Communications

Genetic parameters for pre-weaning growth traits of Mehraban Iranian fat-tailed sheep

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BATHAEI (S.S.), LEROY (P.L.). Paramètres génétiques de la vitesse de croissance et du poids des agneaux avant sevrage dans la race Iranienne à queue grasse Mehraban. *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (2) : 235-238

Les auteurs ont utilisé les données provenant de 975 agneaux, nés pendant les saisons d'agnelage de 1984-1990 et issus de 18 béliers, en vue d'analyser les paramètres génétiques suivants : poids à la naissance, poids au sevrage, gain quotidien avant sevrage, poids corporel à 30, 60 et 90 jours. Ces paramètres génétiques ont été calculés à partir des corrélations entre les demi-frères paternels. L'héritabilité pour le poids à la naissance, le poids au sevrage, le gain quotidien avant sevrage et le poids corporel à 30 et 60 jours ont été respectivement de : 0,35, 0,44, 0,33, 0,36, 0,39. Les corrélations génétiques étaient le plus souvent élevées et toutes positives, particulièrement entre le poids au sevrage et le poids à 60 jours (0,77). La corrélation phénotypique correspondante était également positive et élevée (0,80). Aucun antagonisme génétique n'a été décelé parmi les caractères étudiés. La réponse à la sélection pondérale entre 60 et 90 jours devrait constituer un moyen efficace.

Mots clés : Ovin Mehraban - Agneau - Paramètre génétique - Croissance - Gain de poids - Héritabilité - Corrélation génétique - Iran.

Introduction

Among the most economically important characteristics of meat animals apart from conformation are body weight and rate of gain, particularly at the time when animals have the highest potential value for meat. Hence, a decision of notable economic importance to livestock breeds concerns the particular traits and phase of an animal's growth upon which to base selection for improving weight and rate of gain. The potential for genetic improvement of a trait is largely dependent upon its heritability and its genetic correlations with other traits. Its heritability could vary with the age of the animal. The phenotypic and genetic correlations among traits mays also vary. Therefore, it becomes important to estimate heritabilities and correlations at various ages of animals to be selected. No information regarding genetic and phenotypic parameters for body weight and pre- and post-weaning growth rate is available for the fat-tailed Mehraban sheep. Knowledge of these parameters is imperative since they are the prerequisites for the estimation of growth rates and for the development of successful breeding schemes.

The aim of the present study was to estimate the genetic parameters for weight and/or rate of gain in the Mehraban breed considered as simple traits. The Mehraban sheep is raised in the region of Hamadan, western Iran. It can be considered as a farm sheep and is kept in the region permanently. Ranges are the main feed source during spring, summer and autumn but it also utilizes farm residuals and is hand-fed during the late autumn and winter months. The nutritional level for the breed is medium to low. The sheep involved in this study were maintained under farm conditions in Mehraban (85 km north of Hamadan). They were grazed on a range which was medium in vegetation and some barley was available during the autumn. The animals received supplemental feed during the autumn and winter months and were hand-fed completely for about six months of the year. The basic diet consisted of alfalfa hay, barley and dried sugar beet pulp.

Material and methods

Data on birth weight, pre-weaning daily gain and weaning weight traits analyzed in this study were collected from 975 Mehraban lambs, progeny of 18 rams, born during the 1984-1990 lambing seasons. All lambs were weighed at birth, then every 10 days until weaning. The lambs were weaned at 90 days of age. The sex, type of birth, age of dam and year of birth effects were considered fixed effects. Statistical analysis was performed using least-squares procedures (10). The statistical model was used as follows:

$$Y_{ijklmno} = \mu + a_i + b_{ij} + s_k + t_l + p_m + c_n + e_{ijklmno}$$

where: $Y_{ijklmno}$ is the weight at a particular age or gain in weight during a particular period of the oth individual of the kth sex, out of a dam of mth age, of ith sire, of lth type of birth and nth year;

