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USE OF RAMS OF IMPORTED BREEDS FOR INCREASING THE MILK PRODUCTIVITY OF TSIGAY BREED SHEEP

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Abstract

A number of studies have been performed on growth and development of ewe lambs of Tsigay breed and Bentheimer cross breeds at birth, and when they were 3-3.5, 6-7 and 12-13 months-old. At the age of 12-13 months, body measurements have been done and build indexes have been calculated. Milk productivity of Tsigay ewes and ♀Tsigay x ♂Bentheimer cross breeds of first and second lactation has been measured during first 20 days after parturition.

Milk productivity is presented during milking period, and chemical composition of Tsigay sheep milk is compared with that of mixed bred ewes produced by crossing with Bentheimer rams at first lactation.

Key words: sheep, lambs, cross breed, lactation, milk, fat, protein, milk productivity

Introduction

Sheep is an animal with versatile productivity and can compete with any livestock species, providing at the same time meat, wool, milk, lamb skin for hats and neckpieces, and sheepskin for fur coats and other products.

Recently, sheepskin and even Karacul skin have become unprofitable at most of the farms because of low prices for wool. It is due, in no small part to lack of adequate government support and unestablished market conditions. All this led to the reduction in the number of sheep and, as result, the need of sheep milk and increase of meat marketable productivity arose.

Taking into consideration internal and external markets requirements for sheep milk products, many countries' sheep breeding selection is focused on sheep milk productivity increase with the use of different races specialized in this aspect. Moreover, these breeds are used for obtaining and exploitation of commercial livestock (cross-breed) and for creation of new types and specific lines.

Two new types of sheep were created in Republic of Moldova – Tsigay sheep of wool, meat and milk purpose (Buzu et.al., 2005) and Karakul sheep of fur, meat and milk purpose (Buzu et. al., 2007). Currently, some research of milk productivity increase is being performed with half-fine wool breed.

Materials and Methods

The objects of research are Tsigay ewes, Bentheimer stud rams of milk line, mixed bred young stock resulting from cross-breeding. Growth and development of lambs were studied by means of individual weighting of young stock at birth, at the age of 3-3.5 months and at the age of 6-7 months by conventional methods, but at the age of 12-13 months classified evaluation is used, according to "Instruction on valuation of half-fine wool breed sheep with elements of stock breeding" (1997). Ewes' milking ability in first twenty days after parturition was determined by product of weight gain by ratio 5.35 (amount of milk spent on obtaining of one kilogram of weight gain). When studying the exterior of 10 Tsigay ewes and 10 mixed bred ewes of F_1 and 10 of F_2, body measurements have been done and main build indexes have been calculated (Krasota et. al., 1976). Udder measuring was taken at 12 ewes of first and second lactation of pure Tsigay breed and F_1 ♀Tsigay x ♂Bentheimer cross breed (Kirikova, 2006).

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Milk productivity in lactation period was studied by carrying out control milks (Instruction, 2013). Chemical composition of milk was analyzed on the device Lactoscan MCC.

Statistical analysis of experimental results with the purpose of evaluating the significance of differences consisted in classification of material, calculating arithmetic mean value (M), error (m) and validation criterion (Plokhinskiy, 1978).

Results and Discussion

The results of ewes' growth and development obtained at different age periods (Table 1) demonstrate that live weight at birth is higher in Tsigay ewes than in mixed bred. Mixed bred ewes ♀(♀Tsigay x ♂Bentheimer) x ♂Bentheimer are characterized by high growth dynamics in the suckling period in comparison with their herdmates ♀Tsigay x ♂Bentheimer and Tsigay. Average live weight at the age of 3.5 months was 22.10 ± 0.42 kg, which is higher by 0.5 kg as compared with ♀Tsigay x ♂Bentheimer sheep and by 0.63 kg as compared with Tsigay sheep.

From the moment of weaning till the age of 6-7 months, capacity for survival of mixed bred young stock is high, meaning that climatic adaptation is good. For this period live weight of ♀(♀Tsigay x ♂Bentheimer) x ♂Bentheimer ewes was 29.57±0.86 kg, which was higher by 2.95 kg as compared with ♀Tsigay x ♂Bentheimer sheep and by 2.47 kg as compared with Tsigay sheep.

At the age of 12-13 months ♀(♀Tsigay x ♂Bentheimer) x ♂Bentheimer ewes have reached live weight of 43.50±0.78 kg, and their herdmates of ♀Tsigay x ♂Bentheimer and pure Tsigay breed had 41.72±0.41 kg and 41.92±0.31 respectively.

