

RESEARCHES REGARDING THE STRUCTURAL FEATURES OF THE MUTTON'S LEG, IN COMPARISON TO THE LOCAL SHEEP BREEDS AND THEIR HALF-BREEDS WITH MEAT BREEDS FROM E.U.

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Abstract

The purpose of researches was that to emphasize the structure features of the mutton's leg at the local sheep breeds and certain half-breeds with meat breeds from E.U. The research developed during 2006-2011 on 95 mutton's legs from the local sheep breeds (Meat Breed - Palas, Palas Merino, Țigaia, Țurcana) and the half-breeds F₁ Meat Breed x Texel, Suffolk x Merino, German with Black Head x Țigaia and German with Black Head x Țurcana. The mutton's legs were dissected separating the muscles, the bones and the fat (of covering and inter-muscular). The muscles, the bones and the fat were weighted with a precision of ± 5 g. The coxal, the sacrum, the femur and the tibia, and also their groups of muscles were also measured and weighted. Two indicators of the mutton's leg were calculated (the indicator of compactness and the indicator of muscularity of the thigh) after the formula presented by Laville E [1]. The Meat Breed - Palas and its half-breeds with Texel had the most compact mutton's legs with the best muscle/bones (4.3/1-4.5/1) and muscles/fat (7.0/1-7.6/1) proportions in the mutton's leg. Țigaia breed and their half-breeds had the smallest muscles/fat proportions (3.6/1-3.7/1), due to the excessive deposit of fat. Țurcana breed and theirs half-breeds with the German breed with Black Head had the smallest muscles/bones (3.2/1-3.3/1) proportions due to the very heavy skeleton. The made researches emphasizes the fact that all local sheep breeds (except Meat Breed - Palas) have a very heavy skeleton, maybe due to a high density of the bone tissue, due to the lack of selection for increasing and improving the meat production (tens of generations).

Key words: mutton's leg, tissue structure, muscle /bones proportion

INTRODUCTION

The quality of carcasses at the sheep species depends on the conformation (the degree of covering with muscles and the development of the skeleton), the state of fattening (deposit of fat under skin and in the pelvises and abdomen cavities), the muscle /bones, muscle /fat proportions and others.

The mutton's leg, as a component part of the carcass has an important rate in establishing the quality and in classifying in one of the five classes from EUROP grid.

The quality of the mutton's leg depends on the dimensions of width and length (indicator of compactness) correlated to the degree of muscles' development, the most

appreciated being the mutton's legs which are short, wide and well covered with muscles. The muscles/bones and muscles/fat proportions have a strong influence upon the quality of the mutton's leg.

In Romania a few researches concerning the structural features of the mutton's leg at the local sheep breeds and at the half-breeds with meat breeds were made, the present paperwork having the purpose to investigate such aspects.

MATERIAL AND METHODS

The researches were made during 2006-2011 on 95 mutton's legs from four local breeds (Meat Breed - Palas, Palas Merino, Țigaia, Țurcana) and four of their half-breeds with Texel, Suffolk and German with Black Head breeds.

Detaching the mutton's leg from the right half of the carcass was made by sectioning

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the articulation between the 6th lumbar vertebra and the 1st sacral.

The mutton's leg were weighted with a precision of ± 5 g and then they were dissected, separating the muscles, bones, covering and inter-muscular fat, which were weighed with the same precision.

The coxal, the femur, the tibia and sacrum bone were also weighed and measured. Separately, there were also weighed the muscles of the basin (linked to the coxal and sacrum), the muscles of the thigh (linked to the femur) and the muscles of the jamb (linked to the tibia).

The following indicators were calculated:

- The indicator of compactness of the mutton's leg after the method of Laville [1]

$$IJ = \frac{LB}{LJ} \quad \text{where:}$$

LB – width at basin (between coxo-femoral articulations);

LJ – length of mutton's leg (between ischio-pubian joining and tarsus– metatarsus articulation);

- Indicator of thigh muscularity, after Purchas' formula, quoted by [1]

$$IMC = \frac{\sqrt{\frac{G}{L}}}{L} \quad \text{where: } G = \text{weight of}$$

the thigh muscles (g)*; L = length of femur (cm).

- *m. rectus femoris, m.vastus lateralis, m. vastus, medialis, m. vastus intermedius, m. sartorius, m.semimembranosus, m. adductor, m. pectineus, m. gracilis, m. semitendinosus, m. gluteo-biceps.

The obtained data were statistically processed and to interpret the differences besides Țurcana breed (which had the smallest values) the Fisher test was used (proportion of variances).