μ = overall mean;

a_i is the random effect of the ith sire (i = 1,..., 18);

b_{ij} is the random effect of ith sire within jth dam;

s_k is the fixed effect of kth sex of lambs (1 = male, 2 = female);

t_l is the fixed effect of lth type of birth (1 = single, 2 = twin);

p_m is the fixed effect of mth age of dam (m = 1,..., 6) 6 classes corresponding to 1,2,3,4,5 and 6 years old;

c_n is the fixed effect of the year of birth (n = 1,..., 6) from 1984 to 1990;

$e_{ijklmno}$ is a random element assumed normally and independently distributed.

Within and among sire components of variance adjusted for these, other measured sources of variation for the different traits were estimated. Estimates of heritabilities and all correlations were based upon variance and covariance components using the method of paternal half-sibs.

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Heritabilities were estimated as :

$$h^2 = \frac{4\sigma^2 s}{\sigma^2 s + \sigma^2 e}$$

where: $\sigma^2 s$ = variance between sires; $\sigma^2 e$ = variance within sires. The genetic correlations were calculated as:

$$\frac{\sigma^2 sij}{\sqrt{\sigma^2 s \,.\, \sigma^2 sj}}$$

where ij are indices corresponding to traits i and j, $\sigma^2 sij$ is the covariance between i and j, $\sigma^2 si$ and $\sigma^2 sj$ are the variance for the trait i and j respectively. Standard errors were computed from formulae given by HARVEY (10) and SWINGER *et al.* (23). The first order interactions among the factors influencing birth weight, weaning weight and daily gain from birth to weaning were not significant.

Results and discussion

Variance components and heritabilities

Means, standard error and coefficients of variation for weights and gains during the pre-weaning period are presented in table I. The genetic and phenotypic variances along with the heritabilities of the characteristics studied are given in table I. Genetic variances, phenotypic variances and heritabilities increased with advancing age.

The heritability estimate (table I) for birth weight (0.35) was lower than estimates reported by CHO *et al* (5) for Corriedal breed, SIREGAR (20) for Priagan breed, BURFENING (4) for the Rambouillet breed and DASS *et al.* (8) for Bikaneri sheep (0.44, 0.43, 0.92, 0.45, respectively). This trait was higher than estimates reported by POONIA *et al.* (16) for Corriedal, MAUI *et al.* (12) for Merino, MAVROGENIS *et al.* for CHIOS (13) (0.26, 0.10, 0.13, respectively). Similar estimates were reported by MORRISON *et al.* (14) for Hampshire and ERCANBRACK (9) for the Rambouillet and Tharghee breeds. The estimation weaning weight heritability in the present study (0.44) was higher than those reported by POONIA *et al.* (16), MAUI *et al.* (12), SIREGAR (20) and MAVROGENIS *et al.* (13) (0.22, 0.28, 0.35, 0.22). It was lower than the values obtained by WALEED (25), SHIEKH *et al.* (17), SINGH *et al.* (19) (0.51, 0.89, 0.93). Similar results were also reported by CHO (5), PEREIRA (15) and SHRESTHA *et al.* (18). There are several estimates of heritability of pre-weaning daily gain and most of them are low. POONIA *et al.* (16), SIREGAR (20) and THRIFT (24) reported estimates ranging from 0.09 to 0.22. SHRESTHA *et al.* (18) and SINGH *et al.* (19) gave a high estimate of 0.50. The present estimate of 0.33 is intermediate between these extreme values. The heritability estimates reported here indicate that genetic improvement of weight at 60 days or at 90 days (weaning weight) in the Mehraban sheep can be achieved through selection.

Genetic correlations

Genetic correlations between body characteristics were all significant, positive and relatively high. The estimates of genetic correlations between birth weight, 30 and 60 days of age, weaning weight and daily gain from birth to weaning (table II), are of general interest in selection for these characteristics in the Mehraban breed. Low genetic correlations were found by SIREGAR (20) and MAVROGE((13) for birth weight, weaning weight and pre-weaning growth rate, but STOBART *et al.* (22), ABDULKALIQ (1) and MARTIN *et al.* (11) reported very high genetic correlations between weights at different pre-weaning ages and weaning weight, ranging from 0.66 to 1.0.

