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SOME SOURCES OF VARIATION IN THE BODY WEIGHTS OF KARAKUL, MEHRABAN, NAEINI AND BAKHTIARI BREEDS OF SHEEP[1]

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ABSTRACT

Birth weights, weaning weights and daily gains from birth to weaning of 353 lambs of four fat-tailed Iranian breeds of sheep, Karakul, Mehraban, Naeini and Bakhtiari, were analyzed by the least-squares method.

Breed had a highly significant effect on all of the traits. Karakul produced significantly heavier lambs at birth followed by Bakhtiari, Mehraban and Naeini breeds, but weaning weight of Mehraban and Bakhtiari lambs were the same and both were significantly heavier than Karakul which was in turn significantly heavier than Naeini lambs. Mehraban and Bakhtiari lambs had similar rate of growth from birth to weaning and both were significantly superior to Karakul and Naeini which were similar.

Age of dam had a significant effect only on birth weight. Ram lambs were significantly heavier than ewe lambs both at birth and at weaning and had significantly higher daily gain from birth to weaning. Lambing year had no significant effect except on birth weight. None of the first-degree interactions including breed x sex, age of dam x sex, lambing year x sex and breed x age of dam were significant. The regressions of weaning weight and daily gain on birth weight were 2.4 kg and 23.4 g, respectively, and were highly significant. The regressions of weaning weight and daily gain on age at weaning were also highly significant. Correlation coefficient between weaning weight and birth weight was 0.64 and that between daily gain and birth weight was 0.52.

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INTRODUCTION

Milking the sheep is a common practice in Iran. In most areas, milking is started as soon after parturition as lambs can be kept away from the ewes for several hours. Since the ranges are usually poor in vegetation, the ewe flock must travel great distances from the village or tribal headquarters, and the young lambs cannot follow their mothers. The lambs are usually allowed to nurse for a short time after milking the ewes, which may be once or twice a day. The lambs are grazed and are not usually given supplement feeding. Weaning age differs depending on the region and the condition of the lamb but the average is approximately 12 weeks after birth. Consequently, weaning weight under the usual operating conditions is comparatively low and the lambs are not usually in good condition at weaning. This system of lamb rearing lowers production and reproduction performance of the animal.

In case there is a high correlation between preweaning and post-weaning performance in meat production, early evaluation of pre-weaning lambs would produce greater efficiency in meat production and consequently higher income of feedlot operations. Evaluation of the relative importance of different factors affecting the pre-weaning performance of lambs would therefore be essential in lamb production in general and breed improvement programs in particular.

The objectives of this study were:

1. To compare the birth weight, weaning weight and daily gain from birth to weaning of four fat-tailed carpet-wool Iranian breeds of sheep, raised under similar conditions.
2. To evaluate the relative importance of some factors affecting birth weight, weaning weight and daily gain from birth to weaning.

MATERIALS AND METHODS

Breeds: This study involved four fat-tailed carpet wool Iranian breeds of sheep, Karakul, Mehraban, Naeini and Bakhtiari. Mehraban is raised mainly in the vicinity of Hamadan. The breed takes its name from a relatively small region which is considered to be its place of origin. This breed can be considered as a farm sheep and is kept in the region permanently. The sheep are mostly light-brown, but there are also some black, white or spotted animals. The head, face and a part underneath the neck and throat are devoid of wool.

Rams are polled in this breed.

Karakuls are mainly range sheep and are famous for raising lambs with high quality fur at birth, but are mostly raised for meat production in Iran. The color is either black or gray. Its distribution covers the southern (Shiraz area) and north eastern part of the country, which borders with Russia and Afghanistan. A high proportion of Karakul sheep in the southern part of Iran (which is also called Gray Shirazi) is raised by the tribes and managed under migratory systems. Due to fluctuations in the world pelt market, lower demand for the gray pelts and rapid rise in meat price, Karakul is used mostly for meat production. In recent years, there has been some crossbreeding in Karakul flocks, in which rams from other breeds, mainly Naeini, have been mated to Karakul ewes, aiming to produce animals more resistant to drought. This has led to a reduction in the quality of fur and consequently, meat and carpet-wool have become the main objectives in its production.

Naeini is a small-sized sheep and has white fleece with black muzzle, lower part of legs and feet. It is the most widely distributed breed in Iran. This breed has different names in various regions such as Baluchi, Kalakui, Yazdi, Kermani, Araghi and Farahani. Despite considerable differences between the animals of different areas, they have much in common, particularly in color and fleece characteristics. Their distribution covers central and eastern poor ranges. The breed is very hardy and appears to be the best forager among the native breeds.

Bakhtiari is a relatively large-sized sheep. It is distributed in the south western part of Iran. The typical sheep belong to the Bakhtiari tribe and are managed under the migratory system. Winter ranges are located in the southern part of the area and summer mountain ranges are in the northern part of the area which can be classified as fair to good ranges. The typical sheep is white, but black and brown animals are also found among the breed. Rams are polled in this breed.

