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GROWTH PERFORMANCE AND BODY PARAMETERS EVALUATION IN YOUNG FEMALE SHEEP FROM THE MEAT LINE

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Abstract

The research conducted aimed to evaluate the growth intensity of a population of crossbred sheep resulting from the crossing of Karakul of Botoșani breed females with Palas meat breed rams. For this purpose, two experimental groups were established, one consisting of young crossbred sheep females and the other of young females belonging to the Karakul of Botoșani breed. Both groups benefited from the same maintenance conditions and the same experimental treatment. The research was carried out during 2024, the young females being of similar age. The results obtained highlight the fact that although, at birth, the group consisting of lambs of the Karakul of Botoșani breed had an average weight higher than that of the crossbred females, the latter reach the age of 1 year to have, on average, 12 kg more than the Karakul of Botoșani ones. The results obtained are important and relevant both for activities aimed at obtaining meat production and for farms producing reproductive material. Young sheep is very important in the sheep herd as the improvement and consolidation of future generations of sheep depends on them.

Key words*: body weight, Botoșani Karakul sheep, crossbred, young sheep.*

INTRODUCTION

Human nutrition depends on a considerable extent on the intake of animal protein, namely meat, and as the demand for meat is continuously increasing, we want to form and certify a sheep population specialized in meat production starting from the Karakul of Botoșani breed. The Karakul race sheep has a number of biological morpho-productive features, one of which is basic and refers to the unique, very beautiful fur skin of the new-born lamb, slaughtered at 1-5 days after birth (Buzu, 2014). Karakul of Botoșani is a breed of sheep raised in North-East of Romania, increased Karakul sheep is a tradition in this area since the beginning of XIX century, when, for the first time, were imported sheep of this breed from Russia. (Pascal, 2011; Pascal, 2015; Pascal, 2019). Sheep breeding for meat production is on the rise in our country due to the increasing meat demand from consumers. The Karakul of Botoșani breed is a breed specialized in skin production, but due to the current trend of decreasing market demand for skins both nationally and internationally, it is necessary that the Karakul of Botoșani breed improvement program also includes specific objectives for meat production in order to maintain the local and regional importance of sheep belonging to this breed (Crîșmaru et al., 2021; Crîșmaru et al., 2022; Pascal et al., 2005; Nechifor et al., 2022). Research for this new population specialized in meat production began in 2017, and the first results obtained were more than encouraging.

MATERIALS AND METHODS

The experimental protocol was implemented over a period of 1 year with periodic weight using individual electronic scale and body size evaluation, respectively withers height, croup height, chest circumference and chest depth for both the females from the crossbred meat line and the females of the Karakul of Botoșani breed. In 2017, the year of first generation, the individuals from the meat line were the result

of crossbreeding Karakul of Botoșani ewes with rams from meat breeds.
The two batches were made up of 15 females of the same age, which after weaning were kept in the stable, benefiting from the same maintenance and feeding conditions, respectively alfalfa hay and a mixture of cereals specific to the age category (corn and oat grains).
The monitored parameters were: birth weight, weight at 3 months, weight at 6 months, and weight at 1 year, growth rate, and body dimensions for the same time intervals. Only females were evaluated since the improvement of future generations of products depends on their development until the moment of transition to the base herd and respectively the moment of becoming mothers. The moment when ewes come into heat is very important, and photoperiodism greatly influences this aspect. Photoperiodic information (light or obscurity) is received by sheep to eyes level through retina and is transmitted by nervous way till to pineal gland (epiphysis) which secretes melatonin hormone. (Pascal et al., 1995).
Once systematized, the data were processed and interpreted using methods specific to such research - arithmetic mean, error of the mean, standard deviation, coefficient of variability, significance tests, using the GraphPad Prism, Student test and SPSS Amos statistical programs.



