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Study Concerning the Chemical Composition of Meat in Sheep of Different Breed Structures

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Abstract. In last ten years, Romania occupies the first place within the European countries concerning the number of exploited sheep heads, destined to slaughtering. Over 97% of the volume of this export is represented by the Turcana young sheep, and difference of 3 % is represented by Tsigai young sheep. The determination of the chemical composition of the meat, the surface of *Longissimus dorsi* and leg of mutton area from Tsigai young sheep, Suffolk x Tsigai and German blackface x Tsigai intensive fattened is the aim of our paper.

The determination of the chemical composition of the meat allows a deep analyze of its quality traits, making possible the evolutive characterization of the breed. The work methodology involved analyze of the chemical composition of the meat harvested from cutlet (*Longissimus dorsi*, LD), according to Weende pattern: water content, dry matter, crude protein, crude fat and crude ash. The results obtained show that the Tsigai young sheep has the highest water and lowest dry matter content, and German blackface x Tsigai, the lowest water and the higher dry matter content.

The groups of cross breed achieved higher *Longissimus dorsi* (LD) and leg of moutton area, compared with the pure breed. Compared with Tsigai breed, *Longissimus dorsi* (LD) area determined was higher with 13.94% to Suffolk x Tsigai, and 2.14%, respectively to German Blackface x Tsigai. Leg of moutton area was higher with 24.09% to Suffolk x Tsigai, and 9.26%, respectively to German Blackface x Tsigai.

Keywords: Ţsigai, chemical composition, meat, cutlet, muscle, ovine

INTRODUCTION

The sheep meat represents an aside category inside world meat production, because as concerns its qualities is considered meat with especial organoleptic and nutritive features. Besides physical and psycho-sensorial qualities, the chemical composition recommends it in human alimentation because of high content in lysine and PUFA fatty acids, from which we mention CLA and LA (Palmquist, 2007). The ruminants, among farm animal species, provide by the milk and meat 90% from CLA quantity from human food (Russo *et al,* 2003).

However, even these features make it special, the ovine meat consumption is different from a country to another, the greatest one on world level being registered in Mongolia with about 65.20 kg/inhabitant head, in Europe the greatest consumption being registered in Island with 29.80 kg, and in our country that is traditionally in sheep breeding, the consumption is about of 2.90 kg of meat/inhabitant head (FAOSTAT, 2007).

From these reasons we approached such a theme that is part of an ample study concerning the ovine meat quality, to have data for the market help and to contribute for stimulation of this product consumption especially as concerns the culinary point of view and also the dietary-alimentary one.

MATERIALS AND METHODS

The biological material submitted for experiments was represented of young ovine of Tsigai breed (group 1), as native breed characterized by a good adaptability to mountain zone, and cross breeds resulting from crossing between Suffolk x Tsigai (group 2) and German blackface (noted in experiment GCCN) x Tsigai with specialized breeds for meat production. The three lots of young male sheep were intensive fattened in stalling.

The age of the Tsigai young sheep in the beginning of the fattening phase was 59 days, and 61 days at Suffolk x Tsigai and GCCN x Tsigai, respectively. The experimental groups were formed of 12 heads each. The experimental period comprised three phases: accommodation phase of 15 days, when the fodder without restriction was done with an unique mixture with 15% protein level; breeding-fattening phase of 65 days in which the protein level of unique fodder was of 13%; finishing phase of 20 days, in which the protein level of unique fodder was of 12 %. The unique fodder was formed of combined fodder and lucerne hay in case of accommodation phase; combined fodder, lucerne hay and hill hay in case of breeding-fattening phase; combined fodder, corn flour and hill hay in case of finishing phase. The feeding, water and salt was at discretion.

In the end of the fattening were chosen 5 heads of young fattened rams from each experimental lot, which were representative as concerns the body conformation, but also of body weight to express the average of each lot, these ones being submitted for slaughtering and appreciation of meat production quantitative and qualitative features.