Source of data: In order to establish a sheep breeding station for breed comparison and crossbreeding experiments, the ewes of Mehraban, Naeini and Bakhtiari breeds were purchased from the large flocks which are supposed to have typical animals. The Karakul breeding flock of the College Station were also used. In 1971, Mehraban and Naeini ewes were introduced to the station and in 1973 some other Mehraban and Naeini and also Bakhtiari ewes were purchased. Most of the ewes were pregnant on arrival at the station. This study involved the birth weights and weaning weights of the first lambing records of

the ewes. No classical selection for meat, milk and wool has been performed on these sheep.

Experimental procedure: Data from 375 lambs (79 Karakul, 131 Mehraban, 91 Naeini, 74 Bakhtiari) born and 353 lambs weaned were used in this study. The lambs were born single from January through April in 1972 and from January through March in 1974. The lambs were creep-fed during the suckling period. In 1972, the creep-ration consisted of 50% barley, 10% sunflower seed meal, 20% wheat bran, 18% dried sugar beet pulp with molasses, 1% bone meal and 1% salt. The ration provided 12.4% crude protein, 3.1% crude fat, 6.7% ash, 9.9% crude fiber and 92.9% dry matter. In 1974, sunflower seed meal was replaced by cotton-seed meal and half of the salt was replaced by vitamin and antibiotic supplements. The ration was ground, mixed and fed *ad libitum*. Alfalfa was fed free choice. About 10 days after parturition, the lambs were separated from their mothers and allowed to have access to the ewes only for about 12 hr at night. In 1972, most of the lambs were weaned at 75 days of age and some were weaned experimentally at 45 and 60 days of age. In 1974, all of the lambs were weaned at 75±5 days of age and were docked by rubber rings on the first day after birth. The ewes were not milked, neither during nursing nor after weaning.

Analysis of data: The data were analyzed by the least-squares procedure as described by Harvey (9, 10). For analyzing the data on birth weight, constants were fitted for breed of sheep, age of dam, sex of lamb, year, interactions between breed and age of dam, breed and sex of lamb, age of dam and sex and year and sex of lamb. In order to analyze the data on weaning weight and daily gain from birth to weaning, the regression of each trait on age at weaning (days) and birth weight were included in the model.

Pairwise tests of significance among the least-squares means were performed with the Duncan's Multiple Range Test as modified by Kramer (4, 13). Standard error of different estimates was calculated from the appropriate terms of the variance-covariance matrix.

RESULTS AND DISCUSSION

The analysis of variance of the data for birth weight, weaning weight and daily gain from birth to weaning is shown in Table 1 and the least-squares means by breed, age of dam, sex of lamb and lambing year and the test of significance for differences between means are presented in Table 2. Breed had a highly significant effect ($P<0.01$) on all the

Table 1. Analysis of variance for traits studied (mean squares)

Source of variation	d.f.	Birth weight	d.f.	Weaning weight	Daily gain from birth to weaning
Breed	3	10.28**	3	127.81**	27052.00**
Age of dam	3	4.00**	3	1.94	62.33
Sex of lamb	1	4.12**	1	57.69**	10900.00**
Lambing year	1	1.82**	1	7.06	3382.00
Breed x sex	3	0.16	3	10.04	2509.33
Age of dam x sex	3	0.01	3	5.90	756.67
Lambing year x sex	1	0.50	1	1.56	628.00
Breed x age of dam	9	0.74	9	5.74	1470.44
Regression of trait on weaning age	–	–	1	400.56**	63197.00**
Regression of trait on brith weight	–	–	1	554.06**	53185.00**
Error	350	0.32	326	5.31	1331.98

**- Significat at 1% probability level.

Table 2. Least-squares means and standard errors by breeds, age of dam, sex of lamb and lambing year and test of significance for differences between means.

Classification	No. of lambs	Birth weight, kg	No. of lambs	Weaning weight, kg[a]	Daily gain from birth to weaning,g
Overall mean	375	3.9 ± 0.1	353	17.6 ± 0.2	204.1 ± 3.9
Breed:					
Karakul	79	4.6 ± 0.2 a*	75	17.4 ± 0.7 a	198.7 ± 10.7 a
Mehraban	131	3.6 ± 0.1 b	122	18.9 ± 0.3 b	224.3 ± 4.2 b
Naeini	91	3.2 ± 0.1 c	86	15.4 ± 0.4 c	174.9 ± 5.7 a
Bakhtiari	74	4.1 ± 0.1 d	70	18.8 ± 0.4 b	218.9 ± 5.8 b
Age of dam:					
2 years	121	3.5 ± 0.1 a	113	17.3 ± 0.3 a	202.4 ± 4.6 a
3 years	136	4.0 ± 0.1 b	127	17.7 ± 0.6 a	204.9 ± 9.8 a
4 years	58	4.1 ± 0.1 b	55	17.8 ± 0.4 a	205.1 ± 6.1 a
5&6 years	60	3.9 ± 0.1 b	58	17.7 ± 0.4 a	204.0 ± 6.0 a
Sex of lamb:					
Female	189	3.7 ± 0.1 a	179	17.1 ± 0.3 a	197.2 ± 4.6 a
Male	186	4.0 ± 0.1 b	174	18.1 ± 0.3 b	210.9 ± 4.5 b
Lambing year:					
1972	154	3.8 ± 0.1 a	146	17.4 ± 0.4 b	198.8 ± 6.1 a
1974	221	4.0 ± 0.1 b	207	17.8 ± 0.2 a	209.3 ± 3.8 a

