Dairy productivity of sheep bred in the Republic of Moldova

Peter Lyutskanov*, Oleg Mashner
Scientific and Practical Institute of Biotechnologies in Zootechny and Veterinary Medicine
*Corresponding author: liutskanov@mail.ru

Citation: Lyutskanov, P., & Mashner, O. (2021). Dairy productivity of sheep bred in the Republic of Moldova. *Zhivotnovadni Nauki*, *58*(5), 32-37 (Bg).

Abstract

The article presents the materials of studying the milk productivity of local and imported sheep breeds and their crossbreeds. Udder and nipple measurements were taken from the studied sheep, and udder volumes were calculated on the basis of the measurement data. By the method of control yield, milk production has been studied during the suckling, milking period and lactation. The highest milk yield for a total lactation of 365.66 liters was obtained from Ostfrizian ewes and on second place the Assaf breed with a productivity of 355.52 liters, from the crossbred ewes ♀ Tsigay x ♂ Ostfrizian for lactation was obtained 290.15 liters of milk, and from ♀ Karakul x ♂ Awassi 326.30 liters with a reliable difference of $P \leq 0.001$ to the average data for the groups. The chemical composition of milk at Karakul sheep is significantly higher ($P \leq 0.001$), compared to the average for the studied breeds, and at Ostfrizian sheep and their crossbreeds with Tsigay ♀ Tsigay x ♂ Ostfrizian, the percentage of fat is lower, the other indicators are also significantly higher.

Key words: sheep breeds, crossbreeds, udder measurements, milkiness, lactation, chemical composition.

Introduction

Sheep breeding in the Republic of Moldova is an important sector of the national economy. It is associated with the production of valuable types of raw materials for light industry – semi-thin Tsigay and rough Karakul wool, karakul, sheepskins, as well as food products – lamb (lamb meat) and sheep milk processed into cheese and albumin cottage cheese. Sheep cheese and albumin cottage cheese are traditional foods, especially among residents of the south of the republic.

At the breeding of the main sheep breeds – Tsigay and Karakul milk production is low, which does not meet the needs of the internal market. In the sixties of the nineteenth century, the milk productivity of the Tsigay sheep of the local population for 140 days of lactation was 77.08 kg with a limit of 55.2–91.5 kg (Guzun, 1966). According to the data obtained by Dovbush F. M. in 1968, for two months of the milking period, 8.6 kg of milk were received per sheep. In 2005, a newly created Moldovan type of Tsigay sheep was approved, and in 2007 a copyright certificate was obtained, in which the milk productivity was 126.3 kg for 180 days of lactation, including 29.3 kg during the milking period (Buzu et al., 2007). The Moldovan type of Karakul sheep, created in 2007, for 166 days of lactation has a milk content of 76.6 liters of milk (Buzu et al., 2009).

In order to improve the milk productivity of local sheep in recent years, sheep have been brought in the dairy direction of the breed productivity of Ostfriz, Assaf, Bentheimer, Awassi.

The purpose of the research is to study the milk production of local and imported sheep and their crossbreeds.

Material and methods

The studies were carried out on sheep farms of LLC «Donastas-com», district Leova, LLC «Avikom-Agro» and «Turcan Andrey» farm, in the Orhei district. The objects of research were ewes of breed Tsigay, Karakul, Ostfrizian, Assaf and crossbreed of the ♀ Tsigay x ♂ Bentheimer, ♀ Tsigay x ♂ Ostfrizian and ♀ Karakul x ♂ Avassi. Udder measurements were carried out according to the method (Kirikov, 2006). Milk productivity in the suckling, milking period and lactation was studied by the method of control milk yields (Maşner et. al., 2013). The study of the chemical composition of milk was carried out on the device Lactoscan MCC.

Statistical processing of experimental results for assessment the significance of differences consisted in grouping the material, calculating the arithmetic mean (M), error (m), and reliability criterion (Plokhinsky, 1978).

Results of research

Over the study of the milk production of purebred and crossbred ewes, udder measurements were studied. Table 1 shows the data of measurements of udder and nipples at purebred Tsigay, Karakul, Ostfrizian and Assaf ewes.

