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## CARCASS TRAITS OF LAMBS FROM KARAKACHAN SHEEP, SLAUGHTERED AT WEANING AT 90 DAYS OF AGE

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**Abstract:** The Karakachan sheep is autochthonous sheep breed in Bulgaria with very old origin. It is considered as a typical representative of the archaic type of sheep named “Tzackel”, occurring in some countries from the Balkan Peninsula. In present days, this breed, is threatened by extinction, due to the danger of crossbreeding with other breeds. Herds with typical representatives of the breed in Bulgaria are relatively small in number. In the past the Karakachan sheep was defined as primitive and low-yielding, and now this breed are not attractive enough for most farmers. However, in mountainous conditions with heavily rugged terrain, this old breed is able to provide a relatively good income for farmers. The advantage of this autochthonous breed are its exceptional durability and unpretentiousness to the conditions and the food base, it can realize sheep production with relatively low cost, with relatively low capital investments. Especially considering the fact, that this breed can be reared in harsh areas, where the highly productive sheep breeds would be difficult to adapt. The Karakachan sheep as a local breed has a pronounced combined productivity. The lambs are sold for meat after a suckling period of about 3 months, and then the sheep are milked for 2-3 months. In present work the carcass traits of 3 months old Karakachan lambs has been investigated. 6 males lambs, born as singles, were slaughtered immediately at weaning, at 90 days of age, without a period of intensive fattening after weaning. Based on the results of slaughter analysis of suckling lambs from Karakachan sheep, it can be concluded that the average slaughtered live weight was 26.8 kg, the average weight of the cold carcass was 13,61 kg. Dressing percentage of chilled carcass, without the offal was 50,6 % . The linear measurements of the carcass were as follows - diagonal carcass length – 54.0 cm, length of ham – 29.66 cm, circumference of ham – 32.16 cm. The ratio meat:bones in the carcass of the Karakachan lambs at weaning at 90 days of age, was relatively high - 3.26:1.

**Keywords:** Karakachan sheep, carcass traits, slaughtered performance, dressing percentage

### 1. INTRODUCTION

The type "Tzackel", defined by many authors as one of the oldest forms among the genetic resources in sheep breeding in Europe. This type of sheep is widespread in many countries of Southeast Europe, and in particular on the Balkan Peninsula (Hlebarov, 1940; Barić, 1952; Milić, 1954). The Karakachan sheep is an autochthonous breed in Bulgaria, with ancient origin, and has considered as a typical representative of the archaic type "Tzackel" (Hlebarov, 1937). The initial studies of the breed in Bulgaria established the initial stages of crossing in this valuable genetic resource, and as early as the 1930s it was suggested that the most typical specimens has been remained in the herds of Karakachan nomads (Hlebarov, 1942). In the 70s of the century, in order to preserve the national genetic livestock resources in Bulgaria, a flocks of local sheep breeds were created, including the a flocks of Karakachan sheep. The herds was reared on state farms, and experimental farms at research institutes in the country (Dimitrov, Dimitrova, & Vassilev, 1994). At the beginning of the 21st century in Bulgaria, from the former multi-thousand nationalized population of the Karakachan sheep, only a few small flocks remain in several scientific institutes. The predominant exterior type of sheep, however, differs significantly from that in the old descriptions and photographs of the breed from the last century. White animals, with uncharacteristic spotting, atypical wool, larger stature, long tails, atypical head and massive horns, were observed (Sedefchev & Sedefchev, 2011). The general opinion was that the original type of Karakachan sheep, described by the first authors, researchers of the breed, has disappeared. In the 2001 year, under a project for the conservation of biodiversity, supported by SAVE, it was established that there are still preserved specimens of breed in isolated mountain villages of Bulgaria, with preserved original type. A program to restore and preserve the Karakachan sheep in its original type was started. One of the main reasons for the status of the breed in present days, is that the Karakachan sheep in the past were defined as primitive and low-productive, and this breed for most farmers is not attractive enough. Currently, the herds with typical specimens of the breed, with a pronounced original type in Bulgaria are few, and it is necessary to update their productive qualities, as well as to prepare effective current strategies for the conservation of this ancient genetic resource in sheep breeding. The Karakachan sheep as a local breed owns a pronounced combined productivity - for meat, milk and wool. The advantage of this autochthonous breed is its exceptional durability and unpretentiousness to the conditions and the fodder base. This breed can realize sheep production with relatively low cost, with relatively low capital investments. The lambs are sold for meat usually immediately after the 90-days suckling period, and then the sheep are milked for 2-3 months. Given the market situation in the past, and the orientation to certain markets with