a- Average weaning age was 68.4 days.

*- All means within a particular sub-class differ significantly ($p<.05$) except those followed by the same letter.

traits studied. Karakul produced significantly heavier lambs at birth followed by Bakhtiari, Mehraban and Naeini breeds, but weaning weight of Mehraban and Bakhtiari lambs were similar and both were significantly heavier than Karakul which was in turn significantly heavier than Naeini lambs. Similar conclusions for Karakul, Mehraban and Naeini lambs were reached by Farid *et al.* (7), who reported significantly heavier body weight of Mehraban lambs at weaning (75 days of age) followed by Karakul and Naeini while Karakul was the heaviest breed at birth followed by Mehraban and Naeini. They attributed the superiority of Karakul lambs at birth to the better genetic make up of the lambs and prenatal maternal environment of the breed. They also pointed out better post-natal maternal environment of Mehraban ewes over Karakul and Naeini and concluded that the superiority of Mehraban lambs over Karakul and Naeini in weaning weight was mainly due to this factor.

Mehraban and Bakhtiari lambs had similar rate of growth from birth to weaning and both were significantly superior over Karakul and Naeini. Farid *et al.* (7) reported the superiority of Mehraban lambs over Karakul, which in turn had significantly faster rate of growth than Naeini lambs. Since in comparing the daily gains, the regression of daily gain on birth weight was not included in their model, it is probable that part of the observed differences among the breeds in the two studies has been due to differences in birth weight.

Birth weight was the only trait which was significantly influenced by the age of the dam. The lightest lambs were born from 2-year old ewes as compared with the other age groups. The same conclusions were reached by Farid *et al.* (7). Sidwell and Miller (17) reported a significant effect of age of dam on birth weight, but weaning weight and daily gain from birth to weaning were not affected. The significant effect of age of dam on birth weight and/or weaning weight of lambs are reported by Blackwell and Henderson (2), Sidwell *et al.* (16), Yalcin and Bichard (21), Singh *et al.* (15), Vesely *et al.* (19), Holtmann and Bernard (12), Fahmy *et al.* (5,6), Parker (14), Aboul-Naga *et al.* (1), Vesely and Peters (20) and Hunter (8). The general conclusion that can be drawn from these reports is that the effect of age of dam on birth weight and weaning weight of lamb is curvilinear, reaching its maximum at approximately 3 to 5 years of age, indicating that these age groups appear to be optimum in terms of mothering ability. In nearly all the above cases, the lightest lambs were born and weaned by 2-year old dams.

Ram lambs were significantly heavier than ewe lambs both at birth (0.30 kg) and at weaning (1.0 kg) and had significantly higher daily gain from birth to weaning (13.7 g).

The average birth weight of lambs in 1974 was significantly heavier than that in 1972, but weaning weight and daily gain from birth to weaning did not differ significantly in the two years. Better feed and management practices for the pregnant ewes in 1974, compared to 1972 may have caused the difference in birth weight.

The analyses showed that none of the two factor interactions were significant sources of variation. This is in agreement with the findings of Sidwell *et al.* (16), Holtmann and Barnard (12), and Sidwell and Miller (17). Vesely and Peters (20) reported that first-degree interactions including year, age of dam, sex, rearing type and breed represented a very small source of variation in weaning weight, each of which represented a maximum of one percent of the total sums of squares.

The regression of weaning weight and daily gain from birth to weaning on birth weight and age at weaning was highly significant. The regression of weaning weight and daily gain on birth weight was 2.4 kg and 23.4 g, respectively. The regression of the same traits on age at weaning was 0.12 kg and 1.55 g, respectively. DeBaca *et al.* (3), Harrington *et al.* (11) and Seebeck (18) studying the weaning weight of lambs reported that birth weight was a significant source of variation for this trait. Sidwell *et al.* (16) and Sidwell, and Miller (17) reported significant effects for birth weight on weaning weight and daily gain from birth to weaning. Farid *et al.* (7) found the birth weight to be a significant source of variation for weaning weight, but it did not have a significant effect on daily gain from birth to weaning.

The correlation coefficient between weaning weight and birth weight was 0.64 and the correlation coefficient between daily gain from birth to weaning and birth weight was 0.52, both of which were highly significant.

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