

FATTENING PERFORMANCE AND MEAT CHARACTERISTICS OF LAMBS FROM THE BREEDS REARED IN CENTRAL BALKAN MOUNTAINS REGION

Genkovski, D. and G. Uzunov

*Research Institute of Mountain Stockbreeding and Agriculture
281, Vasil Levski Str., Troyan, Bulgaria*

ABSTRACT

A comparative trial was conducted to determine fattening performance, meat production and quality traits of lambs from the following breeds: Karakachanska, Srednostaroplaninska and Tetevenska. The lambs were weaned at 45 days of age, and then fattened for 100 days indoors, in order to obtain high quality carcasses for exportation.

The Staroplaninska lambs featured faster growth, averaged 0.240 kg/day for males and 0.214 kg/day for female ones. The median feed consumption per 1 kg of weight gain was 5.26 FU for the male lambs and 5.63 FU for the females. Their carcasses had the highest meat yield, 54.55%, and lowest bone percentage compared to the Karakachanska and Tetevenska breeds.

The sheep breeds raised in the Central Balkan Mountains proved ability to produce suckling lambs matching the specifications of the European standards, intended for commercial realization in younger age and at high price.

The meat of the Karakachanska lambs had the best water retaining capacity, tenderness and fat content in the muscle tissue – traits that are highly valued by consumers.

When raised indoors, the Karakachanska lambs accomplished weight gain of 1 kg from 5.68 FU for males, and 6.17 FU for females. For Srednostaroplaninska lambs these figures were less by 7.40% for the males, and by 8.75% for the females, respectively, and in Tetevenska lambs were less by 3.88% (males) and 2.24% (females).

Key words: *milk characteristics, fattening performance, Karakachanska breed lambs, Srednostaroplaninska breed lambs, Tetevenska breed lambs.*

INTRODUCTION

In the region of Central Balkan Mountains native sheep breeds have been bred, as a result from age long popular breeding activities. These breeds were widely used over the period from 1950 to 1970 in crossbreeding programmes utilizing fine-wooled and semi fine-wooled breeds. Thereby, some of the native breeds got absorbed while only a small number remained from others.

Over the period mentioned above, regardless of the low productivity performance traits of the native sheep breeds and their negative economic impact on agriculture, some amateur sheep breeders managed to preserve them for the coming generations and later these breeds became part of the national gene pool of Bulgaria. In connection with this, in 2001, the

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Association for Breeding of who consider endanger and fall below the critical survival minimum.

In Troyan town (where the Association has its registration office), and in the surrounding region for years, they have been reared the semi fine-wooled Staroplaninska Tsigai breed, and the coarse-wooled Karakachanska, Tetevenska and Srednostaroplaninska breeds, which have been established to fit the climatic, forage and terrain conditions of the mountain.

Meanwhile the two breeds – Tsigai and Karakachanska – have been subjected for investigations by a number of authors (Alexieva, 1979; Kafedjiev *et al.*, 1992, Stankov, 1995; etc.), while the native breeds; Tetevenska and Srednostaroplaninska have not been studied as they commonly reared on private farms.

Genkovski (2002) concluded that lambs of the Karakachanska breed when put under similar conditions of feeding and management had lower growth rate and poorer utilization of feeds compared with lambs of Staroplaninska Tsigai breed.

Kafedjiev *et al.* (1992) studied the finishing and meat producing characteristics of lambs of Rhodope Tsigai and Karakachanska breeds fattened up to 25 kg and 35 kg of live weights, respectively. Based on the data obtained they were assumed that fattening indoors was effective up to 23-25 kg LW for Karakachanska breed lambs and up to 25-30 kg LW for Rhodope Tsigai ones.

Yankov (1999) studied the growth rate, meat producing performance and feed consumption and found that 1 kg of weight gain in Karakachanska breed lambs was obtained from 5.22 FU and 546 g digestible protein. The carcass composed of 55.06% muscle tissue, 21.58% fats and 23.58% bones.

The Republic of Bulgaria has a traditional production and exportation of lambs to a number of European countries. The requirement standards of the European Union, however, impose new trends regarding the quality and the ecological nature of the imported meat.

The aim of this study was to evaluate a new high intensive indoors fattening system for 100 days implemented on Karakachanska, Srednostaroplaninska and Tetevenska lambs weaned at 45 days of age, to establish high finishing meat process and quality characteristics of lambs for exportation.