Comparing the indicators of measurements obtained for each of the studied species in comparison with the average data, it should be noted that the length of the udder is shorter by 1.80 cm at Karakul sheep and by 0.30 cm at Ostfrizian sheep. The length of the udder of Tsigay and Assaf sheep in comparison with the average indices is greater by 0.60 cm. By the width of the udder, the results at two local breeds of Tsigay and Karakul is less in comparison with average values, and at imported Ostfrizian and Assaf is higher, the biggest difference is 1.01 cm at Ostfrizian sheep. The depth of the udder of Tsigay sheep is by 3.17 cm less, and on the rest of the breeds are bigger and more reliable on Assaf ewes by 4.83 cm ($P \leq 0.001$). The obtained data on the perimeter of the udder are identical to the depth of the udder, that is, for Tsigay sheep it is less by 3.89 cm, and for the rest of the sheep for Assaf breed the difference is significant – 7.31 cm ($P \leq 0.001$). On the base of measurements is calculated the udder volume. By volume, the largest udder is at Assaf sheep it is 3599.4 cm^3, which is higher than the average data by 1488.7 cm^3 ($P \leq 0.001$).

Udder nipple measurements showed that along their length there is a big difference in comparison with the average data only at sheep of the Assaf breed. According to the diameter of the nipples to the sheep breed Assaf were added Karakul, which significantly exceed the average by 0.61 cm ($P \leq 0.001$) and Assaf ewes by 0.93 cm ($P \leq 0.001$).

The purpose of the research was to study the milk productivity of local and imported sheep breeds and their crossbreeds. Milk production for the full lactation consists of milk production

Table 1. Udder measurements (M ± m), cm

Measurements	Sheep breeds				
	Karakul n = 10	Tsigay N = 15	Ostfrizian n = 20	Assaf n = 15	Average N = 60
Udder:Length	15.40 ± 0.40	17.80 ± 0.58	16.90 ± 0.43	17.80 ± 1.24	17.20 ± 0.25
Width	13.00 ± 0.31	12.80 ± 0.37	14.40 ± 0.50	13.50 ± 0.75	13.39 ± 0.20
Depth	19.00 ± 0.54	14.80 ± 0.37	19.80 ± 0.85*	22.80 ± 1.34***	17.97 ± 0.25
Perimeter	39.00 ± 1.41	33.40 ± 1.36	38.60 ± 0.66	44.60 ± 1.48***	37.29 ± 0.28
Volume	2302.7 ± 159.3	1377.0 ± 109.9	2370.4 ± 160.4	3599.4 ± 262.7***	2110.7 ± 63.9
Nipples:Length	3.00 ± 0.15	3.10 ± 0.18	3.10 ± 0.26	3.62 ± 0.27	3.16 ± 0.10
Diameter	2.02 ± 0.10***	1.16 ± 0.05	1.00 ± 0.06	2.34 ± 0.17***	1.41 ± 0.03

*$P \leq 0.05$; ***$P \leq 0.001$

in the suckling and milking periods. For four breeds, the lactation period ranged from 209.5 days at sheep of the Tsigay breed to 242.9 days at the Ostfrizian breed. On average, it was 225.96 days (table 2).

Milkiness for lactation at imported dairy sheep is higher in comparison with local sheep, as well as with data on average on the four studied breeds. The highest productivity in Ostfrizian ewes is 365.66 liters and in second place is the Assaf breed with a productivity of 355.52 liters. Comparing with indicators of average milk yield for lactation, we note that they are higher by 141.01 liters and 130.87 liters, respectively, the difference in both cases is significant – $P \leq 0.001$. Considering, that the duration of the lactation period in these two breeds is different, we calculated the average daily milk yield.