Figure 1. Crossbred females sheep batch (original)

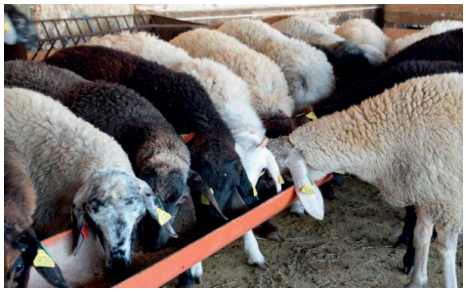


Figure 2. Karakul of Botoșani females batch (original)

RESULTS AND DISCUSSIONS

The young female sheep batches were maintained under semi-intensive growing conditions, in stables within the unit, and were given a food supplement consisting of concentrated mixture of seeds. One of the best methods of managing young flocks in sheep breeding units is to maintain them in stables throughout the year with the administration of the best quality fibrous feeds from the stock. The application of this breeding system ensured, during the study period, the achievement of high growth rates and a low number of individuals with pathological conditions. The young flocks benefit primarily from the comfort offered by shelters during periods of unfavorable or hot weather and from an ad-libitum water source.

Table 1. Birth weight evaluation on the females from the two batches

Birth weight	Karakul Botoșani batch	Crossbred batch
N	15	15
$\overline{X} \pm s_{\overline{x}}$ (kg)	5.52 ± 0.275	5.393 ± 0.241
Minimum (kg)	3.6	3.8
Maximum (kg)	7.6	7.3
Standard deviation (kg)	1.065	0.9354
t value	0.347ns	

ns - statistically insignificant differences

According to the assessment of body weight at birth, summarized in Table 1, we can say that Karakul of Botoșani females have an average weight higher than the average weight of

crossbred females, with a maximum weight of 7.6 kg. Since 2017, from the first generation of mixed-breed females obtained, the birth weight has been lower than that of Karakul of Botoșani females, respectively 3.71 kg, but since then this aspect has been improved, so that the difference in weight between mixed-breed females and Karakul of Botoșani females, at birth, is no longer so great.

Table 2. Evaluation of weight and growth gain at 3 months of females from the two groups

Statistical indicators	Body weight (kg)		Growth rate (g/zi)	
	Karakul Botoșani batch	Crossbred batch	Karakul Botoșani batch	Crossbred batch
N	15	15	15	15
$\bar{x} \pm s_{\bar{x}}$	26.33 ± 0.83	29.73 ± 0.91	291.7 ± 9.27	329.5 ± 10.15
Minimum	21	24	236	270
Maximum	33	37	365	410
Standard deviation	3.2	3.535	35.91	39.3
t value	2.761*		2.750*	

* - statistically significant differences (p<0.05).

The weaning period plays a crucial role in the future development of the products, because if the body weight at weaning is below 20 kg, then the lambs will have difficulty in properly assimilating the feed and there will be delays in their growth and development. As can be seen in the data presented in Table 2, the crossbred females had a higher weight on average than Karakul of Botoșani females, with a minimum of 24 kg and a maximum of 37 kg. This faster development of the crossbred females comes in counterbalance to the birth weight and this demonstrates a higher growth rate of the crossbred females compared to the Karakul of Botoșani females, recording an average of 329.5 g average daily gain. According to a study conducted in 2021, the crossbred females average weight at 3 months was 25.54 kg, a weight that is lower than that recorded in 2024 in the crossbred female group, which shows us an improvement in this parameter and the increased meat production skills of the Karakul of Botoșani breed.

When evaluating body weight at the age of 6 months, according to the data presented in Table 3, the difference in weight between the average weight of crossbred females compared to the average weight of Karakul of Botoșani females is accentuated, obtaining a value of 40.3 kg in Karakul of Botoșani females and 46.97 kg in mixed-breed females, with an average daily gain of 223.9 g in Karakul of Botoșani females and 260.8 g in mixed-breed female.

Table 3. Evaluation of weight and growth gain at 6 months of females from the two groups

Statistical indicators	Body weight (kg)		Growth rate (g/zi)	
	Karakul Botoșani batch	Crossbred batch	Karakul Botoșani batch	Crossbred batch batch
N	15	15	15	15
$\bar{x} \pm s_{\bar{x}}$	40.3 ± 1.2	46.97 ± 1.28	223.9 ± 6.64	260.8 ± 7.09
Minimum	33.5	40	186	222
Maximum	48.5	58	269	322
Standard deviation	4.648	4.955	25.7	27.45
t value	3.802***		3.800***	

*** - statistically high significant differences (p<0.001).

According to the data summarized in Table 4, for the age of 1 year, it is observed that the average weight of the crossbred females is clearly higher than the average weight of the Karakul of Botoșani females, recording a significant difference of approximately 12.33 kg between the average weights. Also, the average daily gain was in favor of the crossbred females, recording 185.8 g/day. Although the average weight records significant differences, we can see that there are individuals with a fairly close maximum weight, respectively 77 kg in the case of the Karakul of Botoșani females and 80 kg in the case of the crossbred females. Starting with the weighing performed at 3 months of age,

differences of varying degrees of significance are observed in terms of body weight of the two batches, due to the heterosis effect resulting from the cross between Karakul de Botoșani ewes with meat breed rams and the selection applied within the meat line.

