMBS IN UPPER EGYPT

العوامل المؤثرة علي وزنى الميلاد و الفطام في حوالى الفرافرة

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هدفت هذه الدراسة الى تقييم العوامل البيئية و الوراثية المؤثرة علي وزني الميلاد و الفطام في حملان الفرافرة عن طريق استخدام٣١٥١ سجلاً من سجلات وزنى الميلاد و الفطام بين عامى ١٩٩٥ و ٢٠٠٩م. لأغنام سلالة الفرافرة المرباة في محطة بحوث ملوي(محافظة المنيا) التابعة لمعهد بحوث الانتاج الحيواني.

قدرت مكونات التباين و التباين المشترك بالتحليل المتعدد للصفات بطريقة التشابه العظمى المحددة لنموذج الحيوان واشتمل على عوامل ثابتة كسنة و موسم الولادة و عمر الأم عند الولادة و نوع ولادة الحمل و جنسه، أما العوامل العشوائية فاشتملت على التأثير الوراثي المباشر للحيوان و التأثير الوراثي الأمي و التأثير البيئي الدائم و كذلك التأثير المتبقي

أظهرت النتائج أن:

١. العوامل البيئية كلها (سنة الميلاد، موسم الميلاد، عمر النعجة عند الولادة، نوع ولادة الحمل و جنس الحمل) كان لها تأثير معنوي جدا على كلا من وزني الميلاد و الفطام .

٢. المكافئ الوراثي المباشر لصفتي وزن الميلاد و الفطام ٠,٢٥± ٠,٠٢ و ٠,٢١± ٠,٠٣ على الترتيب .

٣. المكافئ الوراثي الأمي كان٠,٤٠ ± ٠,٠١ و ٠,١٩± ٠,٠١ لصفتي وزن الميلاد و وزن الفطام على الترتيب.

٤. الارتباط المظهري و الوراثي بين الصفتين ٠,٥٢ ± ٠,٠١ و ٠,٣٧± ٠,٠٣ على الترتيب ، أما الارتباط الوراثي بين التأثير الوراثي و التأثير الأمي لصفة وزني الميلاد والفطام كان ٠,١٦ ± ٠,٠٥

٥. التأثير البيئي الدائم لصفتي وزن الميلاد و الفطام ٠,٣٨ ± ٠,٠٢ و ٠,٢٠ ± ٠,٠٤ على الترتيب.

أوضحت النتائج من هذه الدراسة امكانية تحسين صفات الوزن عند الميلاد والفطام فى أغنام الفرافرة و ذلك بالإنتخاب وأن مكافئهما الوراثي المتوسط وإرتباطهما ينبئان بفائدة إستخدام هاتين الصفتين في برامج الإنتخاب.