special requirements for carcasses, lambs from Bulgarian farmers in the past were fattened to a higher live weight and older age. In most studies of the slaughter characteristics of lambs from local sheep breeds in Bulgaria, the animals were subjected to intensive fattening after weaning. After the change of the market situation, and the modern requirements of the pretentious consumer to a leaner and tender meat, the lambs of the local breeds are sold for meat immediately after weaning, without a period of intensive fattening. In recent years, the demand for lean carcasses has grown due to increased awareness of consumers for healthy meat, with a focus on the quantity and quality of fat (Font i Fournols & Guerrero, 2014). Traditional lamb production in Mediterranean countries is based on light lambs that are slaughtered at early ages (i.e., at 30–90 days of age), so just after weaning or after a short fattening period (Juárez, Horcada, Alcalde, Valera, Polvillo, & Molina, 2009; Santos-Silva, Mendes, & Bessa, 2002). These carcasses weigh up to 13 kg and are characterised by their pale pink colour, lower amounts of fat, and good flavour (Beriaín, Horcada, Purroy, Lizaso, Chasco, & Mendizabal., 2000). The greater slaughter age of lambs results in heavier carcasses, increased adiposity and increased intramuscular fat (della Malva et al., 2016). In some southern European countries, a practice has been imposed for the sustainable development of the local sheep breeds through the sale of lamb meat from light suckling lambs, in the form of the Protected Geographical Indication - „Agnello del Centro Italia“ (Lamb from Central Italy; European Union, Commission Regulation № 475/2013) (Budimir, Trombetta, Francioni, Toderi, & D'Ottavio, 2018). The aim of the present work is to be studied the possibilities for obtaining lamb meat from Karakachan lambs at weaning at 90 days of age, without a period of intensive fattening, and to determine the characteristics of carcasses.

## 2. MATERIALS AND METHODS

To establish the meat characteristics and the carcass traits of lambs from Karakachan sheep, at weaning, at 90 days of age, a complete slaughter analysis of 6 lambs was performed. Karakachan lambs, originated from the "Rare Breeds Center" in Vlahi village, Kresna municipality (fig.1). The experimental group consisted of 6 Karakachan lambs. The lambs that have been selected for this study were aligned by sex and type of birth - male, single. During the mammalian period, lambs were reared according to traditional technologies, with breast milk as the main food, and after the 20th day of birth, they had free access to alfalfa hay and concentrated fodder (corn, barley and sunflower meal). Slaughter analysis was performed according to the methodology of Zaharijev & Pinkas (1979). Immediately before slaughter, the lambs were subjected to fasting diet for a 24-hour period, and had free access to water. The live weight, was weighed immediately before slaughter. The weight of the offals was measured separately, and the weight of the internal fats, was measured. After chilling at 4 °C for 24 h, the cold carcass weights were recorded, and the dressing percentages were calculated. The left side of each carcass was jointed into three main commercial cuts: neck, shoulder, ribs, loin, and ham. After cuts of the carcass, each part was weighed and boned. The ratio of meat: bones in each part of the carcass was determined. The obtained data were processed statistically.

## 3. RESULTS AND DISCUSSIONS

The meat obtained from suckling lambs, without an additional intensive fattening period, is a valuable product, with a high dietary and taste qualities. The authors, who have studied the meat characteristics of lambs from local breeds of sheep in Bulgaria, have performed their studies in intensively fattened lambs to a higher live weight and to an older age (Hlebarov & Petrov, 1934; Dimitrov & Boshnakov, 1977; Boykovski, Stoyanov, Nedelchev, Nakev & Pinkas, 1979; Ivanov & Dimitrov, 1984; Raychev & Stankov, 1986; Raycheva & Shindarska 1999). The results of the slaughter analysis of Karakachan lambs, at 90 days of age, are presented in tables 1, 2, and 3. Within the formed samples, the live weight before slaughter (after 24 hours of fasting) was 26.8 kg. The formation of a relatively high live weight for the suckling period of 90 days was indicative. The average weight of the chilled carcasses of the Karakachan lambs was 13.61 kg, ranging from 12.6 kg to 16.3 kg. The carcass weight is an important indicator of meat productivity in lambs.

**Table 1. Carcass traits of Karakachan lambs at weaning in 90 days of age (n-6).**

Signs	Karakachan lambs (n-6)			
	SX	SD	max	min
Live weight before slaughter, kg	26.878	2.364	31.1	25.2
Weight of cold carcass, kg	13.6	1.412	16.3	12.6
Dressing percentage of cold carcass, %	50.553	1.155	52.411	49.580
Skin, kg	3.466	0.233	3.8	3.2
Legs (no skinned), kg	0.750	0.031	0.8	0.7
Head (skinned), kg	1.055	0.120	1.250	0.900
Lunges, kg	0.446	0.038	0.500	0.380
Liver, kg	0.550	0.063	0.650	0.500
Heart, kg	0.103	0.005	0.110	0.1
Internal fats (omentum, sweetbread), kg	0.733	0.136	0.950	0.550
Intestines (empty), kg	1.1	0.063	1.2	1.0
Stomach (empty), kg	0.700	0.083	0.8	0.6
Separated fats, kg	0.316	0.064	0.4	0.250
Big length of cold carcass, cm	54.0	2.366	57.0	50.0
Length of ham, cm	29.666	0.516	30.0	29.0
Circumference of ham, cm	32.166	3.763	39.0	29.0
Area of m. Longissimus (at 11 ribs), cm <sup>2</sup>	12,006	1,654	13,19	10.93

Some studies have indicated that heavier lamb carcasses show higher dressing percentage (Polidori, Pucciarelli, Cammertoni, Polzonetti, & Vincenzetti, 2017), and meat: bone ratio (Rajkumar, Dass, Verma, & Das, 2014). The carcass weight is decisive for the classification of lamb carcasses in the relevant categories by the SEUROP lamb carcass classification system. Grigoli et al (2019) cited a similar results in lambs from Valle del Belice breed.