Table 4. Evaluation of weight and growth gain at 1 year of females from the two groups

Statistical indicators	Body weight (kg)		Growth rate (g/zi)	
	Karakul Botoșani batch	Crossbred batch	Karakul Botoșani batch	Crossbred batch batch
N	15	15	15	15
$\bar{x} \pm s_{\bar{x}}$	56.33 ± 2.31	68 ± 1.51	153.8 ± 6.29	185.8 ± 4.17
Minimum	41	62	112	169
Maximum	77	80	210	219
Standard deviation	8.95	5.855	24.36	16.17
t value	4.226***		4.239***	

*** - statistically high significant differences (p<0.001).

In addition to the body weight assessment, the females in the two groups were also assessed in terms of body dimensions, and the results of the periodic assessments, respectively at 3 months, 6 months and 1 year, are shown in Tables 5, 6 and 7. As can be seen in the data summarized in table no. 5, the only significant difference is recorded in terms of the average thoracic perimeter, which in the crossbred females has a value of 71.22 cm and in the Karakul of Botoșani females only 65.22 cm. At this age, only the chest circumference records a difference with a high degree of statistical significance, t=5.47, which demonstrates the positive effect of the meat breed ram on the development of lambs, and also the capacity of Karakul of Botoșani breed to adapt to meat production. This difference also explains the difference between the average weights of the females in the two groups, and thus the superior meat production capacity of the crossbred females is observed.

Table 5. Evaluation of body measurements at 3 months of age of females from the two groups

Measurements at 3 months of age	Withers height		Croup height		Chest circumference		Chest depth	
Lot	Karakul	Crossbred	Karakul	Crossbred	Karakul	Crossbred	Karakul	Crossbred
N	15	15	15	15	15	15	15	15
$\bar{x} \pm s_{\bar{x}}$ (cm)	54.46 ± 0.76	54.18 ± 0.8	56.79 ± 0.86	56.52 ± 0.89	65.22 ± 0.77	71.22 ± 0.78	25.71 ± 0.23	26.34 ± 0.36
Minimum (cm)	49	51	52	52	58	65	24	23
Maximum (cm)	62	62	65	63	69	77	27	29
Standard deviation (cm)	2.944	3.104	3.347	3.438	2.967	3.04	0.876	1.398
t value	0.253ns		0.218ns		5.47***		1.479ns	

ns - statistically insignificant differences
*** - statistically high significant differences (p<0.001).

At the 6-month and 1-year assessments, the aspects related to body dimensions are maintained, namely the crossbred females register a higher average value of the thoracic perimeter, obtaining at 6 months 89.4 cm compared to 79.87 cm recorded on the Karakul of Botoșani females and at one year 116.1 cm on the crossbred females compared to 104.1 cm on the Karakul of Botoșani females. At 6 months of age, the difference recorded in the thoracic perimeter retains its significance with a slight increase in the value t=6.308, and the depth of the chest records a difference with a significant significance for p<0.05. These differences are due to the increased development capacity of the crossbred females based on the selection applied within the meat line and the heterosis effect resulting from the crossing Karakul of Botoșani ewes with rams from meat breeds. At the age of 1 year, the body dimensions of the crossbred females are generally larger than the body dimensions recorded in the Karakul of Botoșani females, this aspect being also highlighted by the difference between the averages weights recorded in the two groups.

