

# Milking capacity, composition and some properties of milk from Karakachanska, Srednostaroplaninska and Tetevenska sheep breeds

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Study of the milking capacity, the composition and some properties of milk of sheep from Karakachanska breed, Srednostaroplaninsko and Tetevensko varieties was made.

The results of this study showed that the milking capacity varied from 71.40 l in Tetevensko variety to 57.15 l in Karakachanska breed.

The average daily value of the milking capacity was the highest in the three groups at 1<sup>st</sup> control (in April) and it was in the limits from 0.720 l in Tetevensko variety to 0.560 l in Karakachanska breed. Tendency of the highest average daily milking capacity in all four controls in Tetevensko variety was observed.

Regarding to the quality milk composition the differences between the groups were minimal.

The highest percentage of casein – 4.25 had the milk from Tetevenski sheep and the best milking curdling capacity – 218 s. The milk from Karakachanska breed had the slowest curdling.

**Key words:** milking capacity; milk composition; percentage of fat; lactose; dry matter; dry fatless residue; milk density; curdling capacity

## Introduction

The native sheep breeds have been an object of study over the recent years. These sheep have been included in the Breeding Programme of the Association for Conservation of the National Livestock Gene Bank in Bulgaria. These breeds have been and are a basis for the creation of new highly productive sheep breeds.

The indices characterizing the composition, the properties and the technological qualities of sheep milk, produced from different breeds, varieties and crossbreeds in our country have been a object of the research of many authors – *Hlebarov (1933)*, *Savov et al. (1951)*, *Djorbineva et al. (1985)*, *Georgiev (1990)*, *Velev et al. (1984)*, *Djorbineva (1992)*, *Dimov et al. (1997)*, *Odjakova et al. (2002)*, *Pejchevski et al. (1998)*, *Petrova et al. (1998)*.

*Bajkov (1915)* wrote that the Karakachanska breed was reared mainly for milk. *Hinkovski et al. (1984)* announced that from a ewe, in all the period, about 40 l were gained, *Hlebarov (1940)* announced about 74.78 l for milking period of 198 days with 0.378 l average daily milking capacity. According to *Aleksieva (1977)*, the average milking capacity from Karakachanska sheep breed, for the milking period, was 61.88 l with hesitations from 25.33 l to 140.40 l.

The aim of this study was to investigate the milking productivity, composition and some properties of milk in ewes of Karakachanska breed, Tetevensko and Srednostaroplaninsko variety, all of them reared in the region of Central Balkan Mountains.

## Materials and methods

The study was performed during the milking period, from the weaning of lambs in April to the end of July. Three groups of milking ewes were included in the study and they were typical representatives of the breeds according to the requirements of the Breeding Programme of the 'Association for breeding Tsigai and Native sheep breeds'.

56 ewes from Karakachanska breed were included in the first group, 35 in the second one – from Srednostaroplaninsko variety and 29 – in third one – from Tetevensko variety. The trial sheep groups were reared according to the adopted systems for indoor management in winter and summer-pasture rearing in April and May in the foothill regions and from June to the middle of September at high mountain pasture.

For determining the milking productivity and milk composition each months controls of the ewes were conducted and individual milk samples of 50 ml milk were taken. Collected milk samples were taken at the corresponding controls as to be determined some of the milk properties. The milk samples were examined according to the accepted methods, in the Milking Laboratory in the Research Institute of Mountain Stockbreeding and Agriculture in Troyan.

The results were processed using statistical variation techniques.