For exterior studying of the analyzed ewes (10 animals of each group) body measures were taken (Table 2) and body built indexes were calculated: overextension, thoracic index, blockiness and index of bone (Table 3).

Withers height, height at hips, scapulo-ischial length, chest width, pastern girth and live weight were higher at Tsigay ewes as compared to mixed bred ewes. Mixed bred ewes of ♀(♀Tsigay x ♂Bentheimer) x ♂Bentheimer breed had higher indexes of chest width and chest girth, as compared to pure Tsigay and ♀Tsigay x ♂Bentheimer cross breed, while scapulo-ischial length, pastern girth and live weight were higher than at ♀Tsigay x ♂Bentheimer ewes.

Cross breed ♀(♀Tsigay x ♂Bentheimer) x ♂Bentheimer had higher values at all body built indexes, as compared to Tsigay and ♀Tsigay x ♂Bentheimer breeds. Cross breed ♀(♀Tsigay x ♂Bentheimer) x ♂Bentheimer ewes exceed Tsigay ewes by 1.1% in terms of overextension, 3,6% at thoracic

Table 1
Live weight of ewes at different ages, kg

Breed and cross breed	Age, months							
	At birth		3 – 3.5		6 – 7		12-13	
	n	M±m	n	M±m	n	M±m	n	M±m
Tsigay	178	4.00±0.05	178	21.47±0.25	63	27.14±0.56	109	41.92±0.31
♀Tsigay x ♂Bentheimer	152	3.68±0.05	152	21.60±0.27	151	26.62±0.32	84	41.72±0.41
♀(♀Tsigay x ♂Bentheimer) x ♂Benth	77	3.61±0.06	77	22.10±0.42	19	29.57±0.86	14	43.50±0.78

Table 2
Body measures of ewes at the age of 12-13 months, cm

Indexes	Tsigay	♀Tsigay x ♂Bentheimer	♀(♀Tsigay x ♂Bentheimer) x ♂Bentheimer
Height at the withers	68.90±0.82	66.10±0.79	66.60±0.93
Height at hips	71.80±0.84	69.30±0.71	69.90±1.29
Scapulo-ischial length	69.30±1.06	67.10±0.62	67.70±0.79
Chest width	30.50±0.61	30.60±0.47	30.80±0.84
Chest depth	35.80±0.81	35.00±0.63	34.60±0.72
Chest girth	106.7±1.66	107.4±1.88	108.5±1.90
Pastern girth	7.45±0.11	7.05±0.21	7.40±0.16
Live weight, kg	40.20±0.48	39.00±0.29	40.10±1.08

index, 5,8% at blockiness and 0.3% at the index of bone; as compared to ♀Tsigay x ♂Bentheimer ewes, the excess of the same indexes was 0.2%, 1.4% 0.2% and 0.5% respectively.

From evidence derived after growth and development analysis, we can conclude that ewes of ♀(♀Tsigay x ♂Bentheimer) x ♂Bentheimer cross breed on the studied parameters exceed pure Tsigay and ♀Tsigay x ♂Bentheimer cross breed.

When studying the influence of using Bentheimer stud rams of milk type imported from Germany with the purpose of milk productivity increase at Tsigay breed, cross breed ♀Tsigay x ♂Bentheimer bred in Republic of Moldova and pure Tsigay sheep on first and second lactation, following parameters were analyzed: udder measures, milking ability in first twenty days after parturition, milk productivity during first lactation and chemical composition of milk.

Udder measures taken at Tsigay ewes and ♀Tsigay x ♂Bentheimer ewes at first and second lactation compared together, demonstrate that ♀Tsigay x ♂Bentheimer values are higher than those of Tsigay sheep both of first and second lactation (Table 4).

The values of second lactation are higher than those of the first. One of the main measures specific for the udder – udder volume – is higher by 349 cm^3 at first lactation and by 254 cm^3 at second lactation. Udder width and depth at second lactation are larger by 1.8 cm ($P \leq 0.05$) and 1.49 cm ($P \leq 0.01$) respectively, as compared with Tsigay ewes.

Milking ability of pure Tsigay and cross bred F_1 ♀Tsigay x ♂Bentheimer ewes during the first twenty days after parturition at first and second lactation is present in Table 5.

At first lactation milking ability of cross bred ewes with single-born offspring is higher by 1.65 l ($P \leq 0.001$) and – of those with twin offspring is higher by 0.5 l, in comparison with Tsigay ewes. At an average milking ability of F_1 ewes is higher by 1.41 l ($P \leq 0.01$) compared with Tsigay ewes.