RESULTS AND DISCUSSIONS

The data presented in table 1 show the existence of some differences between the local breeds and meat half-breeds regarding the rate of muscles, fat and bones in the mutton's leg.

Table 1 The tissue structure of the mutton's leg at the local sheep breeds and the half-breeds with meat breeds

Nr.	Breed Half-breed	Tissue structure (%)		
		Muscle	Fat	Bones
1.	Meat Breed-Palas	72.64	10.41	16.90
2.	Țigaia	63.26	16.97	19.78
3.	Țurcana	69.43	10.62	19.82
4.	Palas Merino	67.66	13.30	19.78
5.	F ₁ Suffolk x Merino	69.96	12.46	17.53
6.	F ₁ Texel x Meat Breed	73.99	9.72	16.38
7.	F ₁ German with Black Head x Țigaia	63.28	17.71	18.91
8.	F ₁ German with Black Head x Țurcana	69.18	11.76	19.07

It can be noticed that the Meat Breed - Palas had the biggest proportions of muscles (72.64%) in the mutton's leg, being followed by Țurcana with 69.43%, Palas Merino with 67.66% and Țigaia with 63.26%. From the half-breeds, Texel x Meat Breed with 73.99%, being followed by F₁ Suffolk x Merinos with 69.96%, F₁ German with Black Head x Țurcana with 69.18% and F₁ German with Black Head x Țigaia with 63.28%.

Regarding the rate of the fat in the mutton's leg, from table 1 it results that the half-breeds of F₁ German with Black Head x Țigaia and Țigaia Breed had the biggest values of the fat in the mutton's leg (17.71% respectively 16.97%).

The lowest values of the fat were at the half-breeds of F₁ Texel x Meat Breed, Meat Breed-Palas and Țurcana breed (9.72%, 10.41% and 10.62%).

From the same table it can be noticed that the half-breeds of F₁ Texel x Meat Breed had the smallest rate of the bones in the mutton's leg, this being of 16.38%, followed by the Meat Breed-Palas with 16.90 %.

At the other breeds and half-breeds the rate of the bones in the mutton's leg was round the value of 19%.

The researches made by Vicovan G. and collaborators [3] revealed the fact that Țigaia breed and its half-breeds with the German Breed with Black Head had the fattest carcasses, having the smallest rates of muscles (24% fat and 52-54% muscles), and the Țurcana breed had the biggest rate of the bones in the carcass, this being of 25.37%.

From table 1 it can be noticed that the rate of the fat, bony and muscular tissue, in the mutton's leg at the local breeds and half-breeds is much correlated with their rate in the carcass, keeping the same tendency.

The research developed by Laville and collaborators [1] regarding the structure of the mutton's leg at certain breeds and half-breeds from France revealed the fact that at the meat breed of Charmoise and the half-breeds for meat of Berrichon x Romanov the

rate of the muscles in the mutton's leg was of 61.7-62.4%, values which are close to those of Țigaia breed.

However the fat in the mutton's leg had the rate of 21.4-21.7%, more with around 4 percent points besides Țigaia (the local breed with the biggest fat deposits).

At Charmoise breed and the half-breeds of Berrichon x Romanov, in the mutton's leg, the bones had a rate of 8.8-11.9%, half of the values registered at all the Romanian sheep breeds and their half-breeds with meat breeds, as resulted from the present research and the results presented by Pascal C. [2].

For these high differences only an explanation might be that of the density of the skeleton which could be much bigger at the Romanian sheep breeds, these being selected for many generations with priority on the way of improving the wool production, less for the milk production and not at all for meat.

In table 2 it is presented the rate of the mutton's leg and two carcass indicators at the local breeds and the meat half-breeds comparatively to Țurcana.

Table 2 The rate in the carcass of the mutton's leg, its structural indicators, comparatively on breeds and half-breeds and the significance of differences besides Țurcana breed

