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CROSSBREEDING OF IRANIAN FAT-TAILED SHEEP I – PREWEANING GROWTH PERFORMANCE OF KARAKUL, MEHRABAN, NAEINI AND THEIR RECIPROCAL CROSSES[1]

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ABSTRACT

Birth weights, weaning weights and daily gains from birth to weaning of 335 straightbreds and two-breed cross lambs of three fat-tailed Iranian sheep breeds were analyzed by the least-squares method.

Breeding groups (three straightbred and six crossbred groups) had a highly significant effect on all the traits. Among the straightbreds, Mehraban was the heaviest breed at weaning and had higher daily gain from birth to weaning followed by Karakul and Naeini. Karakul was the heaviest breed at birth followed by Mehraban and Naeini. The performance of the crossbred groups, is also discussed.

Birth weight was the only trait which was highly influenced by the age of dam. Ram lambs were heavier than ewe lambs both at birth and at weaning, and had higher daily gain from birth to weaning.

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Regressions of weaning weight on age at weaning, and on birth weight were 0.24 and 1.30 kg., respectively, which were highly significant.

INTRODUCTION

Sheep play a vital role in the economy of Iran. In spite of the large number of sheep, because of low efficiency of production, the mutton supply (the most important source of red meat) is inadequate for meeting the increasing demand. Consequently, meat is imported at a high annual foreign exchange cost.

Crossbreeding is one of the effective methods for improving the efficiency of lamb production and obtaining desirable combinations for the future development of more productive new breeds. The positive effect of crossbreeding on growth and weight of lamb has been reported by Donald *et al.* (4), Sidwell *et al.* (16), Singh *et al.* (18), Holtmann and Bernard (12), Fahmy *et al.* (7), Sidwell and Miller (17), Galal *et al.* (9), Aboul-Naga *et al.* (1) and Vesely and Peters (20).

The main objective of this study was to evaluate the three fat-tailed Iranian breeds of sheep (Karakul, Mehraban and Naeini), especially in relation to the effect of crossbreeding on birth weight, daily gain from birth to weaning and weaning weight.

MATERIALS AND METHODS

Mother flock. This study involved three fat-tailed Iranian breeds of sheep including Karakul (K), Mehraban (M) and Naeini (N). The characteristics of the breeds are described by Farid and Makarechian (8). No classical selection for meat, milk and wool production has been performed on these breeds.

Flock management. All sheep involved in this study were from the Animal Research Station flock. These sheep were generally grazed on range which was poor in vegetation. To prevent overgrazing, the vegetation was supplemented during the different seasons. In spring the sheep were on barley pasture about a month. During the summer there was some barley, wheat and corn stubbles available. Corn silage and dried sugar beet pulp was fed during the fall and winter. About 300 g of barley per ewe per day was fed during late pregnancy and early lactation until the ewes were out on barley pasture.

The breeding period extended from July 20 to September 10, 1972. The ewes were assigned randomly to the rams in each breeding group. Eight K, eight M and six N rams were used in this experiment.

Experimental animals. The data used in this study included 341 lambs born and 335 lambs weaned. The lambs were born from December 1972 through February 1973. Only single born lambs were included in the study. The lambs were creep-fed and weaned at 75 + 10 days of age on three dates. The creep ration consisted of 50% barley, 10th sunflower seed meal, 20% wheat bran, 18% dried sugar-beet pulp with molasses, 1% bone meal and 1% salt which was ground and mixed. The ration provided 12.4% crude protein, 3.1% crude fat, 6.7% ash, 9.9% crude fiber, 92.9% dry matter and was fed *ad libitum.* Alfalfa was fed to the lambs and they had access to the ewes only for about 12 hours at night.