Table 3
Indexes of body built of mixed bred ewes at the age of 12-13 months

Indexes	Tsigay	♀Tsigay x ♂Bentheimer	♀(♀Tsigay x ♂Bentheimer) x ♂Bentheimer
Overextension	100.64±1.50	101.55±0.72	101.71±0.87
Thoracic index	85.38±1.71	87.59±1.62	88.99±1.34
Blockiness	154.45±4.18	160.03±2.17	160.26±2.05
Index of bone	10.81±0.20	10.65±0.26	11.11±0.18

Table 4
Udder measures of ewes at first and second lactation, cm

Breed	Measures	1st lactation			2nd lactation		
		M±m	σ	Cv, %	M±m	σ	Cv, %
Tsigay	Length	17.91±0.45	1.56	8.73	18.16±0.32	1.11	6.13
	Width	13.25±0.49	1.66	12.50	13.33±0.38*	1.30	9.80
	Depth	17.33±0.38	1.30	7.52	17.42±0.36**	1.25	7.10
	Girth	38.25±0.83	2.89	7.57	39.08±0.51	1.78	4.55
	Dug length	3.42±0.12	0.42	12.05	3.71±0.13	0.45	12.13
	Dug girth	0.52±0.03	0.10	20.10	0.55±0.02	0.08	15.66
	Udder volume, cm^3	2367±130	450	19.00	2864±127	439	15.32
♀Tsigay x ♂Bentheimer	Length	18.50±0.26	0.90	4.89	18.91±0.39	1.37	7.28
	Width	13.75±0.41	1.42	10.34	14.41±0.31	1.08	7.51
	Depth	18.00±0.49	1.71	9.50	18.91±0.37	1.31	6.93
	Girth	38.67±0.40	1.37	3.53	39.83±0.67	2.32	5.84
	Dug length	3.45±0.11	0.39	11.46	3.75±0.18	0.65	17.52
	Dug girth	0.54±0.03	0.12	20.79	0.56±0.04	0.15	27.41
	Udder volume, cm^3	2716±206	714	26.33	3118±176	611	19.6

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

When analyzing the milking ability of second lactation ewes, the trend persists. Milking ability of cross bred ♀Tsigay x ♂Bentheimer ewes with single-born offspring is higher by 0.94 l ($P \leq 0.01$), with twins by 1.97 l, and the group average – by 1.88 l ($P \leq 0,01$).

The first milk control was carried out ten days after weaning. The second milk control took place 34 days after, and the third in 29 days, all performed according to the specific instruction (Instruction, 2013).

Every milk control required average daily milk production by groups to be calculated (Table 6). Cross breed ♀Tsigay x ♂Bentheimer demonstrated higher milk productivity as compared to Tsigay ewes during first control milk by 121.8 ml; during second control milk – by 79.4 ml and during third – by 95.6 ml ($P \leq 0.05$).

Based on the data obtained, milk productivity was calculated for standard 120 days of milking period and amounted to 49.81 l for Tsigay ewes, whereas cross bred ♀Tsigay x

Table 5
Milking ability of ewes during the first 20 days at first and second lactation

Parameters			n	M ± m, l	σ	Cv,%
1st lactation	Single-born	♀Tsigay x ♂Bentheimer	33	26.33±0.24***	1.35	5.1
		Tsigay	48	24.68±0.23	1.58	6.4
	Twins	♀Tsigay x ♂Bentheimer	4	31.03±0.64	1.29	4.1
		Tsigay	7	30.53±2.21	3.12	3.3
	Total	♀Tsigay x ♂Bentheimer	37	26.84±0.33**	1.99	7.4
		Tsigay	55	25.43±0.36	2.67	10.5
2nd lactation	Single-born	♀Tsigay x ♂Bentheimer	33	27.13±0.25**	1.45	5.3
		Tsigay	48	26.19±0.27	1.85	7.1
	Twins	♀Tsigay x ♂Bentheimer	10	33.23±0.65	2.05	6.2
		Tsigay	5	31.26±1.27	3.2	2.8
	Total	♀Tsigay x ♂Bentheimer	43	28.55±0.47**	3.05	10.7
		Tsigay	53	26.67±0.34	2.44	9.2