Nr.	Breed Half-breed	Rate of mutton's leg		Indicator of compactness of the mutton's leg		Indicator of the muscularity of the thigh	
		X ± sx	V%	X ± sx	V%	X ± sx	V%
1.	Meat Breed-Palas	0.3467±0.0031 p > 0.05	4.35	0.94±0.0117 p < 0.001	5.97	0.55±0.0253 p < 0.001	10.45
2.	Palas Merino	0.3406±0.0031 p > 0.05	4.16	0.73±0.0090 p < 0.001	6.57	0.46±0.0083 p < 0.05	8.32
3.	Țigaia	0.3347±0.0045 p > 0.05	5.41	0.75±0.0121 p < 0.001	5.79	0.46±0.0080 p < 0.01	6.88
4.	Țurcan	0.3420±0.0046 -	4.21	0.65±0.1300 -	6.32	0.43±0.0085 -	6.25
5.	F ₁ Texel x Meat Breed	0.3497±0.0037 p > 0.05	3.79	0.95±0.0245 p < 0.001	8.15	0.56±0.0194 p < 0.001	12.39
6.	F ₁ Suffolk x Merinos	0.3408±0.0026 p > 0.05	1.88	0.88±0.0360 p < 0.001	10.06	0.52±0.0317 p < 0.001	14.86
7.	F ₁ German with Black Head x Țigaia	0.3399±0.0062 p > 0.05	3.66	0.87±0.0360 p < 0.001	8.22	0.51±0.0163 p < 0.001	6.38
8.	F ₁ German with Black Head x Țurcana	0.3497±0.0038 p > 0.05	1.90	0.78±0.0334 p < 0.001	7.39	0.49±0.0143 p < 0.05	5.09

From the table it can be noted that the rate of the mutton's leg from the semi-carcass was between the limits of 0.3347 (at Țigaia breed) and 0.3497 (at the half-breeds of meat F₁ Texel x Meat breed-Palas and F₁ German with Black Head x Țurcana).

All differences regarding the rate of the mutton's leg at the local breeds and the half-breeds comparatively to Țurcana were insignificant in the point of view of statistics.

The data presented in table 2 are comparable to those obtained by other authors

[1] on the French breeds of Charmoise and Rava together with certain half-breeds with Romanov and Belgian Texel breeds. At these the rate of the mutton's leg from the semi-carcass was of 31.82-35.80% (values obtained through processing the data of Laville [1]).

From the same table it can be noted that the compactness indicator of the mutton's leg had values of 0.65-0.95, the most compact mutton's legs being of Meat breed-Palas, with the indicator value of 0.94, and the least compact mutton's legs were at Țurcana breed, the indicator having the value of 0.65, Palas Merino and Țigaia being between these limits.

At the half-breeds with the meat breeds of Texel, Suffolk and German with Black head the indicators of compactness were between the limits of 0.78 and 0.95. All the differences besides Țurcana were very significant in the point of view of statistics.

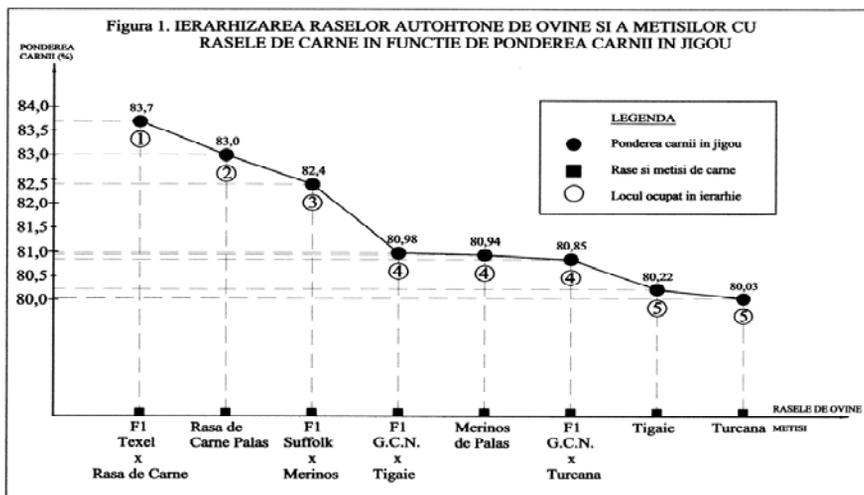
These data cannot be compared to those obtained by other authors [1] because the

values of the compactness indicator of the mutton's leg were smaller (0.23-0.38), due to the much bigger length of the mutton's leg (33.3-40.0 cm), maybe measured in a different way from the method described by Laville [1] himself and used in this paperwork.

In table 2 are also presented the values of the indicator of the muscularity of thigh (IMC) at the local sheep breeds and their half-breeds with meat breeds.

The values of the indicator at the local breeds and half-breeds were between the limits of 0.43 at Țurcana and 0.56 at the half-breeds of F₁ Texel x Meat Breed-Palas. All the differences resulted by comparison to the Țurcana breed were significant in the point of view of statistics, the Meat Breed-Palas and all half-breeds of meat having the biggest values for the thigh muscularity indicator.

Figure 1 presents the hierarchy of the local breeds depending on the rate of the meat in the mutton's leg.



Note: The meat represents the muscles together with the covering and inter-muscular fat; G.C.N. - German with Black Head breed.