MATERIALS AND METHODS

A comparative assessment experiment was conducted for establishing the fattening, meat producing and quality characteristics of lambs - using (5 males and females) for each breed of Karakachanska, Srednostaroplaninska and Tetevenska, which purchased from private farms. The lambs were weaned at 45 days age and equalized on analogues of sex, age, live weight and type of parturition. The animals were reared indoors, allocated into six groups by breed and sex. They were fed with meadow hay with 0.4 FU and 42 g digestible protein and concentrate mixture containing a 1.018 FU and 120 g

digestible protein. The trial period lasted 100 days, and then all the male lambs were slaughtered after 24 hours starvation and subjected to slaughter analysis. The female lambs were left for replacement. The carcasses of the slaughtered lambs were cut in halves along the spinal column. Following a 24-hour period of chilling at temperature of 2-4 °C, all of the left carcass halves were cut in joints along the lines of the topographic parts, in compliance with the EU specifications, while some of them were modified to fit the commercial consumption predilections and preferences of the Bulgarian consumers. The carcass topographic parts were boned and the subcutaneous and intermuscular fat was removed.

From ribs 10th through 13th m long dorsi of each carcass half was separated and subjected to analysis of the chemical and physicochemical meat characteristics.

The methods described by Zahariev and Pinkas (1979) were implemented for assessment of the carcasses and the ratio of their components, as well as its components of meat, bones and fat.

The amounts of feed uptake were checked on daily basis, and the live weight was measured every 15 days.

RESULTS AND DISCUSSION

The data for accumulation of live weight over the 100-day fattening period is shown by breed and sex in Table 1.

Table 1. Fattening performance of lambs over 100-days finishing period, kg.

Gender	n	Live weight		Weight gain		%
		Beginning of trial	End of trial	Absolute	Average daily gain	
		x ± SE	x ± SE	x ± SE	x ± SE	
Karakachanska breed						
♂	5	12.2±0.15	33.2±0.37	21.0±0.23	0.210±0.18	100
♀	5	11.6±0.27	30.5±0.29	18.8±0.19	0.188±0.12	100
Srednostaroplaninska breed						
♂	5	12.5±0.21	36.5±0.33	24.0±0.27	0.240±0.19	114.3
♀	5	12.1±0.23	33.5±0.45	21.4±0.35	0.214±0.23	113.8
Tetevenska breed						
♂	5	12.4±0.18	34.9±0.54	22.6±0.43	0.226±0.32	107.6
♀	5	11.8±0.25	32.1±0.39	20.3±0.36	0.203±0.15	108.0

Results of this study showed that among sheep breeds reared in the region of Central Balkan Mountains, Srednostaroplaninska breed lambs had the highest growth intensity with average daily gain (ADG) of 0.240 kg/d for

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males and 0.214 kg/d for females, followed by the lambs of Tetevenska breed, 0.226 kg/d for males and 0.203 kg/d for females, respectively. The lambs of Karakachanska breed had the lowest values (0.210 kg/d for males and 0.180 kg/d for females). The differences between the groups are mathematically unproved at $P < 0.001$. Genkovski *et al.* (2002) reported that Karakachanska lambs weaned at 50-60 days age and fattened for 75 days had low ADG, of 0.205 kg/d for the males and 0.190 kg/d for the females. These results are in agreement with the present results with the same breed as it achieved 0.210 kg/d for males and 0.188 kg/d for the females, when they weaned at 45 days of age and fattened for 100 days.

This is a logical consequence for ranking the Karakachanska sheep breed among the smallest size breeds reared in Bulgaria. Live weight range 35-37 kg for the ewes and 45-55 kg for the rams. According to the latest findings of Balevska and Petrov (1970), this breed is typical representative of the Tsakel breed and also one of the oldest proto sheep not only in South East Europe, but also in Europe as a whole; it is genetically similar to the European Moufflon (*Ovis ammon musion*). Under indoors raising system of the Karakachanska breed of lambs, 1 kg of ADG was obtained for the males from 5.68 F.U. and for the females from 6.17 F.U. (Table 2). The lambs of Srednostaroplaninska breed needed less feed units, for 1 kg of ADG, by 7.40% for males and 8.75% for females. The corresponding values for Tetevenska lambs were 3.88% and 2.24%.