The meat chemical composition was determined basis on Weende scheme, establishing the proportion of water, dry matter (SU), crude protein (PB), crude fat (GB) and crude ash (CB). The dry matter was gravimetrically determined by using of drying stove, the crude fat by Soxhlet method, and crude protein by Kjeldahl method. The samples submitted for analysis were collected from chop region (muscle *Longissimus dorsi - LD*).

For determining of the surface the *Longissimus dorsi*, the semicarcass was sectioned between the D12 and D13 vertebra, perpendicularly on the axis of the backbone, the shape of the *Longissimus dorsi* muscle being copied on transparent paper. The size of the areas was determined on the computer.

The leg from the half of the femur was sectioned, perpendicularly on its longitudinal axe, the shape of this section being copied on transparent paper. Statistical data processing and interpretation was based on student test.

The research was conducted at the Reghin Research and Development Station for Sheep and Goats in Mures County in 2007.

RESULTS AND DISCUSSION

After the analyses effected on collected samples were obtained the next values, which define the meat chemical composition (Tab. 1).

Tab. 1

Chemical composition of meat in young ovine depending on genotip - %

Specification	Breed/ Cross breed (n = 5)	$\overline{X} \pm s_{\overline{x}}$	V %	d	Difference significance
Weight before slaughtering (kg)	Tsigai	36.80 ± 0.29	1.77	-	-
	Suffolk x Tsigai	40.83 ± 0.42	2.30	+4.03	***
	GCCN x Tsigai	39.68 ± 0.63	3.55	+2.88	**
Cold carcass weight (kg)	Tsigai	16.56 ± 0.44	5.98	-	-
	Suffolk x Tsigai	19.48 ± 0.27	3.08	2.920	**
	GCCN x Tsigai	18.66 ± 0.38	4.56	2.100	**
Water (%)	Tsigai	75.53 ± 0.32	0.98	-	-
	Suffolk x Tsigai	73.89 ± 0.29	0.88	-1.040	°°
	GCCN x Tsigai	73.08 ± 0.31	0.94	-2.450	°°°
Dry matter (%)	Tsigai	24.47 ± 0.33	3.02	-	-
	Suffolk x Tsigai	26.11 ± 0.29	2.49	1.040	**
	GCCN x Tsigai	26.92 ± 0.31	2.56	2.450	***
Crude protein (PB) (%)	Tsigai	19.90 ± 0.38	4.27	-	-
	Suffolk x Tsigai	22.09 ± 0.46	4.66	2.190	**
	GCCN x Tsigai	21.60 ± 0.24	2.50	1.700	**
Crude fat (GB) (%)	Tsigai	3.49 ± 0.28	18.05	-	-
	Suffolk x Tsigai	2.97 ± 0.25	18.98	-0.520	ns
	GCCN x Tsigai	4.39 ± 0.32	16.40	0.900	ns
Crude ash (CB) (%)	Tsigai	1.08 ± 0.04	8.33	-	-
	Suffolk x Tsigai	1.05 ± 0.04	8.57	-0.030	ns
	GCCN x Tsigai	1.00 ± 0.03	7.00	-0.080	ns

Note: Differences between the three genotipe denote distinctly significant and very significant differences (Student test, $p<0.01$; $p<0.001$).

Data presented in tables should that the highest water content of *Longissimus dorsi* (LD) has Tsigai breed, the opposite being placed GCCN x Tsigai. Following this course the situation is reversed if the dry matter content, the highest content to the DM meeting at GCCN x Tsigai. The group of GCCN X Tsigai have the highest fat content, while Suffolk x Tsigai have the highest protein content of DM, ash content was higher in Tsigai breed.

The differences concerning the dry matter content of meat are distinctly significant ($p<0.01$) when compared group 1 with 2, and very significant ($p<0.001$) in comparison group 1 with 3.

Also, distinctly significant differences ($p<0.01$) were recorded between groups of cros breeds and Tsigai breed about the meat content in crude protein. Differences made on the crude fat and crude ash are not represented ($p>0.05$).

The chemical composition of meat depends not only of race, but a number of factors, including here system maintenance.