Phenotypic correlations

Phenotypic correlations between body weights were all significant and positive (table II). The estimate of 0.55 for the correlation between birth and weaning weight is similar to the estimate reported by MAUI *et al.* (12). MAVROGENIS (13) and THRIFT *et al.* (24) found the correlation between weaning weight and pre-weaning growth rate to be 0.88. The corresponding estimate in the present study is 0.88. The estimated correlation of 0.51 between birth weight and pre-weaning daily gain was higher than reported by MAVROGENIS (13), BONAITI *et al.* (3) and THRIFT *et al.* (24). The phenotypic correlations followed the pattern of corresponding genetic correlations all positive but higher. As expected, correlations among successive weights were higher than others. Estimated heritabilities indicate that mass selection for rapid growth would be effective. Live weight as a selection criterion would be a better trait to select for, mostly because of its ease of measurement compared with growth rate.

Conclusion

On the basis of the evidence presented in this paper, it appears that the most desirable selection criterion would be body weight at 90 days of age. It should be better than birth weight, 30 and 60 days of age or pre-weaning growth rate, since it is much less influenced by maternal effects obscuring the genotype for growth or creating bias. The influence of non-genetic effects was defined and described in detail in an earlier study (2). The high correlations ensure that the selection applied at weaning will induce an improvement in later weights. Furthermore, although the generation interval may not be considerably shortened, decrease costs should certainly be observed, since culled lambs would leave the herd earlier. However, attention should be given to the impact of weight-oriented selection, which may affect other production features in meat production favorably or unfavorably. This problem requires further investigation.

TABLE I Means, standard error, genetic and phenotypic variances, heritabilities and standard error of heritability for pre-weaning traits in Mehraban sheep.

Trait	Number of lambs	Mean	s.e.	Genetic variance	Phenotypic variance	h^2	s.e.
Birth weight (kg)	975	3.92	0.13	0.7064	2.0183	0.35	0.14
Body weight (kg) :							
At 30 days	957	11.76	0.12	0.8655	2.4053	0.36	0.26
At 60 days	945	17.93	0.14	1.3633	3.4822	0.39	0.20
Weaning weight at 90 vs (kg)	938	22.34	0.33	1.8560	4.1701	0.44	0.19
Average daily gain (g) : Birth to weaning	938	209	0.08	0.5472	1.6583	0.33	0.16

s.e. : standard error, h^2 : heritability.

*TABLE II Genetic and phenotypic correlations among pre-weaning traits.**

Trait	Birth weight	Weaning weight at 90 days	Body weight (30 days)	Body weight (60 days)	Average daily gain: birth to weaning
Birth weight	—	0.45 ± 0.17	0.65 ± 0.14	0.49 ± 0.13	0.44 ± 0.15
Weaning weight (at 90 days)	0.55	—	0.64 ± 0.14	0.77 ± 0.12	0.79 ± 0.11
Body weight :					
At 30 days	0.72	0.68	—	0.67 ± 0.12	0.55 ± 0.19
At 60 days	0.58	0.80	0.83	—	0.67 ± 0.14
Average daily gain: birth to weaning	0.51	0.88	0.65	0.78	—

** Genetic correlations and s.e. above the diagonal phenotypic correlations below the diagonal.*

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BATHAEI (S.S.), LEROY (P.L.). Genetic parameters for pre-weaning growth traits of Mehraban Iranian fat-tailed sheep. *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (2): 235-238

Data corresponding to 975 lambs, progeny of 18 rams, born during the 1984-1990 lambing seasons, were used to estimate genetic parameters for birth weight, weaning weight, pre-weaning daily gain, and body weight at 30, 60 and 90 days of age. Genetic parameters were estimated from paternal half-sib correlations. Heritabilities for birth weight, weaning weight, pre-weaning daily gain, and body weight at 30 and 60 days of age were 0.35, 0.44, 0.33, 0.36, 0.39 respectively. Genetic correlations were mostly high and all positive, especially between weaning weight and weight at 60 days of age (0.77). The corresponding phenotypic correlations were mostly high and positive (0.80). No genetic antagonisms were found among the characteristics that were studied. Response to selection for weight at 60 or 90 days of age should be effective.

