

## **TEST DAY MILK, COMPOSITION AND UDDER MORPHOLOGY AT WEST BALKAN MOUNTAIN SHEEP AND THEIR F<sub>1</sub> CROSSES WITH CHIOS BREED**

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### **Abstract**

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The aim of the present study was to compare the test day milk, composition and udder morphology at West Balkan Mountain sheep and their F<sub>1</sub> crosses with Chios breed.

An experiment was carried out in 2005 in the Experimental base of the Institute of Animal Science – Kostinbrod, Bulgaria in order to obtain F<sub>1</sub> crosses from West Balkan Mountain ewes and Chios. The investigation was carried out with 16 ewes from West Balkan Mountain breed (control group) and 9 F<sub>1</sub> Chios crosses (experimental group) on first test day milk at first lactation. The comparative study of animal production from the two groups includes the follows traits: test day milk and its composition, laboratory yield of cheese and udder morphology. The effect of crossing on the variation of the studied traits and their statistical parameters was evaluated by least square method (ANOVA – single factor).

At the present study it is observed a tendency for higher value of test day milk with 25% in F<sub>1</sub> crosses of Chios in comparison with West Balkan Mountain ewes. The content of total solids, % (16.38%), solids non fat, % (11.61%), fat, % (4.77%) was significantly higher in F<sub>1</sub> crosses of Chios (P<0.05, P<0.01) compared to West Balkan Mountain – (14.89%, 10.93%, 3.93%). The daily yield of fat and daily yield of total solids were significantly higher in Chios' crosses compared to West Balkan Mountain ewes (P<0.05). It is observed a tendency for higher value of the individual laboratory yield of cheese for Chios' crosses (2.139 g) with compare to West Balkan Mountain ewes (1.971 g). In F<sub>1</sub> crosses of Chios the udder have significantly the bigger length, width and depth (P<0.01, P<0.001).

*Key words:* sheep, test day milk, milk composition, udder morphology, F<sub>1</sub> Chios' crosses

### **Introduction**

The increase of milk yield was a basic objective in sheep breeding, which might be reached by increasing the genetic potential through crossing. The

literapositive effect on daily milk yield and milk yield for milking period in the crosses obtained on the base of local sheep in Balkan region.

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cheese production at difficult sheep breed were studied in Bulgaria. A method for determination of individually laboratory yield of cheese was worked up in the sheep breeding. This is precondition for its use as a selection criterion in practice characterizing the yield of cheese per sheep.

The studies on the udder parameters of sheep using for milk production recently in relation to selection for machine milking and getting of quality raw milk have been of interest. Hatjiminaoglou et al. (1986) studied the udder morphology and milk emission kinetic of Chios ewes. The authors indicated that the teats are with a great slope in relation to vertical line. For the last years, there was an increased interest to the Greek sheep breed Chios from Bulgarian farmers. So it is necessary to do concrete investigations about productive traits of crosses, that were received on base of Bulgarian breeds and rams from Chios.

The aim of the present study was to compare the test day milk, composition and udder morphology at West Balkan Mountain sheep and their  $F_1$  crosses with Chios breed.

## Material and Methods

An experiment was carried out in 2005 in the Experimental base of the Institute of Animal Science – Kostinbrod, Bulgaria in order to obtain  $F_1$  crosses from West Balkan Mountain ewes and Chios. The investigation was carried out with 16 ewes from West Balkan Mountain breed (control group) and 9  $F_1$  Chios crosses (experimental group) on first test day milk at first lactation. The comparative study of animal production from the two groups includes the follows traits: test day milk and its composition, laboratory yield of cheese and udder morphology.

The test day milk was determined according to Instruction for control of production traits, 2003. The individual milk quantity on the first milking control according to AC method of ICAR was controlled. The milk quantity was measured in volume unit (ml). The milk production of each ewe for the test day was calculated from the milk obtained from morning milking multiplied by flock coefficient (K), calculated ac-

ording to the formula:

$$K = \frac{\text{Morning milk} + \text{Evening milk}}{\text{Morning milk}}$$

The milk composition – total solids, %, solids non-fat, %, fat, %, protein, %, density, °G 20/4°C were determined on 20 ml milk sample with milk analyzer “Ekomilk”, Bultech. The daily yield of total solids, fat and protein and ratio protein: fat was individually calculated.