Table 2. Consumption of feed per 1 kg of weight gain over the 100-days fattening period.

Gender	n	Consumption of feed				Difference %
		Concentrate kg	Hay kg	Feed units	Digestible protein	
Karakachanska breed						
♂	5	3.7	4.8	5.68	645.6	100
♀	5	4.1	5.0	6.17	702.0	100
Srednostaroplaninska breed						
♂	5	3.4	4.5	5.26	597.0	92.60
♀	5	3.8	4.4	5.63	640.8	91.25
Tetevenska breed						
♂	5	3.6	4.5	5.46	621.0	96.12
♀	5	3.9	4.6	5.81	661.2	97.76

The results of the slaughter analysis are listed in Table 3. The highest dressing percentage values were recorded for Srednostaroplaninska lambs (43.52%), followed by Tetevenska breed (42.22%) and the lowest value was

recorded for Karakachanska breed (40.25%). Lambs fattened for 100 days to produce carcasses with a mass of 13-16 kg can be commercially realized only at the low prices of the home market. The high feed consumption needed per 1 kg weight gain and the low dressing percentage render these breeds unprofitable as producers for lamb carcasses that match the European standards.

In studies on finishing lambs of Central Rhodope and Karakachanska breeds, **Kafedjiev *et al.* (1992)** recommended fattening them only up to 25 and 35 kg L.W., respectively. This would result in carcasses of 10-12 kg that based on the EU standards for lamb carcass. Assessment would subsume them under the suckling lambs' category ("Easter lambs") where there is good market demand for them in Europe at high prices. Selling lambs early in the spring sets up the conditions for increasing the milk yield. In Bulgaria, all sheep, regardless of their level of milk production, are generally used for milking, which is an important aspect in the economic efficiency of their rearing. Sheep milk is a raw product for the production of white brine cheese that is in demand both at the home and the world markets.

Cutting the carcass into topographically defined joints (Table 4) revealed that lambs of Srednostaroplaninska breed had higher share percentage of the leg (30.24%) in the carcass weight, compared with Karakachanska and Tetevenska breeds. This is statistically significant. This parceling of the topographic parts of the carcass is necessitated to meet the commercial and consumer values, traditions and preferences of the Bulgarian consumers who prefer lamb containing less separable intermuscular and subcutaneous fat. The produced meat features of the assessed carcasses did not provide a comprehensive idea of the meat producing potential of the topographic parts when considered individually. Table (5) lists data on the quantities of meat, fats, and bones in each topographic part.

Table 3. Live weight before slaughter.

n	Live weight before slaughter kg		Carcass weight				Dressing percentage	
			kg		After 24 h kg		Cool carcass	Cool carcass + pluck
	X ± SE	C	x ± SE	C	x ± Sx	C	%	%
Karakachanska breed								
5	32.70 ± 0.35	4.25	13.66 ± 0.24	3.15	13.16 ± 0.32	3.16	40.25	49.03
Srednostaroplaninska breed								
5	35.80 ± 0.38	4.10	15.90 ± 0.26	2.86	15.58 ± 0.38	3.28	43.52	53.46
Tetevenska breed								
5	33.90 ± 0.31	5.52	14.72 ± 0.19	3.24	14.31 ± 0.41	3.03	42.22	52.22

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Table 4. Weight and percentage of each topographic part out of the entire carcass weight.

Neck		Shoulder		Loin		Leg	
Kg	%	kg	%	kg	%	kg	%
Karakachanska breed							
0.968	7.36	2.321	17.64	1.375	10.45	3.615	27.47
Srednostaroplaninska breed							
0.939	6.03	2.684	17.23	1.426	9.15	4.712	30.24
Tetevenska breed							
0.931	6.72	2.564	17.92	1.708	12.32	3.789	26.48

Table 4. (continued)

Tail		Chest		Rump		Abdomen	
Kg	%	kg	%	kg	%	kg	%
Karakachanska breed							
0.127	0.95	3.400	25.84	0.732	5.56	0.622	4.73
Srednostaroplaninska breed							
0.140	0.90	4.084	26.21	0.744	4.81	0.846	5.43
Tetevenska breed							
0.150	1.09	3.552	24.75	0.719	5.03	0.897	6.28

Table 5. Percentage of meat, fats and bones in each topographic part (%).