Analysis of data. Data were analyzed by the least-squares procedure as outlined by Harvey (10). Birth weight was analyzed using a model in which constants were fitted for breeding groups (three straightbreds and six crossbred groups), age of dam and sex of lamb. For analyzing the data on weaning weight and daily gain from birth to weaning, constants were fitted for breeding groups, age of dam and sex of lamb, and the regression of each of the traits on age at weaning was also included. These two later traits were also analyzed by another model which was similar to the first one, but regression of each of the traits on birth weight was also included. The assumption

that there was no interaction between the main factors was tested by F-test using the variance of the within-cell deviations from the expected on the residual variance (10). In each case this proved to be nonsignificant and therefore interactions were not considered in the model.

In order to analyze the ewe daily live weight change during nursing, constants were fitted for breed of ewe and sex of lamb.

Pairwise tests of significance for differences between means were performed using Duncan's Multiple Range Test (5) as modified by Kramer (13). Standard errors of different estimates were calculated by using appropriate inverse elements of the variance-covariance matrix (10).

RESULTS AND DISCUSSION

The least-squares means of birth weight, weaning weight and daily gain from birth to weaning for straightbreds and crossbred groups are presented in Table 1. Straightbred M was the heaviest breed at weaning and had significantly higher daily gain from birth to weaning followed by straightbreds K and N; but K was the heaviest breed at birth followed by M and N. The superiority of K lambs at birth may be attributed to the better genetic make-up of the lambs and/or better prenatal maternal environment.

Among the crosses, MK and NK did not differ significantly in birth weight, but both were heavier than KM and NM which were similar. MN was the lightest crossbred group in birth weight and did not differ significantly from KM which was in turn similar to NM.

M and K ewes weaned comparable lambs in all the crosses and were superior to

Table 1 Least-squares means and standard errors of birth weight, weaning weight and daily gain from birth to weaning for straightbreds and crossbred groups, and test of significance for differences between means.

Classification		No. of lambs	Birth weight, kg.	No. of lambs	Weaning weight, kg.	Daily gain from birth to weaning, g.
Sire	Dam					
K	K	54	4.72 ±0.08 a[2]	52	20.36 ± 0.45a	206.6 ± 5.8a
M	K	27	4.51 ± 0.10 ab	27	20.59 ± 0.56 ab	212.2 ± 7.2a
N	K	27	4.47 ± 0.10 b	27	20.86 ± 0.56 ab	214.9 ± 7.2a
K	M	30	4.04 ± 0.09c	29	21.82 ± 0.53 b	234.8 ± 6.8b
M	M	69	4.01 ± 0.07 c	69	21.41 ± 0.38 b	230.4 ± 4.9b
N	M	30	3.94 ± 0.09 cd	28	21.70 ± 0.51 b	234.4 ± 6.5b
K	N	26	3.69 ± 0.10 de	25	17.78 ± 0.59 c	199.7 ± 7.7a
M	N	24	3.57 ± 0.11 e	24	18.33 ± 0.60 c	194.5 ± 7.7a
N	N	54	3.50 ± 0.08 e	54	16.69 ± 0.42 e	175.8 ± 5.5c

1 – K = Karakul, M = Mehraban, N = Naeini

2 – All means differ significantly (5% level) except those followed by the same letter

those reared by N ewes. All the crosses with M ewes produced fastest growing lambs from birth to weaning followed by K and N which were similar. This can be attributed to the better mothering ability of the M breed.

Comparisons between the straightbreds and crossbreds with the same breed of dam indicated that straightbred K was heavier than NK crossbred group at birth, which was similar to MK. No significant difference was found between straightbred K and the other two crosses with the same breed of dam in weaning weight and daily gain. No significant difference was found between straightbred M and the two crosses with M ewes for all the traits studied. Straightbred N was similar to the two other crosses with the same dam breed for birth weight, but inferior to the crossbreds in weaning weight and daily gain from birth to weaning. It should be noted that in estimating weaning weight and daily gain the data were not adjusted for bith weight.