To estimate of the individual laboratory yield of cheese (ILYC) a modified method from Raicheva et al. (2005) was used based on the method reported by Othmane et al. (2002). Some parameters were evaluated at the modification of the method (type and size of centrifuge tube; the amount of milk samples and rennet; time and temperature, °C of drying in the open air). 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 morphological udder parameters of studied ewes were determined according to the method of Labussiere et al. (1981) on the base of the udder measurements (length, width and depth) and teats measurements (length and thickness). The udder type was determined by subjective method. There are 5 types in accordance with the udder form and teats position (Figure 1). 1 – with asymmetric half, 2 – irrelevance very high position of teats, 3 – irrelevance high position of teats with outline half, 4 – good framed udder with low irrelevance position of teats, 5 – good framed udder with low vertical position of teats.

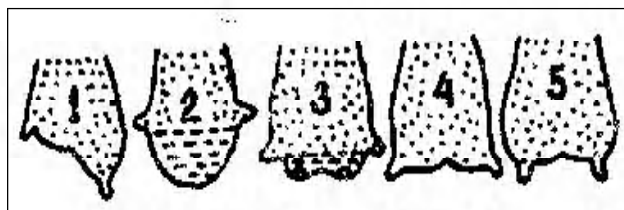


Fig. 1. The udder types

The effect of crossing on the variation of the studied traits and their statistical parameters was evaluated by least square method (ANOVA – single factor).

## Results and Discussion

The analysis of the results for the values of F-criterion showed significant effect of crossing on the variation of traits characterizing milk composition ( $P<0.05$ ,  $P<0.01$ ) and udder morphology parameters ( $P<0.05$ ,  $P<0.001$ ). Significant effect on the variation of test day milk, the percentage and yield of protein, individual laboratory yield of cheese and morphology parameters of teats was not observed (Tables 1, 3, 5 and 7).

**Table 1**  
Value of F-criterion

Traits	F stat.
Test day milk, l	2.58 NS
Total solids, %	9.166 **
Solids non fat, %	11.16 **
Fat, %	4.36 *
Protein, %	3.69 NS
Density, °G 20/4 °C	8.73 **

Note: \* - at  $P<0.05$ ; \*\* - at  $P<0.01$

**Table 2**  
Test day milk and composition

Traits	West Balkan Mountain				F1 Chios' crosses				Sign.
	X	Sx	SD	VC	X	Sx	SD	VC	
Test day milk, l	0.416	0.037	0.149	35.96	0.522	0.059	0.176	33.74	NS
Total solids, %	14.89	0.288	1.153	7.74	16.38	0.412	1.235	7.54	**
Solids non fat, %	10.93	0.111	0.445	4.07	11.61	0.187	0.560	4.82	**
Fat, %	3.93	0.271	1.083	27.58	4.77	0.327	0.982	20.58	*
Protein, %	5.54	0.091	0.365	6.59	5.98	0.263	0.788	13.17	NS
Density, °G 20/4 °C	1.036	0.001	0.002	0.20	1.038	0.001	0.002	0.19	**

Note: Significant between groups - \* - at  $P<0.05$ ; \*\* - at  $P<0.01$

The results obtained showed no significant differences in test day milk in the studied groups (Table 2). A tendency was observed for higher value (0.522 l) of the test day milk with 25% at  $F_1$  crosses of Chios' rams in comparison with West Balkan Mountain ewes (0.416 l). The similar results for more milk yield at Chios' crosses were reported by Pacinovski et al. (1999), Ylmaz and Altnel (2003), Esen and Ozbey (2002) and Yardme and Ozbeyaz (2001).

Significant differences for total solids %, solids non fat %, fat % content and density between the two groups ( $P<0.05$ ,  $P<0.01$ ) were established (Table 2). The content of total solids of milk from  $F_1$  crosses was significantly higher ( $P<0.01$ ) compared to the West Balkan Mountain ewes. This was connected with higher value of fat and solids non-fat content in milk of  $F_1$  crosses ( $P<0.05$ ,  $P<0.01$ ). The significant difference was observed for the density of milk as well ( $P<0.01$ ). The fat content was lower in comparison with the protein content both the control and experimental groups. The results were similar to the reported by Peiychevski et al. (1988b), Petrova (2000) and Raicheva and Ivanova (2005).