*** $P \leq 0.001$ ** $P \leq 0.01$

Table 6
Milk productivity during milking period of ewes of the first lactation

Name		Tsigay	♀Tsigay x ♂Bentheimer
Suckling period, days		104.2±7.5	104.6±7.9**
First control milk, ml (July, 4)		625.6±48.9	747.4±51.8*
Second control milk, ml (August, 7)		410.3±36.8	489.7±38.3
Third control milk, ml (September, 4)		239.3±19.64	334.9±31.06
Milking period, days	Weaning – 1st control milk	10	15
	3rd control milk – end of milking	10	25
	1st -2nd control milks	34	34
	2nd- 3rd control milks	29	29
Number of milking days		88	88
Milking ability for the milking period, ml			
(1st x 25) + (2nd x 34) + (3rd x 29)		36530	45047
For 120 days, ml		49814	61428
+ / - to Tsigay, ml		-	+ 11614
+ / - to Tsigay, %		0	+ 23.3
Average daily milk productivity, ml		415.1	512.2
+ / - to Tsigay, ml		-	+ 97.1

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

Table 7
Chemical composition of milk during milk controls of the first lactation ewes

Parameters	Control milk			For the whole period
	1st	2nd	3rd	
	July 4, 2014	August 7	September 4	
Tsigay				
Fat	8.47±0.61	9.66±0.67	11.68±0.66	9.93±0.43
Nonfat milk solids	8.28±0.39	11.33±0.23	11.10±0.19	10.23±0.30
Density	26.95±0.63	36.77±0.41	34.34±0.31	32.68±0.81
Lactose	3.72±0.17	5.09±0.11	4.97±0.08	4.59±0.13
Salts	0.60±0.02	0.83±0.01	0.79±0.01	0.74±0.02
Protein	3.92±0.19	5.37±0.11	4.85±0.13	4.85±0.13
♀Tsigay x ♂Bentheimer				
Fat	8.57±0.26	10.48±0.60	11.28±0.41	10.11±0.42
Nonfat milk solids	9.69±0.15	11.27±0.19	10.98±0.29	10.64±0.21
Density	31.05±0.53	35.92±1.09	34.15±1.48	33.70±1.03
Lactose	4.35±0.06	5.06±0.08	4.92±0.13	4.77±0.09
Salts	0.71±0.01	0.81±0.01	0.78±0.02	0.76±0.01
Protein	4.60±0.07	5.34±0.09	5.20±0.13	5.04±0.09

♂Bentheimer ewes reached 61.43 l, which was 11.62 l (23.3%) more than the pure Tsigay sheep.

Average daily milk production for the whole milking period of Tsigay sheep amounted to 415.1 ml, and to 512.2 ml - of cross bred ♀Tsigay x ♂Bentheimer sheep.

While performing milk controls by groups, a general sample of milk was taken during morning, lunchtime and evening milking operations; the chemical composition of milk was analyzed on the device Lactoscan MCC. Table 7 shows average data of the first, second and third milk controls – morning, noon and evening.

For the whole period the parameters of the chemical composition of milk of cross breed ♀Tsigay x ♂Bentheimer, such as fat percent, nonfat milk solids, density, lactose, salts and protein content, were higher by 0.18; 0.41; 1.02; 0.18; 0.02 and 0.19 units respectively.

Conclusions

Cross bred ♀(♀Tsigay x ♂Bentheimer) x ♂Bentheimer ewes exceed the pure Tsigay and ♀Tsigay x ♂Bentheimer sheep by the parameters studied in terms of growth and development.

Comparing the udder measures of Tsigay breed and ♀Tsigay x ♂Bentheimer cross breed ewes at the first and second lactation, it should be pointed out that udder parameters of ♀Tsigay x ♂Bentheimer cross breed are higher at both the first and second lactation.

Milk productivity of cross bred ewes at the first lactation during first twenty days after the parturition with single-born offspring is higher by 1.65 l ($P \leq 0.001$), as compared to Tsigay ewes, and by 0.5 l in comparison with twin offspring. At the average, milk productivity of F_1 ewes is higher than that of Tsigay by 1.41 l ($P \leq 0.001$); at second lactation it is higher by 0.94 l, 1.97 l and 1.88 l ($P \leq 0.01$) respectively.

Cross breed ♀Tsigay x ♂Bentheimer milk productivity during the milking period is higher than pure Tsigay ewes' productivity; at the first control milk – by 121.8 ml, at the second – by 79.4 ml, and at the third – by 95.6 ml ($P \leq 0.05$). Milk productivity for the standard 120 days of milking period of Tsigay sheep reached 49.81 l, whereas ♀Tsigay x ♂Bentheimer sheep produced 61.43 l. which was 11.62 l (23.3%) more.

For the whole period the parameters of the chemical composition of milk of cross breed ♀Tsigay x ♂Bentheimer, such as fat percent, nonfat milk solids, density, lactose, salts and protein content, were higher by 0.18; 0.41; 1.02; 0.18; 0.02 and 0.19 units respectively.

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