

# YIELD OF CHEESE AND SHEEP MILK COMPOSITION FROM SYNTHETIC POPULATION OF BULGARIAN DAIRY AND EAST-FRIESIAN BREED

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**Abstract:** Comparison between Synthetic population Bulgarian milk (SPBM) and East-Friesian (EF) sheep was done for laboratory yield of cheese and milk composition. The comparison of the means for the individual laboratory yield of cheese showed significantly higher values in the ewes of SPBM on first lactation (2,4735 g) compared to the EF breed (1,7608 g), ( $P < 0,001$ ). The higher amount of cheese probably was connected with the tendency for higher content of the fat, protein and dry matter. However on the second lactation the two breeds showed the same values: SPBM 1,9370 g and EF breed 1,9282 g. No significant differences in the quantity of milk and its composition between the sheep on first and second lactation were observed for both breeds.

**Key words:** milk composition, laboratory yield of cheese, Synthetic population Bulgarian milk, East-Friesian sheep

## Introduction

In Bulgaria the sheep milk is widely used to cheese production. There are many investigations on the effect of some factors on milk production and milk characteristics (*Dimov, 1995; Djorbineva et al., 1995; Petrova and Nedelchev, 2000; Pacinovski et al., 2000*). At the present time the milk composition is not a factor influencing the price of milk. It is an important factor determining its yield and quality of the final products (*Oravcova et al., 2007*).

The method for determination of individual laboratory yield of cheese was worked up in the sheep breeding. The information for used of the method for estimation of individual laboratory yield of cheese in sheep breeding is very limited, but this method is very important for practice and sheep selection like a selection criterion (*Othmane et al., 2002b*). In this connection the information for individual laboratory yield of cheese in sheep from different breeds is very useful.

The aim of the present study was to determine individual laboratory yield of cheese and milk composition in sheep from Synthetic population Bulgarian milk and East-Friesian breed.

## Materials and Methods

A study was conducted with two groups of dairy sheep reared in different areas of the Balkan. 20 ewes (10 of first lactation and 10 of second lactation) of Synthetic population Bulgarian milk (SPBM) in IAS (Institute of Animal Science), Kostinbrod, Bulgaria and 20 ewes (10 of first lactation and 10 of second lactation) of the East-Friesian breed (EF) in IAS (Institute of Animal Science), Skopje, Macedonia, were investigated in order to study the test day milk, composition and individual laboratory yield of cheese (ILYC).

The test day milk in ewes of SPBM was determined according to the Instructions on the Control of the Productive Qualities (2003) by AC method of ICAR. The quantity of the milk was measured in volume measurement units (ml). The milk production of each ewe for the test day was calculated by multiplying the quantity of the milked milk at the individual test in the morning by the coefficient for the flock, determined for the test day with reference to the quantity of the morning and evening milk. The composition of the milk (fat, protein, dry matter, and solids non fat content) were determined for a 20 ml sample of milk using a milk analyzer "Ecomilk" of the Bultech Company, Bulgaria. The daily yield of dry matter, fat and protein was calculated individually.

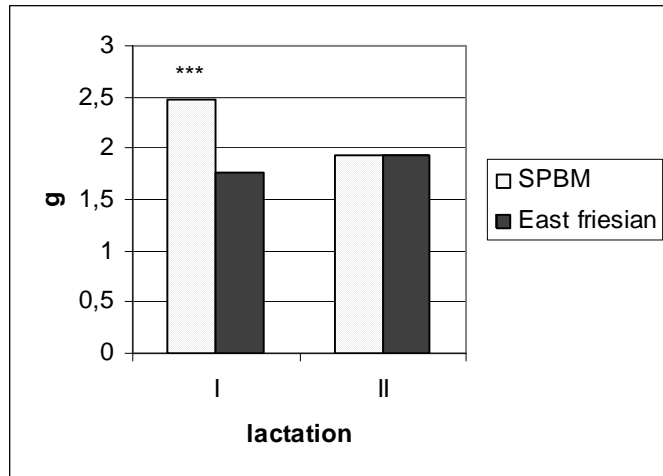
The test day milk in the ewes of East-Friesian breed was determined according to the A4 method of ICAR. The quantity of the milk was measured in volume measurement units (ml). The milk production of each ewe for the test day was calculated by the sum of the quantities of the milked milk at the individual test in the morning and in the evening. The composition of the milk (the contents of fat, protein, dry matter, solids non fat and lactose) were determined for a 50 ml milk sample using a milk analyzer "Milkoscan FT 6000" of the Foss Electric Company, Denmark. The daily yield of dry matter, fat and protein was calculated individually.