Key words : Mehraban sheep - Lamb - Genetic parameter - Growth - Liveweight - Heritability - Genetic correlation - Iran.

Heritability of growth traits in local chickens at 6 weeks in Nigeria

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EBANGI (L.A.), IBE (S.N.). Héritabilité des caractères de croissance chez des poules de race locale âgées de 6 semaines au Nigeria. *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (2) : 238-240

Les valeurs de l'héritabilité du poids corporel, de la longueur de la cuisse, de celle du bréchet et de la profondeur de la poitrine pour les poules indigènes du Nigeria âgés de 6 semaines, ont été obtenues à partir des données d'un modèle imbriqué. Cent soixante-dix poussins des deux sexes, issus de 5 coqs fécondant chacun 4 poules par insémination artificielle ont été utilisés. A l'éclosion, les poussins étaient marqués à l'aile et leur pedigree établi à partir des ascendants. Les moyennes de ces caractères étaient respectivement de 114,97 g, 3,48 cm, 3,35 cm et 3,22 cm pour le poids corporel, la longueur de la cuisse, celle du bréchet et la profondeur de la poitrine. L'héritabilité estimée à partir du père, de la mère et de la combinaison des indices de variance pour le poids corporel, la longueur de la cuisse et la profondeur de la poitrine était respectivement de 0,41, 0,66 et 0,36 ; 0,58, 0,14 et 0,36 et 0,58, 0,36 et 0,48. Ces mêmes valeurs, calculées à partir des parents et des indices de variance, étaient respectivement de 0,34 et 0,17 pour la longueur du bréchet. Ces résultats montrent que l'héritabilité à 6 semaines est moyenne ou élevée pour les caractères considérés.

Mots clés : Poule - Croissance - Héritabilité - Poids - Mensuration corporelle - Insémination artificielle - Nigeria.

Introduction

Information on genetic parameters of growth traits in the Nigerian local chicken is comparatively scanty in the literature. NWOSU (6) obtained heritability estimates for 4-, 8-, 12-, 16- and 20- week body weight as 0.36, 0.38 and 0,37 ; 0.32, 0.36 and 0.34 ; 0.36; 0.38 and 0.37 ; ( ), 0.49 and 0.44 and 0.33, 0.43 and 0.38 from sire, dam and combined variance components, respectively. OLUYEMI (7) obtained a heritability of 0.31 for 12-week body weight. There was no report in the available literature on heritability of shank length, keel length and breast width. The aim of this study, therefore, is to contribute further information regarding heritability of body weight (W) using local chickens at 6 weeks and to estimate heritability of other growth traits such as shank length (SL), keel length (KL) and breast width (BW) at this age.

Material and methods

The chicks for the experiment were obtained from matings between sires and dams randomly selected from a base population of random-bred, non-selected local fowls maintained at the University Poultry Teaching and Research Farm.