The obtained results for daily yield of fat and daily yield of total solids were significantly higher in Chios' crosses (25.12 g/d and 85.62 g/d) in comparison with West Balkan Mountain ewes (15.62 g/d and 61.13 g/d) ( $P<0.05$ ) (Table 4).

**Table 3**  
Value of F-criterion

Traits	F stat.
Laboratory yield of cheese, g/d	1.71 NS
Total solids, g/d	5.47 *
Fat, g/d	8.42 **
Protein, g/d	4.02 NS
Protein: fat ratio	1.55 NS

Note: \* - at  $P < 0.05$ ; \*\* - at  $P < 0.01$

**Table 4**  
Individual laboratory yield of cheese and daily yield of fat, protein and total solids

Traits	West Balkan Mountain				F1 Chios' crosses				Sign.
	X	Sx	SD	VC	X	Sx	SD	VC	
Laboratory yield of cheese, g/d	1.971	0.079	0.315	14.74	2.139	0.098	0.293	14.86	NS
Total solids, g/d	61.128	5.407	21.628	35.38	85.624	10.214	30.641	35.79	*
Fat, g/d	15.62	1.370	5.480	35.09	25.12	3.671	11.021	43.87	*
Protein, g/d	23.095	2.168	8.671	37.55	30.74	3.325	9.975	32.45	NS
Protein: fat ratio	1.40	0.109	0.453	18.75	1.30	0.110	0.331	25.36	NS

Note: Significant between groups - \* - at  $P < 0.05$

**Table 5**  
Value of F-criterion

Traits	F stat.
Length, cm	7.11 *
Width, cm	35.14 ***
Depth, cm	15.34 ***

Note: \* - at  $P < 0.05$ ; \*\*\* - at  $P < 0.001$

The obtained values of the individual laboratory yield of cheese were 1.971 g for West Balkan Mountain ewes and 2.139 g for Chios' crosses i.e. from 100 l milk will be obtained 19.71 kg and 21.39 kg cheese respectively. However the observed difference between groups was not significant (Table 4). The ratio protein: fat what were 1.40 and 1.30 for West Balkan

Mountain ewes and Chios' crosses respectively (Table 4). These values were higher than the requirement for sheep milk at the manufacture of cheese (Peiychevski et al., 1988a). The same authors obtained the values of this proportion 0.97 – 0.96. According to Peiychevski and Chomakov (1988) when this ratio is higher, the obtained cheese was lower fat content in the total solids.

The studied animals from the two groups had different in udder types. 42.9% of the ewes from West Balkan Mountain breed have good-framed udder with low irrelevance position of teats (type 4). 35.7% were

with irrelevance high position of teats with outline half (type 3). The most desirous udder type (type 5) - good-framed udder with low vertical position of teats have 14.3% ewes. The lowest (7.1%) was the ewe's part with irrelevance very high position of teats (type 2) (Figure 2).

In  $F_1$  Chios crosses the highest was the ewe's part (77.8%) with udder type 4. The percentage of ewes with udder type 5 and 1 was equal (11.1%) (Figure 3).

The average values of separate morphological udder measurements are significantly different (Table 6). The udder length at  $F_1$  Chios crosses was with 2.2 cm significantly bigger ( $P < 0.01$ ) compared to West Balkan Mountain ewes. Labussiere et al., 1988, reported the similar results. The udders of  $F_1$  Chios