## Results and discussion

The annual milking and daily milking capacity is listed in Table 1. From the data we can make the conclusion that the highest average daily milking capacity was recorded in April (1<sup>st</sup> control) for Tetevensko variety – 0.729 l and the lowest one – 0.310 l in July (4<sup>th</sup> control) for Srednostaroplaninsko variety. The differences of Karakachanska breed were significant at  $P < 0.001$ . At 2<sup>nd</sup> control (in May) the average daily milking capacity mostly decreased for Srednostaroplaninski ewes with 0.160 l and leastly for karakachanski ewes – 0.080 l. following the turning out of sheep at alpine pasture, which coincided with 3<sup>rd</sup> control (in June), the average daily milking capacity increased in comparison with that in May (2<sup>nd</sup> control) but it did not reach that at 1<sup>st</sup> control. At 4<sup>th</sup> control the milking capacity in all groups decreased sharply. For Tetevenski ewes it was 51.47 %, for Karakachanski ewes – 52.63 % and 50.00 % for Staroplaninski ewes in comparison with 3<sup>rd</sup> control (in June). This was explained with the approaching of the insemination and also with the change of the grass species, connected with their vegetation.

**Table 1. Daily milking capacity, by control**  
**Tabela 1. Dnevni prinos mleka, po kontroli**

Sheep breed/Rasa	n	I Control/Kontrola		II Control/Kontrola		III Control/Kontrola		IV Control/Kontrola		Milk yield/ Prin. mleka
		$\bar{x} \pm Sx$	C	$\bar{x} \pm Sx$	C	$\bar{x} \pm Sx$	C	$\bar{x} \pm Sx$	C	
Karakachanska	56	0.560±0.25	24.15	0.480±0.21	26.15	0.570±0.24	28.25	0.315±0.16	25.15	57.15
Sredno staroplaninska	35	0.670±0.15	26.18	0.510±0.16	25.15	0.620±0.15	30.04	0.310±0.14	28.14	62.40
Tetevenska	29	0.720±0.24	21.25	0.630±0.22	23.00	0.680±0.20	27.25	0.350±0.24	27.40	71.40

For all the milking period of 120 days, on the basis of milking controls, milking capacity was recorded, which was 71.40 l for Tetevensko variety, followed by that for Srednostaroplaninsko variety – 62.40 l and the one from Karakachanska breed – 57.15 l.

The milk chemical composition by breeds and monthly control is included in Table 2. The percentage of fat was one of the main indices for milk quality for the production of white brine cheese and yellow cheese (kachkaval). In this production sheep milk is standardized regarding the ratio casein vs. fats but the fats were the main indices, which were standardized up to 6.5%.

The percentage of fats in all groups increased with the lactation duration. The values varied from 4.72 % for Karakachanski ewes at 1<sup>st</sup> control to 9.25 % for Tetevenski ewes at 4<sup>th</sup> control. It was observed a trend of the highest percentage of fats in all the four controls for Tetevenski ewes and the lowest for Karakachanski ewes.

**Table 2. Milk composition, %**  
**Tabela 2. Sastav mleka, %**

Sheep breeds/ Rase ovaca	Milk composition/ Sastav mleka	I		II		III		IV	
		Control/Kontrola		Control/Kontrola		Control/Kontrola		Control/Kontrola	
		x ± Sx	C	x ± Sx	C	x ± Sx	C	x ± Sx	C
Karakachanska	Fats/ Masti	4.72±0.04	21.2 4	6.25±0.06	26.1 6	7.20±0.22	12.65	8.42±0.15	9.65
	Protein/Protein	5.22±0.06	6.15	5.45±0.04	9.14	6.24±0.04	4.95	6.38±0.05	7.24
	Lactose/Laktoza	5.25±0.03	7.22	4.82±0.08	4.15	4.13±0.06	3.86	4.32±0.05	6.15
	Dry matter/SM	16.77±0.05	6.11	17.57±0.12	3.95	19.52±0.11	4.25	20.44±0.09	4.53
	Dry Fat-free Residue/ Suve rezidue bez masti	12.02±0.06	4.55	11.32±0.14	4.48	12.32±0.26	3.95	12.02±0.11	3.68
Srednostaroplaninska	Fats/ Masti	5.20±0.04	22.1 5	6.50±0.12	16.5 1	7.75±0.21	14.43	8.65±0.22	10.28
	Protein/Protein	5.42±0.06	8.24	5.72±0.08	6.52	6.03±0.11	6.16	6.26±0.12	8.15
	Lactose/Laktoza	5.05±0.12	6.26	4.63±0.12	5.15	4.75±0.15	4.25	4.53±0.06	4.95
	Dry matter/SM	16.68±0.21	8.15	18.03±0.18	4.93	19.28±0.24	3.96	20.73±0.08	6.15
	Dry Fat-free Residue/ Suve rezidue bez masti	11.48±0.16	4.32	11.53±0.21	6.16	11.53±0.06	3.38	12.08±0.06	3.95
Tetevenska	Fats/ Masti	5.50±0.05	24.1 4	6.85±0.16	12.1 2	7.85±0.04	16.06	9.25±0.26	11.25
	Protein/Protein	5.45±0.11	5.16	5.72±0.12	5.83	6.04±0.08	5.15	6.58±0.15	6.85
	Lactose/Laktoza	4.94±0.14	6.26	4.74±0.10	4.14	4.65±0.12	5.26	4.48±0.12	4.14
	Dry matter/SM	16.85±0.24	5.40	17.99±0.06	6.60	19.17±0.21	4.35	21.14±0.10	4.56
	Dry Fat-free Residue/ Suve rezidue bez masti	11.35±0.16	3.56	11.14±0.03	3.59	11.32±0.11	3.94	11.79±0.09	4.11