Table 6. Evaluation of body measurements at 6 months of age of females from the two groups

Measurements at 6 months of age	Withers height		Croup height		Chest circumference		Chest depth	
Lot	Karakul	Crossbred	Karakul	Crossbred	Karakul	Crossbred	Karakul	Crossbred
N	15	15	15	15	15	15	15	15
$\bar{x} \pm s_{\bar{x}}$ (cm)	67.27 ± 0.81	69.07 ± 0.87	69,8 ± 0.92	70.47 ± 0.87	79.87 ± 0.90	89.4 ± 1.21	33 ± 0.39	34.2 ± 0.34
Minimum (cm)	62	64	65	65	73	83	30	32
Maximum (cm)	75	76	79	78	85	96	36	36
Standard deviation (cm)	3.15	3.369	3.57	3.357	3.502	4.687	1.512	1.32
t value	1.511ns		0.529ns		6.308***		2.316*	

ns - statistically insignificant differences; * - statistically significant differences ($p<0.05$); *** - statistically high significant differences ($p<0.001$).

The values recorded in measurements taken at the age of 1 year show high significant differences in case of chest circumference and chest depth for $p<0.001$, and significant difference in withers height for $p<0.05$.

In 2019, the difference in body mass between the average values determined for the two groups based on the live weight determined at the age of 60 days was 3.26 kg and had a high statistical significance level for $p<0.05$ (Florea et al., 2019). According to the study conducted in 2021, at the age of 6 months the average weight of crossbred females was 38.12 kg, and in 2024 we have an average weight of 46.97 kg, and this aspect can only encourage us in our work to form a population specialized in meat production starting from Karakul of Botoșani females.

Table 7. Evaluation of body measurements at 1 year of age of females from the two groups

Measurements at 1 year of age	Withers height		Croup height		Chest circumference		Chest depth	
Lot	Karakul	Crossbred	Karakul	Crossbred	Karakul	Crossbred	Karakul	Crossbred
N	15	15	15	15	15	15	15	15
$\bar{x} \pm s_{\bar{x}}$ (cm)	75.6 ± 0.85	78.53 ± 1.00	77.2 ± 0.85	79.67 ± 0.99	104.1 ± 1.87	116.1 ± 1.70	36.53 ± 0.36	38.6 ± 0.41
Minimum (cm)	72	71	73	72	92	107	34	36
Maximum (cm)	84	86	85	87	116	128	38	41
Standard deviation (cm)	3.291	3.871	3.299	3.83	7.249	6.595	1.407	1.595
t value	2.233*		1.892ns		4.742***		3.769***	

ns - statistically insignificant differences; * - statistically significant differences ($p<0.05$); *** - statistically high significant differences ($p<0.001$).

The determinations and measurements carried out demonstrate increased aptitude for meat production of crossbred females compared to Karakul of Botoșani females, and taking into account that these females will constitute the future nucleus of mothers, then we can say that in addition to the objective of multiplying the population in the meat line, we also take into account its improvement.

CONCLUSIONS

The average birth weight of the females in the two groups did not show significant differences, but with a slight advantage of the Karakul of Botoșani females with 5.52 kg compared to 5.39 kg recorded in the crossbred females. Starting with the evaluation at 3 months, the average weight of the crossbred females was increasingly higher than the average weight of the Karakul of Botoșani females, reaching a difference of 12 kg at the age of 1 year, with the crossbred females having an average weight of 68 kg and the Karakul of Botoșani females only 56.33 kg.

Comparing the results obtained regarding the body weight of the crossbred females in 2024 with that obtained in a similar study in 2021, we can state that the results obtained in 2024 are superior to those in 2021 and at the age of 6 months the average weight is 46.97 kg in 2024 compared to 36.87 kg in 2021.

The differences recorded in body weight and measurements are due to both the reproduction carried out between breeds and the selection applied within the crossbred population.

Regarding body dimensions, during the analyzed period we can observe that there are differences with varying degrees of significance in terms of thoracic perimeter, chest depth and height at the withers, but which are in favor of the crossbred females, which at the age of 1 year have an average thoracic circumference of 116.1 cm compared to 104.1 cm in the Karakul of Botoșani females.

The growth rate recorded in the crossbred females was, during the analyzed period, better than the growth rate recorded in the Karakul of Botoșani females, recording at the age of 1 year 185.8g/day compared to 153.8 g/day recorded in the Karakul of Botoșani females.

The fact that the crossbred females had better results in terms of body weight and body dimensions during the analyzed period demonstrates their improved capacity for meat production and the fact that compared to the results obtained in 2021 we also have progress in these determinations encourages us to continue the breeding and selection work in order to form and consolidate a population specialized in meat production starting from the Karakul of Botoșani females.

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