At Assaf sheep, it was 1.520 liters, which is by 20 ml higher in relation to Ostfrizian sheep. Comparing the average daily milk yield with the average for the four breeds, we note that at Assaf sheep it is higher by 0.550 ml ($P \leq 0.001$) and at the Ostfrizian breed by 0.530 ml ($P \leq 0.001$). Moldovan local sheep have milkiness for lactation lower than in relation to the average data for the group, and for dairy sheep productivity. The local Moldovan sheep of the combined direction of productivity: Tsigay wool-meat-dairy and karakul pelt-meat-dairy, therefore, productivity is lower. From Tsigay ewes for lactation, the results were 111.18 liters less and from Karakul by 79.37 liters compared to the average data, respectively, and the average daily milk yield is less by 0.430 and 0.346 ml.

During the period of research, milk samples were taken and was studied the chemical composition of milk according to the content of fat, dry defatted milk residue, protein, lactose and density (table 3).

By the karakul breed the obtained indicators of the chemical composition of milk is significantly higher in comparison with the average on fat by 6.3 g/kg; DDMR 5.3 g/kg; protein 2.5 g/kg; lactose 2.3 g/kg; and density by 1.43 A°. At Tsigay sheep, only fat exceeds by 6.5 g/kg; the rest is lower. At Ostfrizian sheep, only the percentage of fat is lower and this is natural, of all

Table 2. Milk productivity (M ± m)

Breed	n	Number of days	Milk productivity, l	Average daily yield, ml
For the full lactation				
Karakul	10	232.80 ± 1.08	145.28 ± 13.30	0.624 ± 0.05
Tsigay	15	209.50 ± 2.09	113.47 ± 17.01	0.540 ± 0.03
Ostfrizian	20	242.90 ± 1.91	365.66 ± 13.16***	1.500 ± 0.05***
Assaf	15	234.60 ± 2.11	355.52 ± 27.62***	1.52 ± 0.12***
On average	60	225.96 ± 1.05	224.65 ± 8.99	0.97 ± 0.03

$^{***}P \leq 0.001$

Table 3. The chemical composition of milk (M ± m), %

Breed	n	Fat	DDMR	Protein	Lactose	Density, A°
Karakul	10	8.71 ± 0.15***	9.11 ± 0.07***	4.32 ± 0.03***	4.08 ± 0.03***	28.83 ± 0.29***
Tsigay	15	8.73 ± 0.15***	8.40 ± 0.09	3.98 ± 0.04	3.77 ± 0.04	26.05 ± 0.29
Ostfrizian	20	7.44 ± 0.02	8.83 ± 0.01***	4.19 ± 0.01***	3.97 ± 0.01***	28.74 ± 0.04***
Assaf	15	6.79 ± 0.15	8.11 ± 0.06	3.85 ± 0.03	3.64 ± 0.03	26.42 ± 0.18
On average	60	8.08 ± 0.06	8.58 ± 0.03	4.07 ± 0.02	3.85 ± 0.02	27.39 ± 0.11

$^{***}P \leq 0.001$

the sheep studied, the highest milk yield per lactation is 365.66 liters, and at high milking animals, the percentage of fat is always lower. For Assaf breed ewes, the data obtained are lower than the average calculated indices.

In the second part of the studies, the same indicators were studied and at the crossbred sheep obtained on the maternal basis of local sheep of the Tsigay and Karakul breeds (table 4). Comparing the taken udder measurements with the calculated average values, we note that in ♀ Tsigay x ♂ Bentheimer crossbreeds, only the length and width of the udder exceed the averages and on the length of the udder the difference is $P \leq 0.05$. At the second group of studied crossbreeds on the Tsigay basis ♀ Tsigay x ♂ Ostfrizian all indicators are below average, but if to compare with ♀ Tsigay x ♂ Bentheimer, then the udder depth is the same, and the perimeter and volume are higher by 0.8 cm and 31.6 cm^3, respectively.

Unlike the previous crossbreeds of the ewe ♀ Karakul x ♂ Awassi, obtained by crossing breeding rams of the Awassi breed of the milk-and-meat direction of productivity with the Karakul ewe breeds, the obtained udder and nipple measurements are higher compared with the average data. The volume of the udder indicates a fairly high milkiness, and the length and diameter of the nipples of good suitability for machine milking. In comparison with the crossbreed ewes on Tsigay basis, the length of the udder is shorter by 1.45 cm in relation to ♀ Tsigay x ♂ Bentheimer and the width of the udder is 1.25 cm and 0.65 cm, respectively, to both crossbreed groups.