The laboratory yield of cheese for the two breeds was determined according to the modified method of *Raicheva et al. (2005)*, based on the method on *Othmane et al. (2002b)* in Laboratory for milk quality, IAS-Kostinbrod. The milk samples (10 ml) were equilibrated at 33°C and then rennet was added. The coagulated milk was centrifuged with centrifuge "Janetzki T 23" for 15 min/2500 rpm to separate cottage cheese and whey. The curd was dried in the open air for 60 min and ILYC was determined by its weight.

The information obtained was evaluated using the methods of variation statistics.

## Results and Discussion

The comparison of the means for the individual laboratory yield of cheese showed significantly higher values in the ewes of SPBM on first lactation (2,4735 g) compared to the EF breed (1,7608 g), ( $P < 0,001$ ), (Figure 1).



**Figure 1. Individual laboratory yield of cheese according to number of lactation and breed, g (n=40)**

The higher amount of cheese probably was connected with the tendency for higher content of the fat, protein and dry matter (Tab. 1 and 2). However on the second lactation the two breeds showed the same values: SPBM 1,9370 g and EF breed 1,9282 g. In previous our study was established correlation coefficients between the individual laboratory yield of cheese and content of dry matter and fat were positive, considerable and significant (*Raicheva et al., 2005*). The mean values of the studied characteristics of the test day milk in the ewes from EF breed were presented on Table 1.

**Table 1. Test day milk and milk composition at the ewes from East-Friesian breed (n=20)**

Parameter	I lactation	II lactation	Significant
	X±SE	X±SE	
Test day milk, l	2.061±0.175	2.782±0.335	NS
Protein, %	4.941±0.106	4.849±0.097	NS
Fat, %	6.237±0.330	6.083±0.333	NS
Dry matter, %	16.874±0.295	16.748±0.256	NS
Solids non fat, %	10.637±0.138	10.665±0.122	NS
Lactose, %	4.233±0.060	4.203±0.040	NS

No significant differences in the quantity of milk and its composition between the sheep on first and second lactation were observed. The quantity of milk for the test day milk on second lactation was 35% higher than the milk on first lactation. Lower daily quantity of milk on EF breed are obtain from *Pacinovski et al. (2007)*. The contents of dry matter, fat and protein were within the normal for sheep milk, respectively 16-20%, 5-12% and 4,5-6,5% (*Peichevski and Chomakov, 1988; Pacinovski et al. 2007*). Similar results were obtained in the ewes of SPBM (Table 2).

**Table 2. Test day milk and milk composition at the ewes from SPBM (n=20)**

Parameter	I lactation	II lactation	Significant
	X±SE	X±SE	
Test day milk, l	0.996±0.097	0.977±0.081	NS
Protein, %	6.134±0.239	5.715±0.309	NS
Fat, %	7.274±0.440	6.875±0.259	NS
Dry matter, %	18.846±0.525	18.195±0.383	NS
Solids non fat, %	11.572±0.280	11.320±0.219	NS

The sheep on first and second lactation did not show considerable differences in the indices test day milk and milk content. Here also the content of dry matter, fat, and protein were normal for this kind of milk.

The daily yield of fat in EF breed showed significantly higher value in the ewes on second lactation compared to the first lactation ( $P<0,05$ ), (Tab. 3). The tendency for higher values were observed for the indices daily yield of dry matter and protein on second lactation at optimal ratio protein : fat (*Peichevski and Chomakov, 1988*).