Neck			Shoulder			Loin		
Meat	Fats	Bones	Meat	Fats	Bones	Meat	Fats	Bones
Karakachanska breed								
53.04	18.72	28.24	65.65	15.10	19.25	54.25	24.65	21.10
Srednostaroplaninska breed								
54.24	20.02	25.74	65.75	15.65	18.60	55.40	23.95	20.65
Tetevenska breed								
53.65	19.74	26.61	64.60	14.65	20.75	55.10	26.60	18.30

Table 5 (continued).

Leg			Tail			Entire carcass		
Meat	Fats	Bones	Meat	Fats	Bones	Meat	Fats	Bones
Karakachanska breed								
69.20	12.10	18.70	28.45	38.45	33.10	51.35	21.65	26.97
Srednostaroplaninska breed								
68.45	14.30	17.25	29.83	38.45	31.72	52.38	21.41	26.21
Tetevenska breed								
65.45	16.60	17.95	27.52	41.64	30.84	51.00	23.14	25.85

Table 5 (continued).

Chest			Rump		Abdomen	
Meat	Fats	Bones	Meat	Bones	Meat	Fats
Karakachanska breed						
34.16	16.44	49.40	54.10	45.90	52.25	47.75
Srednostaroplaninska breed						
33.15	15.35	51.50	55.84	44.16	56.42	43.58
Tetevenska breed						
29.28	21.22	49.50	57.15	42.85	55.28	44.72

It could be noticed that the three breeds investigated have quite similar ratios of meat, fats and bones either in different parts or in the entire carcasses.

The entire carcass of Srednostaroplaninska breed recorded the highest values for meat percentage (52.38%) and bones (26.97%) while Tetevenska breed had the highest fats (23.14%). Regarding to the topographic part neck - it had the highest meat percentage and the lowest bones percentage. Table 6 contains the analytical laboratory results of the physicochemical indices of meat. The median values of pH taken 24 hours post mortem were close (from 5.65 to 5.79). This meat was judged as very good, according to the grading table of Scharer *et al.* (1977) (as quoted by Pinkas and Marinova, 1984).

Table 6. Chemical and physicochemical traits of the meat in m. longissimus dorsi

n	pH 24 h		Tenderness Penetrometric div		WRC%	
	x ± SE	C	x ± SE	C	x ± SE	C
Karakachanska breed						
5	5.79±0.06	0.98	169.40±0.75	15.34	27.72±0.63	7.53
Srednostaroplaninska breed						
5	5.65±0.08	1.73	182.25±1.54	13.59	23.16±0.78	9.62
Tetevenska breed						
5	5.72±0.09	1.92	173.43±1.42	12.59	26.25±0.69	5.83

Table 6. (Continue)

Water %		Protein %		Fats %	
x ± SE	C	x ± SE	C	x ± SE	C
Karakachanska breed					
74.64±0.32	1.54	21.15±0.29	3.17	4.66±0.27	23.24
Srednostaroplaninska breed					
73.26±0.52	2.54	20.43±0.35	4.38	4.15±0.35	35.21
Tetevenska breed					
73.48±0.39	1.67	21.48±0.25	4.53	3.89±0.43	26.89

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An important trait that characterizes meat quality is the capability of muscles to retain part of the chemically unbounded water, known as water retaining capacity (WRC), or hydration of meat. This capacity is closely related to traits such as taste, tenderness, color, etc. that define meat quality. The results of WRC were 27.72% for Karakachanska and 26.25% for Tetevenska breeds which came next and reflected the tenderness of meat. Expressed in terms of penetrometric grades, the tenderness of lamb from Karakachanska breed was 169.40, followed by Tetevenska breed (173.43), the highest value being for the Srednostaroplaninska breed (182.25). The lamb of Karakachanska breed was also noted to have higher content of water and fats. The latter physicochemical traits of meat confirm the assumption that the most delicious barbecue will be prepared from female black lamb of Karakachanska breed slaughtered by reaching 23-25 kg of weight.

CONCLUSIONS

The lambs of Srednostaroplaninska breed has lower consummation of forage and higher average daily growth, in comparison with those of Karakachanska and Tetevenska breeds.

The meat of the lambs of all the three breeds was with good meat and food characteristics.

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