Table 5 presents the milk production of three crossbreed groups of ewes. The lactation pe-

Table 4. Udder measure

Measurements	Crossbreed			
	♀ Tsigay x ♂ Bentheimer n = 15	♀ Tsigay x ♂ Ostfrizian n = 20	♀ Karakul x ♂ Awassi n = 10	On average
Udder:				
Length	20.20 ± 0.66*	15.80 ± 0.47	18.75 ± 1.09	18.48±0.40
Width	14.00 ± 0.44	13.40 ± 0.50	12.75 ± 0.73	13.85±0.30
Depth	17.80 ± 0.37	17.80 ± 0.65	23.88 ± 1.11***	18.64±0.33
Perimeter	33.80 ± 0.37	34.60 ± 1.03	43.75 ± 0.55**	35.45±0.37
Volume	1694.4 ± 54.77	1726.00 ± 148.12	3641.97 ± 222.01***	1973.93±61.74
Nipples:				
Length	3.06 ± 0.11	3.10 ± 0.15	3.60 ± 0.00***	3.15 ± 0.07
Diameter	1.10 ± 0.04	0.98 ± 0.05	2.28 ± 0.38*	1.22 ± 0.04

*$P \leq 0.05$; **$P \leq 0.01$; ***$P \leq 0.001$

Table 5. Milk productivity (M ± m)

Crossbreed	n	Number of days	Milk productivity, l	Average daily milk yield
For the full lactation				
♀ Tsigay x ♂ Bentheimer	15	212.07 ± 2.06	130.34 ± 8.55	0.600 ± 0.05***
♀ Tsigay x ♂ Ostfrizian	20	247.80 ± 0.68	290.15 ± 13.40***	1.170 ± 0.05***
♀ Karakul x ♂ Awassi	10	231.75 ± 1.28	326.30 ± 25.46***	1.41 ± 0.10***
On average	45	227.45 ± 0.97	212.48 ± 7.20	0.91 ± 0.03

***$P \leq 0.001$

riod ranges from 212.07 to 247.8 days, with an average of 227.45 days for the group. 130.34 liters of milk were obtained from the crossbreed sheep ♀ Tsigay x ♂ Bentheimer for lactation, and from ♀ Tsigay x ♂ Ostfrizian 290.15 liters or by 159.81 liters higher. This is the result of the fact that of the two breeds used in crossing with Tsigay sheep for the purpose of increasing milk productivity, the genetic potential of the Ostfrizian breed is higher than of the Bentheimer breed. Milkiness for lactation at ♀ Tsigay x ♂ Ostfrizian crossbreeds is higher compared to the average of 77.67 liters ($P \leq 0.001$) and at ♀ Karakul x ♂ Awassi from which is obtained 326.3 liters of milk is also higher by 113.82 liters ($P \leq 0.001$).

The average daily milk yield of ♀ Tsigay x ♂ Ostfrizian and ♀ Karakul x ♂ Awassi ewes is significantly higher compared to the average and amounted to 1.17 and 1.41 liters of milk, respectively.

Analyzing the chemical composition of milk presented in table 6, it should be noted that at crossbreed ewes ♀ Tsigay x ♂ Bentheimer, all the indicators except for the percentage of fat, which is significantly higher by 8.1 g/kg. ($P \leq 0.01$) is lower on the average by the data for the group of crossbred sheep. At crossbred ewes ♀ Tsigay x ♂ Ostfrizian, the pattern is reversed, the percentage of fat is lower by 8.9 g/kg. and the rest of the indicators are significantly higher: dry defatted residue by 2.5 g/kg ($P \leq 0{,}001$), protein by 1.2 g/kg, ($P \leq 0.001$), lactose on 2.5 g/kg, ($P \leq 0.01$) and density by 1.57 A° ($P \leq 0.001$).