Birth weight was the only trait which was significantly influenced by age of dam (Table 2). The lightest lambs were born from two-year-old ewes as compared to the other age groups which were similar. This is in agreement with the findings of Sidwell and Miller (17) who reported a significant effect of age of dam on birth weight, but weaning weight and daily gain from birth to weaning were not affected. Significant effects of age of dam on birth weight and/or weaning weight of lambs are also reported by Blackwell and Henderson (2), Sidwell *et al.* (16), Yalcin and Bichard (21), Singh *et al.* (18), Vesely *et al.* (19), Holtmann and Bernard (12), Fahmy *et al.* (6), Parker (14), Aboul-Naga (1), Fahmy *et al.* (7) and Vesely and Peters (20).

Table 2 shows that ram lambs were heavier than ewe lambs both at birth (0.22 kg) and at weaning (1.74 kg) and had higher daily gain from birth to weaning (18.9 g). The regressions of weaning weight on birth weight and age at weaning were highly significant, but birth weight and age at weaning were not significant sources of variation in daily gain from birth to weaning. The regressions of weaning weight and daily gain on

Table 2. Least-squares constants by age of dam and sex of lamb and test of significance for differences between constants.

Classification	No. of lambs	Birth weight, kg.	No. of lambs	Weaning weight, kg.	Daily gain from birth to weaning, g
Overall mean	341	4.06 ± 0.05	335	20.06 ± 0.27	211.5 ± 3.5
Age of dam					
2 years	149	−.27 ± 0.06 a	143	−.51 ± 0.31 a	− 2.9 ± 4.0 a
3 years	98	0.10 ± 0.06 b	98	0.14 ± 0.34 a	1.2 ± 4.4 a
4 years	87	0.05 ± 0.07 b	87	0.00 ± 0.38 a	−2.2 ± 4.9 a
5 years	7	0.12 ± 0.14 b	7	0.37 ± 0.75 a	3.9 ± 9.6 a
Sex of lamb					
Female	158	−.11 ± 0.30 a	155	−.87 ± 0.14 a	−9.9 ± 1.8 a
Male	183	0.11 ± 0.30 b	180	0.87 ± 0.14 b	9.9 ± 1.8 b

All constants within a particular subclass differ significantly (5% level) except those followed by the same letter.

Table 3 Least-squares constants for ewe daily weight loss during nursing and test of significance for differences between constants.

Classification	No. of Ewes	Daily weight loss, g.	
Overall mean	335	−116.5	4.4
Breed of dam			
Karakul	106	−2.7	3.8 a
Mehraban	128	4.2	3.2 a
Naeini	103	−1.5	4.1 a
Age of dam			
2 years	143	19.5	5.0 a
3 years	98	−3.3	5.6 b
4 years	87	−1.7	6.1 b
5 years	7	−14.5	12.2 b
Sex of lamb			
Female	155	1.8	2.3 a
Male	180	−1.8	2.3 a

All constants within a particular subclass differ significantly (5% level) except those followed by the same letter.

birth weight were 1.30 kg and 5.21 g, respectively. The regressions of weaning weight and daily gain on age at weaning were 0.24 kg. and 0.35 g, respectively. deBaca *et al* (3), Harrington et al. (11) and Seebeck (15) studied the weaning weight of lambs and reported that birth weight of the lamb was a significant source of variation in this trait Sidwell *et al.* (16) and Sidwell and Miller (17) reported the significant effect of birth weight on weaning weight and daily gain from birth to weaning.

Age was the main factor influencing the changes in live body weight of the ewes with similar management during the nursing period. Breed of dam and sex of lamb had no effect on this trait. The overall mean of ewe daily liveweight loss was 116.5 g. which seemed to be too high (Table 3). This value can be considered as a good measure of feeding and management practices during nursing periods, and in this experiment it is obvious that adequate amounts of feed and proper management had not been provided for the flock in this period. Liveweight loss was significantly less in two-year-old ewes when compared with three- and four-year age groups. This can be partly attributed to the fact that the two-year-old ewes nursed the lightest lambs and produced less milk as compared with the older ewes.

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