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Lamb growth performance and factors affecting body weight of Iranian fat-tailed Mehraban breed of sheep

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BATHAEI (S.S.), LEROY (P.L.). Performances de croissance des agneaux de la race Iranienne à queue grasse Mehraban et facteurs influençant leur poids. *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (1) : 113-116

Une étude des facteurs affectant le poids dans la race Mehraban en Iran a été effectuée de 1984 à 1989. Le poids de naissance, le poids au sevrage (à 90 jours) et le gain moyen quotidien avant sevrage de 973 moutons ont été analysés. Tous les caractères étudiés étaient affectés significativement par l'année de naissance, le sexe, le type de naissance et l'âge de la mère. Les agneaux nés de brebis âgées de 4 à 5 ans avaient le poids le plus élevé à la naissance, pendant la croissance et au sevrage tandis que les agnelles avaient les agneaux les plus légers. Le sexe avait un effet hautement significatif sur le poids avant sevrage en faveur des mâles. Les agneaux nés simples étaient dans tous les cas plus lourds que les agneaux doubles. L'année de naissance avait aussi un effet significatif sur tous les caractères étudiés tandis que le mois de naissance n'avait aucun effet. Le poids au sevrage et le gain avant sevrage étaient associés de façon positive et significative avec le poids de naissance.

Mots clés : Ovin Mehraban - Agneau - Croissance - Gain de poids - Iran.

Introduction

Mutton is the most important source of red meat in Iran, but domestic production cannot meet the consumers increasing demand. Mismanagement and overgrazing of the natural ranges have practically eliminated the possibility of increasing the sheep population in the near future. In order to increase production, efforts must be directed at improvement in feeding, breeding and management of these animals.

To improve breeding, attempts must be made to select superior breeding stock to be parents of successive generations in order to make an impact on the Iranian animal population. Selection can only be effective when animals are compared on an equal basis to identify those that are superior. The growth of animals is influenced by both genetic and environmental factors and their interactions. If non genetic factors are incorrectly evaluated, errors and bias might arise when selecting the superior individuals. It is therefore essential to obtain a knowledge of the factors influencing growth and the present study was undertaken to evaluate the influence of non genetic factors such as age of dam, type of birth, sex, year and month of birth, on birth weight, weaning weight and daily gain from birth to weaning.

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Materials and Methods

The lambs used in this study were from Mehraban fat-tailed Iranian breed of sheep. Mehraban are raised on farms in the western part of Iran. Data used in this study were collected over the 6-year period, 1984 to 1989, from a Mehraban flock in the west of Iran. Observations concern 973 lambs, progenies of 18 rams, each being mated on an average of 20 ewes.

The lambing season was between February to May each year. Age of dam, type of birth and sex of lambs were recorded. Single and twins were included in this study. Lambs were allowed to remain with their dams till the weaning age of 90 days. Body weight of lambs at different periods such as birth, every 10 days to weaning were kept (from 10 to 90 days). Ewes were maintained on pasture.

The data were analyzed by linear fixed models (12). For analyzing the data on birth weight, weaning weight and daily gain from birth to weaning, age of dam, year, type of birth, sex of lamb and month of birth have been included in the following model :

$$Y_{ijklmn} = \mu + a_i + b_j + t_k + s_l + p_m + e_{ijklmn}$$

where :

Y_{ijklmn} = birth weight, weaning weight, daily gain ; μ = overall mean ; a_i = unknown fixed effect of ith age of dam (i = 1,...,6) ; 6 classes corresponding to 1,..., 6 years old ; b_j = unknown fixed effect of jth year (j = 1,...,6) ; 6 years from 1984 to 1989 ; t_k = unknown fixed effect of kth type of birth (1 = single; 2 = twins) ; s_l = unknown fixed effect of lth sex (1 = male; 2 = female) ; p_m = unknown fixed effect of mth birth month (m = 1,...,4) ; 4 months from February to May ; e_{ijklmn} = residual random element assumed normally and independently distributed with zero mean and homogeneous variance, σ^2_e.

Results and Discussion

Results of the analysis of variance and tests of significance for birth weight, weaning weight and daily gain from birth to weaning are given in table I and the least-squares means for the effects of the age of dam, the lambing year, the type of birth, the sex of lamb and the month of birth are given in table II.