At crossbred ewes ♀ Tsigay x ♂ Ostfrizian the pattern is reverse, the percentage of fat is lower by 8.9 g/kg, and the rest of the indicators are significantly higher: dry defatted residue by 2.5 g/kg. ($P \leq 0.001$), protein by 1.2 g/kg ($P \leq 0.001$), lactose by 2.5 g/kg ($P \leq 0.01$) and density by 1.57 A° ($P \leq 0.001$). The data obtained by the crossbreeds ♀ Karakul x ♂ Awassi are lower than the average for all the crossbreeds.

Conclusions

The studied dimensions of the udder and nipples are higher at Assaf purebred ewes in relation to the average data of Karakul, Tsigay and Ostfrizian sheep breeds and at crossbreed ewes ♀ Karakul x ♂ Awassi in relation to the average data with crossbreeds ♀ Tsigay x ♂ Bentheimer and ♀ Tsigay x ♂ Ostfrizian. Milkiness for lactation at imported dairy sheep is higher in comparison with local sheep, as well as with averages indicators for the four studied breeds. The highest productivity is at Ostfrizian ewes 365.66 liters and on the second place is the Assaf breed with a productivity of 355.52 liters, from crossbred ewes ♀ Tsigay x ♂ Ostfrizian for lactation was received 290.15 liters of milk and from ♀ Karakul x ♂ Awassi 326.30 liters with a significant difference of $P \leq 0.001$ to the average data for the groups. The chemical composition of milk at Karakul sheep is significantly higher ($P \leq 0.001$), compared to the average for the studied breeds, and at Ostfrizian sheep and their crossbreeds with Tsigai ♀ Tsigay x ♂ Ostfrizian, the percentage of fat is lower, the other indicators are also significantly higher.

Literature

Buzu, I., Dovus, F., Maşner, O., Liuţcanov, P., Buboc, E., Radionov, V., Darie, G., Arnautov, S., Ru-

Table 6. The chemical composition of milk (M ± m),%

Crossbreed	n	Fat	DDMR	Protein	Lactose	Density, A^0
♀ Tsigay x ♂Bentheimer	15	8.49 ± 0.27**	8/55 ± 0.09	4.05 ± 0.04	3.83 ± 0.04	26.83 ± 0.20
♀ Tsigay x ♂ Ostfrizian	20	6.79 ± 0.02	8.83 ± 0.01***	4.19 ± 0.00***	3.97 ± 0.01**	29.26 ± 0.03***
♀ Karakul x ♂ Awassi	10	6.88 ± 0.15	8.08 ± 0.09	3.83 ± 0.04	3.63 ± 0.04	26.23 ± 0.47
On average	45	7.68 ± 0.11	8.58 ± 0.04	4.07 ± 0.02	3.85 ± 0.02	27.69 ± 0.10

$^{**}P \leq 0.01$; $^{***}P \leq 0.001$

sandu, N., Camenschic, S., Cereseu, S., Scripnic, M., & Babenco, V. (2007). Sheep elite type *(Ovis aries L.)* Moldovan Tigaiy. Patent No. MD 3440. G2 of 31.12.2007. AGPI, Kishinau.(Md).

Buzu, I., Evtodienco, S., Tentiuc, S., Maşner, O., Liuţcanov, P., Scripnic, A., Zelinschii, N., Nazarco N., Prozorovschii, I., & Moroz, P. (2009). Sheep type *(Ovis aries L.)* Moldovan Karakul. Patent no. 3825 G2 of 28.02.2009. AGPI, Kishinau. (Md).

Guzun, V. A. (1996).Technology of milk and dairy products. *Methodical instructions.* Kishinau, p. 66. (Md).

Dovbush, F. M. (1968). Sheep in the farm „Victory". „Moldovan Book", Kishinau. (Md).

Kirikova, T. N. (2006). Exterior and interior features of Romanov sheep breed, depending on the multiplicity. *Abstract of dissertation for the degree of candidate of agricultural sciences.* Komstromskaya State Agricultural Academy. 2006. – p.36. (Ru).

Plokhinsky, N. A. (1978). Mathematical methods in animal husbandry. *Moscow University Press*. 265 p. (Ru).