Research conducted by Demise *et al*. (1995), quoted by Rahmann, G. (2009), of young German Blackface sheep breed fed on pasture, in two versions - extensive and semi-intensive, have showed that in group fed on semi-intensive system was recorded a higher content of dry matter and fat, while in the extensive version was recorded a higher protein content. Average weight of animals at slaughter was 38.30 kg and 15.30 kg hot carcass weight at extensive version, 43.70 kg weight at slaughter and 20.60 kg hot carcass weight in semi-intensive version. The protein content was higher in extensive system, and fat content in semi-intensive system.

The results recorded concerning the *Longissimus dorsi* area at the last ribs and the surface of the leg section are presented below (Tab. 2).

Tab. 2

The surface of the *Longissimus dorsi* and the leg section depending on genotype

Specification	Breed/ Cross breed (n = 5)	$\overline{X} \pm s_{\bar{x}}$	V %	d	Difference significance
Weight befor slaughtering (kg)	Tsigai Suffolk x Tsigai GCCN x Tsigai	36.80 ± 0.29 40.83 ± 0.42 39.68 ± 0.63	1.77 2.30 3.55	- +4.03 +2.88	- *** **
Cold carcass weight (kg)	Tsigai Suffolk x Tsigai GCCN x Tsigai	16.56 ± 0.44 19.48 ± 0.27 18.66 ± 0.38	5.98 3.08 4.56	- 2.920 2.100	- ** **
Surface of muscle *longissimus dorsi* (LD) (cm^2)	Tsigai Suffolk x Tsigai GCCN x Tsigai	13.06 ± 0.19 14.88 ± 0.12 13.34 ± 0.40	3.29 1.81 6.75	- 1.820 0.280	- *** ns
Surface of the leg of mutton section (cm^2)	Tsigai Suffolk x Tsigai GCCN x Tsigai	103.53 ± 0.99 128.47 ± 4.92 113.12 ± 4.10	2.14 8.58 8.12	- 24.940 9.590	- ** *

From the data table is found that the highest value of *Longissimus dorsi* muscle area meets at Suffolk x Tsigai group, followed by GCCN x Tsigai, differences of 1.82 cm^2 recorded between groups 1 and 2 is very significant ($p<0.001$). Between groups 1 and 3, the difference of 0.28 cm^2 in favor of cross breed lot is insignificant ($p>0.05$).

Demise *et al*., (1995), quoted by Rahmann, G. (2009), showed that in pure breed, German blackface has realized a area of *Longissimus dorsi* of 12.60 cm^2 at 15.30 kg hot carcass weight (animals were maintained on pasture in extensive system) and 14.80 cm^2 at 20.60 kg hot carcass weight (animals were maintained in semi-intensive system).

Concerning the area of the leg of mutton section, the differences recorded between the lots of Tsigai breed and Suffolk x Tsigai crossbreed is distinctly significant ($p<0.01$), and between groups of Tsigai breed and GCCN x Tsigai cross breed the difference is significant ($p<0.05$).

Based on data obtained by Suffolk x Tsigai cross breed regarding the leg section area, we can appreciate, that they are comparable and even superior to the results obtained of specialized breeds for meat production. Thus, a study on Charmoise breed, showed a value of leg section area of 121 cm^2 (Laville, E. *et al,* 2002), a value lower than that obtained in this experiment by Suffolk x Tsigai.

CONCLUSIONS

Besides quantitative carcass characteristics, usually is also done the chemical analysis of meat proceeded from the mentioned muscle *Longissimus dorsi*, because this one is tight linked of meat psycho-sensitive features' manifestation, features which are appreciated by the consumers for the meat evaluation, this appreciation leading implicitly to a market with culinary preferences extremely jumpy and very pretentious for the meat quality (Russo *et al.,* 2003).

The water and dry matter proportion varies depending a lot of factors, from which an essential role is played by the breed and administrated fodder, besides the sample proceeding region and applied fattening technology. The completion of carcass tissue composition or structure with meat chemical composition analysis, with data concerning the meat sensory features and all these correlation, offer the adaptation possibility of technological system to obtain carcasses appreciated by consumers and the meat consumption increasing.

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