**Table 3. Average daily yield of protein, fat and dry matter, g/d at the ewes from East-Friesian breed (n=20)**

Parameter	I lactation	II lactation	Significant
	X±SE	X±SE	
Protein, g/d	102.536±9.906	130.559±14.772	NS
Fat, g/d	125.093±7.267	158.305±13.614	NS
Dry matter, g/d	220.611±20.691	294.287±39.128	NS
Ratio protein:fat	0.817±0.054	0.813±0.035	NS

The results obtained for the ratio protein : fat in the ewes of SPBM were within the optimal for cheese manufacture (*Peichevski and Chomakov, 1988*), (Table 4). There were no significant differences in the daily yield of dry matter, fat, and protein between first and second lactation in the studied animals.

**Table 4. Average daily yield of protein, fat and dry matter, g/d at the ewes from SPBM (n=20)**

Parameter	I lactation	II lactation	Significant
	X±SE	X±SE	
Protein, g/d	60.551±6.071	55.308±4.911	NS
Fat, g/d	71.359±7.526	66.597±5.637	NS
Dry matter, g/d	185.911±17.610	176.582±13.798	NS
Ratio protein:fat	0.875±0.067	0.837±0.049	NS

In our previous studies with dairy ewes of two Bulgarians breeds (SPBM and Blackhead Plevan breed) and cross-breeds of Chios, we did not established the significant differences in the cheese yield (2,39 g, 2,60 g and 2,14 g), (*Raicheva and Ivanova, 2005; Raicheva and Kistanova, 2005; Raicheva et al., 2009*). In these studies were established the significant differences in test day milk at the absence of considerable differences in the milk content. This reflects in some cases on a daily yield of dry matter, fat and protein (*Raicheva and Ivanova, 2005*). The ratio protein : fat (from 0,81 to 0,87) in the two breeds found in our investigations, was close to the requirement for sheep milk for cheese manufacturing and to the values obtained from *Peichevski et al. (1988)*. In studies with dairy ewes from Churra breed (*Othmane et al., 2002a,b*) did not established the differences in the cheese yield (2,65 g, 2,67 g and 2,66 g). In these studies they established 0,956 l milk for test day, fat - 6,74% (first lactation), 6,78% (second lactation) and protein - 5,81% (first lactation), 5,96% (second lactation). *Oravcova et al. (2007)* reported in ewes from Lacaune on first lactation fat 7,08%, protein 5,58%, and on second lactation respectively 7,05%, 5,63%.

## Conclusion

Based on the results of these investigations, the following conclusions can be made:

The laboratory yield of cheese was significantly higher in the ewes of SPBM on first lactation (2,4735 g) compared to the EF breed (1,7608 g), ( $P < 0,001$ ).

The daily yield of fat in EF breed was significantly higher in the ewes milk on second lactation, ( $P < 0,05$ ).

No significant differences in the quantity of milk and its composition between the sheep on first and second lactation were observed for both breeds.

The dry matter, fat, and protein percentages were within the normal for sheep milk in the two investigated breeds.

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## Količina sira i sastav mleka bugarske mlečne sintetičke populacije i istočno-frizijske rase ovaca

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## Rezime

U ovom radu izvedena je komparativna analiza između bugarske mlečne sintetičke populacije (BMSP) i istočno-frizijske rase ovaca (IF) u odnosu na laboratorijsku proizvodnju sira i na sastav mleka. Kod analize laboratorijske proizvodnje sira, utvrđen je siginifikantno veći prinos sira iz mleka bugarske mlečne sintetičke populacije u prvoj laktaciji (2,4735 g) u odnosu na istočno-frizijsku rasu ovaca (1,7608 g), ( $P < 0,001$ ). Veća količina sira verovatno je u konekciji sa tendencijom većeg sadržaja masti, proteina i suve materije, dok su u drugoj laktaciji kod obe rase ustanovljene iste vrednosti: BMSP 1,9370 g i IF 1,9282 g.

U odnosu na količinu i sastav mleka obe rase ovaca u prvoj i drugoj laktaciji, nisu utvrđene signifikantne razlike.

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