

## 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 ;  $\mu$  = overall mean ;  $a_i$  = unknown fixed effect of  $i$ th age of dam ( $i = 1, \dots, 6$ ) ; 6 classes corresponding to 1, ..., 6 years old ;  $b_j$  = unknown fixed effect of  $j$ th year ( $j = 1, \dots, 6$ ) ; 6 years from 1984 to 1989 ;  $t_k$  = unknown fixed effect of  $k$ th type of birth (1 = single; 2 = twins) ;  $s_l$  = unknown fixed effect of  $l$ th sex (1 = male; 2 = female) ;  $p_m$  = unknown fixed effect of  $m$ th birth month ( $m = 1, \dots, 4$ ) ; 4 months from February to May ;  $e_{ijklmn}$  = residual random element assumed normally and independently distributed with zero mean and homogeneous variance,  $\sigma_e^2$ .

### 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 month 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

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**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 influenced 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 month of birth were not significant. The phenotypic correlations between birth 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 preweaning 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.

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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 <sup>a*</sup>	0.21	166	22.35 <sup>a</sup>	0.10	166	207 <sup>a</sup>	0.08
2	257	3.89 <sup>b</sup>	0.27	252	22.67 <sup>b</sup>	0.11	252	209 <sup>a</sup>	0.12
3	237	4.04 <sup>c</sup>	0.18	235	23.05 <sup>c</sup>	0.22	235	211 <sup>b</sup>	0.11
4	152	4.20 <sup>d</sup>	0.24	150	23.28 <sup>d</sup>	0.20	150	212 <sup>b</sup>	0.11
5	93	3.66 <sup>a</sup>	0.25	88	22.36 <sup>a</sup>	0.21	88	208 <sup>a</sup>	0.14
6	53	3.37 <sup>a</sup>	0.22	47	22.26 <sup>a</sup>	0.29	47	205 <sup>a</sup>	0.19
Lambing year									
1984	202	3.97 <sup>a</sup>	0.23	201	23.02 <sup>a</sup>	0.20	201	211 <sup>a</sup>	0.08
1985	195	4.00 <sup>a</sup>	0.26	192	23.05 <sup>a</sup>	0.21	192	212 <sup>a</sup>	0.09
1986	199	3.81 <sup>b</sup>	0.25	182	22.25 <sup>b</sup>	0.20	182	204 <sup>b</sup>	0.04
1987	135	3.99 <sup>a</sup>	0.27	134	22.55 <sup>b</sup>	0.12	134	206 <sup>b</sup>	0.04
1988	121	3.85 <sup>b</sup>	0.23	113	22.46 <sup>b</sup>	0.25	113	207 <sup>b</sup>	0.08
1989	121	3.64 <sup>c</sup>	0.21	116	22.39 <sup>b</sup>	0.20	116	208 <sup>b</sup>	0.11
Type of birth									
Single	840	4.11 <sup>a</sup>	0.12	821	24.23 <sup>a</sup>	0.20	821	224 <sup>a</sup>	0.09
Twin	133	3.71 <sup>b</sup>	0.14	117	20.33 <sup>b</sup>	0.33	117	185 <sup>b</sup>	0.12
Sex of lamb									
Male	459	4.08 <sup>a</sup>	0.13	444	23.19 <sup>a</sup>	0.28	444	218 <sup>a</sup>	0.14
Female	514	3.83 <sup>b</sup>	0.11	494	21.48 <sup>b</sup>	0.23	494	196 <sup>b</sup>	0.12
Month of birth									
February	172	3.73 <sup>a</sup>	0.31	159	22.78 <sup>a</sup>	0.20	159	208 <sup>a</sup>	0.12
March	311	3.92 <sup>b</sup>	0.26	300	22.99 <sup>a</sup>	0.10	300	212 <sup>a</sup>	0.09
April	335	3.96 <sup>b</sup>	0.27	326	22.80 <sup>a</sup>	0.11	326	209 <sup>a</sup>	0.05
May	155	3.72 <sup>a</sup>	0.29	152	22.37 <sup>b</sup>	0.18	152	207 <sup>a</sup>	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 Elev. 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.