The milk protein during the grazing period on fore mountain pasture did not differ significantly by breed or lactation month. The milk controls performed while the ewes were grazing on an alpine pasture proved that the protein percentage of for Srednostaroplaninska and Tetevenska breeds varied only slightly while in Karakachanska breed it increased by about 1 %. In the examined breeds, the percentage of milk protein had a stable and progressive curve. The same trend was observed in the milk dry matter content. As for the more constant ingredients, dry fat-free residue and lactose, their variation was within narrow limits and the differences both between groups and lactation months were minimal.

Some of the properties that characterize the milk technological suitability to be processed into cheese are listed in Table 3. The milk casein in Tetevenska breed ewes had higher values (4.25) and it influenced the curdling capacity of milk. Thus, its curdling capacity in combination with calcium levels, density and acidity predetermined its better processing into white brine cheese and yellow cheese (Balkan kachkaval).

**Table 3. Milk composition and properties**  
**Tabela 3. Sastav mleka i osobine**

Sheep breed/ Rasa	Casein/ Kazein		Non-casein protein/ Nekazeinski protein		Calcium/ Kalcijum		Curdling capacity/ Kapacitet zgrušavanja		Density/ Gustina		Acidity/ Kiselost	
	x ± Sx	C	x ± Sx	C	x ± Sx	C	x ± Sx	C	x ± Sx	C	x ± Sx	C
	Karakachanska	3.96 ±0.28	6.15	1.58±0.24	6.12	0.184±0.03	3.15	253±1.15	11.25	1.035±0.15	0.21	23.25±0.62
Sredno staroplaninska	3.88 ±0.24	8.22	1.65±0.18	7.15	0.176±0.05	2.62	246±3.25	16.15	1.034±0.16	1.06	24.15±0.34	9.16
Tetevenska	4.25 ±0.16	4.85	1.62±0.21	5.06	0.179±0.06	2.15	218±4.02	11.24	1.034±0.22	1.15	24.03±0.28	10.2

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## Conclusions

Over the 120-day milking period, the typical native Tetevenska sheep breed registered milk yield of 71.4 l; the value for this trait in Srednostaroplaninska sheep breed was 62.4 l; and in Karakachanska sheep breed it was 57.15 l. The median daily milking capacity in the three trial groups had the highest values in April, from 0.720 l for Tetevenski ewes to 0.560 l for Karakachanski ewes. Referring to non-casein protein, calcium, density and acidity, the differences between the groups were minimal.

The milk from Tetevenski ewes had high percentage of casein and the best curdling capacity – 218 s. The milk of Karakachanski ewes was with the slowest curdling capacity – 253 s.