The R^2 values presented in table II indicate that the main effects, given by order of importance for birth weight, weaning weight and daily gain from birth to weaning are: type of birth, sex of lamb, age of dam, lambing year and mounth of birth. Age of dam had a significant effect ($p < 0.05$) on the pre-weaning traits. The lamb born of 4 and 5 year-old ewes were the heaviest, where as those born of 2 year-old ewes were the lightest. One year-old ewes reared lambs that had significantly lower rates of growth from birth to weaning and were significantly lighter

TABLE I Analysis of variance and tests of significance for birth weight, weaning weight and daily gain from birth to weaning in the Mehraban breed.

Source	d.f.	Birth weight	Weaning weight	Daily gain from birth to weaning
Age of dam	5	25.95*	3.11*	7.61*
Lambing year	5	29.28*	9.45*	7.24*
Type of birth	1	431.27**	232.75**	312.58**
Sex of lamb	1	225.54**	435.49**	382.82**
Month of birth	3	7.38	1.05	3.45
Error	958	5.37	12.18	8.78

*$p < 0.05$; **$p < 0.001$.

TABLE II R^2 of each effect for birth weight, weaning weight and daily gain from birth to weaning in the Mehraban breed

Source	Birth weight	Weaning weight	Daily gain from birth to weaning
Age of dam	0.0384	0.0091	0.0129
Lambing year	0.0425	0.0036	0.0069
Type of birth	0.1622	0.0461	0.0720
Sex of lamb	0.1515	0.1239	0.1178
Month of birth	0.0079	0.0018	0.0022

at weaning, compared with the other age. The results correspond to the findings of several investigators (1, 2, 4, 5, 7, 8, 9, 10, 16, 17).

Pre-weaning traits are greatly influenced by the level of milk production of the ewe and age has a considerable influence on milk production. It was expected that only pre-weaning traits would be influence by the age of ewe, as observed in this experiment.

Sex had the most important influence on the pre-weaning traits ($p < 0.001$) of all the factors studied. The male lambs were significantly heavier than the female lambs at birth (0.25 kg) and at weaning (1.71 kg) and had a significantly higher rate of growth from birth to weaning (22 g/day). Several authors found significant differences in the birth weight and weaning weight of lambs (1, 3, 4, 10, 11, 13, 14, 15, 16). Single lambs were significantly ($p < 0.001$) heavier than twins. Similar results were also reported by other investigators (1, 3, 4, 8, 10, 11, 13, 14, 15). The least-squares mean differences for birth weight and for weaning weight of lambs born as singles and twins were 0.4 and 3.90 kg, respectively (table III). The least-squares mean for daily gain of singles and twins were 224 and 185 g, respectively. Differences in year of birth on the pre-weaning traits were significant ($p < 0.05$). The maximum differences in the birth weight and weaning weight of the lamb born between the best year (1985) and the worst year (1989) were 0.36 and 0.66 kg, respectively. The influence of year on growth of the lambs may have been the result of changes in management, incidence of diseases and other environmental factors.

Several authors found a similar trend (1, 3, 4, 8, 10, 11, 13, 14, 15). However WILSON (18) reported that year of birth had not significant effect on any pre-weaning trait. Month of birth did not affect any pre-weaning trait. Similar results were also reported by other investigators (3, 18). The first order interactions between type of birth, sex of lamb, age of dam, lambing year and mounth of birth we not significant. The phenotypic correlations between bir weight and weaning weight, birth weight and average daily gain and weaning weight and average daily gain were 0.65, 0.53 and 0.96, respectively. The correlation coefficient was significant and similar to corresponding estimates reported by FARID *et al.* (9).

Conclusion

Knowledge of environmental factors which influence pre-weaning weight and weaning weight should be used to help selection. Since, the effects of sex, type of birth and age of dam influence significantly more weight at pre-weaning weight and weaning weight than at later ages. If early selection is practised, correction factors for these non genetic effects or selection within specific groups should be realized. The results obtained in this study suggest that the selection to increase weaning weight (90 days) in the experimental herd could be based on the body weight of the lambs before weaning. The main non genetic factors to be included in a model for the estimation of breeding values of the Mehraban breed are: sex, type of birth, age of dam and lambing year for birth weight, weaning weight and daily gain.