Figure 1. Ranking of races in relation with the weight of jigou

It can be noted that the half-breed of F₁ Texel x Meat Breed-Palas had the biggest rate, of 83.7%, being followed by Meat Breed-Palas with 83% and the half-breed of F₁ Suffolk x Merinos with 82.4%. At the meat half-breeds of Țigaia and Țurcana and

Palas Merino breeds, the meat in the mutton's leg had a rate of 80.85-80.98%, followed by Țigaia with 80.22% and Țurcana with 80.03%.

In figure 2 there are presented the muscles /bones, meat/bones and muscles/fat

proportions in the mutton's legs from the local sheep breeds and their half-breeds with meat breeds.

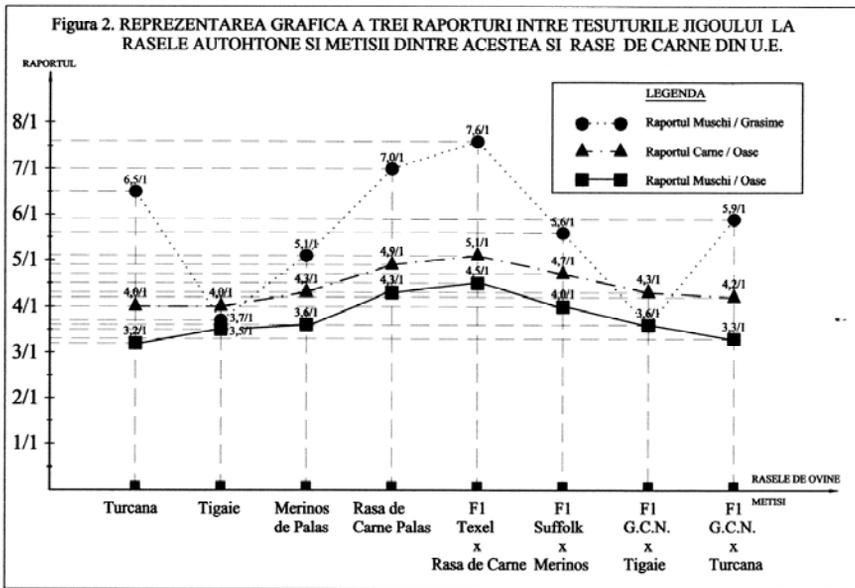


Figure 2 The ratio of the tissues in jigou

It can be noted that the muscles/bones proportion in the mutton's leg at the local breeds was between the values of 3.2/1 at Turcana and 4.3/1 at the Meat Breed-Palas, and the half-breeds had values between 3.3/1-4.5/1.

The presented values are in a way similar to those reported by Pascal C. [2].

The data of Laville and collaborators [1] obtained per breeds and half-breeds from France showed that the muscle/bones proportion had much higher values (from 4.9/1 to 7.0/1), they being due to the reduced weight of the bones from the mutton's leg.

In figure 2 is presented the muscles/fat report in the mutton's leg. This was at the local breeds between the limits of 4/1 at Tigaia and 7/1 at the Meat Breed-Palas, and at the half-breeds the proportion was between 3.6/1 at the half-breed of F₁ German with Black Head x Tigaia and 7.6/1 at the half-breed of F₁ Texel x Meat Breed-Palas.

It is noticed that Tigaia breed and its half-breeds had the smallest proportions because of the excessive deposits of fat.

It is also shown in figure 2 the meat/bones proportion in the mutton's leg at the local breeds and their half-breeds with the meat breeds.

It can be noted that at Turcana and Tigaia the proportion was of 4/1 being followed by Palas Merino with the value of 4.3/1 and Meat Breed-Palas with the highest value, that of 4.9/1.

At half-breeds the proportion had the values between the limits of 4.2/1 and 5.1/1.

CONCLUSIONS

The mutton's leg at the local sheep breeds and their half-breeds with meat breeds has a rate of 33-35% from the weight of carcass, the differences between breeds not being statistically significant, the found values being similar to those presented by others authors in the specialty literature.

The tissue structure of the mutton's leg differ depending on the breed, the half-breeds with Texel breed and Meat Breed-Palas having the biggest rate of meat and the best proportions of muscle/bones and muscles /fat in the mutton's leg. The Turcana breed had

the smallest rate of meat and the smallest proportion of muscles/bones in the mutton's leg.

The Țigaia breed and its half-breeds with German breed with Black Head presented the fattest mutton's legs, having the smallest proportions of muscles/fat.

The most compact mutton's legs with the best muscularity of thigh were held by the half-breeds with Texel breed and Meat Breed-Palas.

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