# Prinos, sastav i neke osobine mleka ovaca karakačanske, srednje staroplaninske i tetevenske rase

D. GENKOVSKI

## Rezime

Ispitivanje prinosa, sastava i nekih osobina mleka ovaca karakačanske rase, srednje staroplaninskog i tetevenskog varijeteta je tema ovog rada.

Rezultati ovog ispitivanja su pokazali da je prinos mleka varirao od 71.40 l kod ovaca tetevenskog varijeteta/soja do 57.15 l kod ovaca karakačanske rase.

Prosečna dnevna vrednost prinosa mleka je bila najveća u prvoj kontroli (u aprilu) i bila je u granicama od 0.720 l kod ovce tetevenskog varijeteta/soja do 0.560 l kod ovaca karakačanske rase. Tendencija najvećeg proseka dnevnog prinosa mleka u sve 4 kontrole je utvrđena kod ovaca tetevenskog varijeteta.

U vezi sa sastavom mleka odnosno kvalitetom, razlike među grupama su bile minimalne.

Najveći procenat kazeina – 4.25 je imalo mleko tetevenske ovce, kao i najveću sposobnost zgrušavanja – 218 s. Mleko karakačanske ovce se najsporije zgrušavalo.

**Ključne reči:** prinos mleka; sastav mleka; procenat masti; laktoza; suva materija; suve bezmanse rezidue; gustina mleka; sposobnost zgrušavanja

## References

**ALEXIEVA S. (1977):** Study of live weight and productive qualities of Karakachanski and Native mountain ewes. Symposium, Problems of breeding work in sheepbreeding, CSTII, Sofia.

**BOJNIKOV D. (1915):** The sheep breeding and its improvement. Stockbreeding Review, Zemizdat, Sofia, 5, 9-12.

**GEORGIEV D. (1990):** Geneological structure, phenotype and genotype characteristic of selective indicators of ewes from Blackhead Pleven breed. Thesis, Sofia.

**DJORBINEVA M., T. DIMITROV, I. PEYCHEVSKI, (1992):** Milk composition and properties of milk from native Starozagorska breed ewes and their crosses with EF rams, at second lactation. Animal Science, Appendix 5 – 8, 134-138.

**DJORBINEVA M., T. DIMITROV, I. DIMITROV, I. IVANOV, (1995):** Variability of the milking capacity, composition and properties of milk from native Starozagorska breed ewes and their crosses with EF rams, at second lactation. Animal Science, 3-4, 80-86.

- DIMOV D., M. DJORBINEVA, G. MIHAYLOVA, (1997):** Milk composition and milk fat of the Splotch-faced Marishni Sheep breed. *Animal Science*, 3-4.
- HINKOVSKI TS., TS. MAKAVEEV, I. DONCHEV. (1984):** Native forms of domestic animals. Zemizdat, Sofia.
- HLEBAROV G. (1940):** Study on the Bulgarian breeds and the possibilities of their improvement. BASci, Sofia.
- ODJAKOVA T., V. KAFEDJIEV, G. MIHAYLOVA, (2002):** Dynamics of some major physicochemical traits of milk in Karakachanska sheep breed during the lactation period. *Animal Science*, 2, 62-65.
- PEYCHEVSKI I., M. DJORBINEVA, T. DIMITROV, I. TSENKOV, (1988):** Milk composition, properties and processing qualities of milk from Starozagorska breed ewes and their crosses with EF rams. *Animal Science* 4, 16-21.
- PETROVA N., D. NEDELICHEV, D. TODOROV, (1998):** Milk productivity and milk composition in Karakachanska sheep breed. *Animal Science*, 1, 86- 89.
- SAVOV T., P. MINEV, P. IVANOV. (1951):** Crossbreeding of native sheep with Merinoflainsh. BASci, Sofia.
- VELEV S., I. PEJCHEVSKI, I. STANKOV, T. DIMITROV, N. PETROV. (1984):** Milk composition of native Starozagorski ewes, *Animal Science*, 1, 42 – 45.