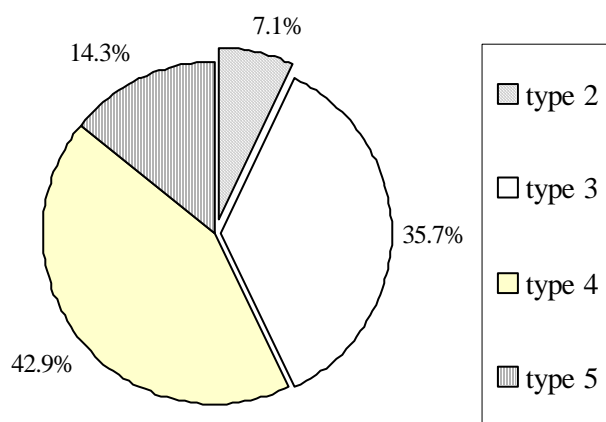


Fig. 2. Percentage of ewes from WBM according to type of udder

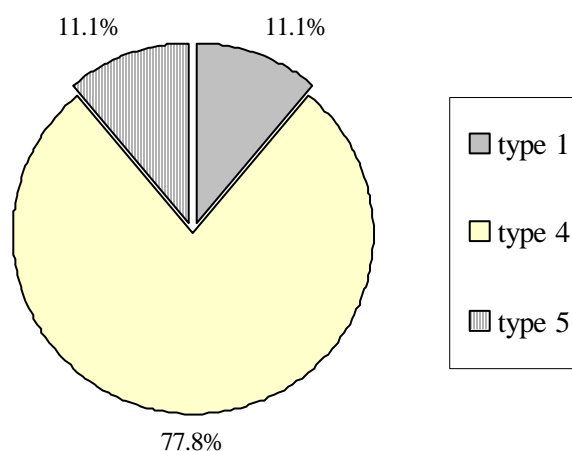


Fig. 3. Percentage of ewes from F1 Chios crosses according to type of udder

Table 6  
Morphology measurements of udder at West Balkan Mountain ewes and F1 Chios' crosses

Traits	West Balkan Mountain				F1 Chios' crosses				Sign.
	X	Sx	SD	VC	X	Sx	SD	VC	
Length, cm	10.029	0.495	2.042	20.36	12.250	0.598	1.690	13.80	*
Width, cm	10.29	0.300	1.238	12.03	13.75	0.567	1.604	11.66	***
Depth, cm	12.80	0.534	2.201	17.21	16.31	0.647	1.831	11.22	***

Note: Significant between groups - \* - at P<0.05; \*\*\* - at P<0.001

Table 7  
Value of F-criterion

Traits	F stat.
Left length, cm	1.04 NS
Right length, cm	0.38 NS
Left thickness, cm	0.06 NS
Right thickness, cm	0.02 NS

crosses were with 3.5 cm significantly wider and deeper than the same measurements at West Balkan Mountain ewes (P<0.001). These values corresponded to the results announced by Such et al. (1999) and Mundan and Ozbeyaz (2004). The obtained results for udder measurements showed that the udder of F<sub>1</sub> Chios crosses better developed.

The average teats parameters of the studied ewes are showed in Table 8. And no significant differences were observed and only a tendency for longer and

Table 8  
Morphology measurements of Teats at West Balkan Mountain ewes and F1 Chios' crosses

Traits	West Balkan Mountain				F 1 Chios' crosses				Sign.
	X	Sx	SD	VC	X	Sx	SD	VC	
Left length, cm	2.23	0.153	0.632	28.30	2.51	0.229	0.647	25.74	NS
Rightlength, cm	2.31	0.159	0.655	28.34	2.46	0.197	0.557	22.52	NS
Left thickness,cm	1.28	0.073	0.301	23.43	1.31	0.083	0.235	17.93	NS
Right thickness, cm	1.29	0.064	0.263	20.28	1.31	0.146	0.412	31.40	NS

thicker teats at  $F_1$  Chios crosses. Although and both groups the teats length was optimally sized and suitable for machine milking requirements (Labussiere et al., 1988) because of the small teats thickness, the machine milking could not be applied.

## Conclusion

At the present study it is observed a tendency for higher value of test day milk with 25% in  $F_1$  crosses of Chios in comparison with West Balkan Mountain ewes.

The content of total solids, % (16.38%), solids non fat, % (11.61%), fat, % (4.77%) was significantly higher in  $F_1$  crosses of Chios ( $P < 0.05$ ,  $P < 0.01$ ) compared to West Balkan Mountain - (14.89%, 10.93%, 3.93%). The daily yield of fat and daily yield of total solids were significantly higher in Chios' crosses compared to West Balkan Mountain ewes ( $P < 0.05$ ). It is observed a tendency for higher value of the individual laboratory yield of cheese for Chios' crosses (2.139 g) with compare to West Balkan Mountain ewes (1.971 g).

In  $F_1$  crosses of Chios the udder was better developed and better formed in comparison to West Balkan Mountain ewes. They have significantly the bigger length, width and depth of the udder ( $P < 0.01$ ,  $P < 0.001$ ).

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