**Table 2. Ratio between some offal and live weight before slaughter of Karakachan lambs at weaning in 90 days of age (n-6).**

Signs	Karakachan lambs (n-6)			
	SX	SD	max	min
Skin: live weight before slaughter, %	12.631	1.600	14.615	10.31
Legs: live weight before slaughter, %	2.727	0.252	3.077	2.344
Head: live weight before slaughter, %	3.830	0.353	4.231	3.448
Internal fats: live weight before slaughter, %	2.638	0.320	2.969	2.115
Intestines: live weight before slaughter, %	3.993	0.307	4.231	3.438
Stomach: live weight before slaughter, %	2.528	0.170	2.759	2.308

**Table 3. Ratio meat:bones in left half of the carcass of Karakachan lambs at weaning in 90 days of age (n-6).**

Signs	Karakachan lambs (n-6)			
	SX	SD	max	min
Meat:bones (left half)	3.261	0.276	3.540	2.807
meat:bones (neck)	3.229	0.485	3.769	2.529
meat:bones (shoulder)	3.581	0.430	4.148	2.969
meat:bones (ribs)	2.474	0.314	2.877	1.943
meat:bones (first quarter)	2.931	0.314	3.270	2.397
meat:bones (loin)	2.800	0.310	3.181	2.437
meat:bones (ham)	3.266	0.199	3.522	3.044
meat:bones (second quarter)	3.759	0.251	4.076	3.5

The carcasses of the Karakachan lambs were heavier than the carcasses produced from 130-day-old Comisana lambs (11.3 kg) (Bonanno et al, 2012), and comparable to those of 100-day lambs of Barbaresca breed (from 12.1 to 13.1 kg) (Lanza, Bella, Priolo, Fasone, & Peas, 2003). The dressing percentage of cold carcass of Karakachan lambs, was 50.6%. This agrees with the results of Mateo, Caro, Carballo, Gutiérrez-Méndez, Arranz, & Gutiérrez-Gil, (2018), for suckling lambs from Churra and Assaf breeds. The weight of the internal fats, including the mesentery and mesenteric lymph nodes, in 90-days old Karakachan lambs was 0.733 kg. Relative to the weight of the chilled carcass was 2.63% respectively (table 2). The quantity of the fat can determine the price paid for lamb carcasses (Gardner et al, 2015). The accumulation of subcutaneous fat on the carcass in this category of lambs (at 90 days of age) was relatively low. During the suckling period, the Karakachan lambs accumulated relatively low quantity subcutaneous and internal fats in the carcass. For comparison, at 25 kg slaughter live weight, and fattened intensively until a higher age, Ivanov & Dimitrov (1984) found in local Stara Zagora lambs 4.07% internal fat. In intensive fattening technologies, a large amount of fat is deposited in the carcass. This is in line with the findings of De Brito, Ponnampalam, & Hopkins, (2017). The analysis of the linear measurements of the carcass from Karakachan lambs, the relatively short carcasses were impressive. The average length of the carcass was 54 cm (table 1). The more compact, shorter, carcasses give the impression of better muscularity, and more convex muscle profiles, which is important for their conformation and their commercial appearance. This is agree with that found by Kirton, Bennett, Dobbie, Mercer, & Duganzich, (1995). From the ratio meat: bones in different parts of the carcass in the left half, presented in table 2, it was clear that the shoulder and the ham has widest ratio meat: bones - respectively 3,581: 1 and 3,266: 1. In the other parts - shoulder and neck the ratios were lower. According to meat classification scheme (Raycheva, 1998), all of the separated parts of the carcasses, including and the whole half of the carcasses of Karakachan lambs, has a high meatiness class. At weaning at 90 days of age, Karakachan lambs has accumulated fat in some topographic areas of the carcass. The fat was accumulated at the root of the tail and back side of the ham, as well as around the kidneys, and the inner walls of the pelvic cavity. The weight of this separated fat was with average weight 0.316 kg (table 1).

**Fig.1. Karakachan sheep with expressed original breed type and Karakachan lambs, at 90 days of age. Rare Breeds Center in Vlahi village, Kresna municipality, Bulgaria. © Sedefchev**



#### 4. CONCLUSIONS

On the basis of the results obtained in the present work it can be concluded:

The average live weight before slaughter was 26.87 for males suckling Karakachan lambs, weaned at 90 days of age. The weight of cold carcass was 13.6 kg, dressing percentage of chilled carcass, without offal was 50.55 %.

The linear measurements of the carcass of males suckling Karakachan lambs at 90 days of age were respectively length of carcass – 54.0 cm, length of ham – 29.66 cm, circumference of ham – 32.16 cm.

The ratio meat:bones in the carcass of suckling Karakachan lambs at 90 days of age was significantly higher - 3.261:1

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