TABLE III Least-squares means and standard errors of birth weight, weaning weight and daily gain for the age of dam, lambing year, type of birth, sex of lamb and month of birth and test significance for differences between means in the Mehraban breed.

Classification	Birth weight (kg)			Weaning weight (kg)			Daily gain from birth to weaning (g)		
	No. of lambs	Mean	S.E.	No. of lambs	Mean	S.E.	No. of lambs	Mean	S.E.
Overall Mean	973	3.74	0.41	938	22.97	0.31	938	208	0.16
Age of dam									
1	181	3.74[a*]	0.21	166	22.35[a]	0.10	166	207[a]	0.08
2	257	3.89[b]	0.27	252	22.67[b]	0.11	252	209[a]	0.12
3	237	4.04[c]	0.18	235	23.05[c]	0.22	235	211[b]	0.11
4	152	4.20[d]	0.24	150	23.28[d]	0.20	150	212[b]	0.11
5	93	3.66[a]	0.25	88	22.36[a]	0.21	88	208[a]	0.14
6	53	3.37[a]	0.22	47	22.26[a]	0.29	47	205[a]	0.19
Lambing year									
1984	202	3.97[a]	0.23	201	23.02[a]	0.20	201	211[a]	0.08
1985	195	4.00[a]	0.26	192	23.05[a]	0.21	192	212[a]	0.09
1986	199	3.81[b]	0.25	182	22.25[b]	0.20	182	204[b]	0.04
1987	135	3.99[a]	0.27	134	22.55[b]	0.12	134	206[b]	0.04
1988	121	3.85[b]	0.23	113	22.46[b]	0.25	113	207[b]	0.08
1989	121	3.64[c]	0.21	116	22.39[b]	0.20	116	208[b]	0.11
Type of birth									
Single	840	4.11[a]	0.12	821	24.23[a]	0.20	821	224[a]	0.09
Twin	133	3.71[b]	0.14	117	20.33[b]	0.33	117	185[b]	0.12
Sex of lamb									
Male	459	4.08[a]	0.13	444	23.19[a]	0.28	444	218[a]	0.14
Female	514	3.83[b]	0.11	494	21.48[b]	0.23	494	196[b]	0.12
Month of birth									
February	172	3.73[a]	0.31	159	22.78[a]	0.20	159	208[a]	0.12
March	311	3.92[b]	0.26	300	22.99[a]	0.10	300	212[a]	0.09
April	335	3.96[b]	0.27	326	22.80[a]	0.11	326	209[a]	0.05
May	155	3.72[a]	0.29	152	22.37[b]	0.18	152	207[a]	0.07

** All means within a particular sub-class differ significantly ($p < 0.05$) except those followed by the same letter.*

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BATHAEI (S.S.), LEROY (P.L.). Lamb growth performance and factors affecting body weight of Iranian fat-tailed Mehraban breed of sheep. *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (1) : 113-116

A study of the factors affecting weight in Mehraban sheep in Iran was undertaken during 1984-89. Birth weight, weaning weight (90 days of age) and daily gain from birth to weaning of 973 lambs were studied. The data have been analysed with a linear fixed model including year, sex, type of birth and age of dam. Lambs born of 4-5 year-old ewe were the heaviest and those born of one year-old ewes were the lightest at birth. The lambs reared by one year-old ewes had significantly lower rate of growth and were the lightest at weaning. Sex had highly significant effect on the pre-weaning traits in favour of the male lambs. Single births were heavier than those of twin births. Lambing year had a significant effect on all traits pre-weaning. Month of birth did not affect any trait. Weaning weight and daily gain from birth to weaning showed positive and significant associations with birth weight.

Key words : Mehraban sheep - Lamb - Growth - Liveweight - Iran.