THE INFLUENCE OF THE GROWTH SYSTEM ON DRESSING PERCENTAGE AND THE MEAT QUALITY OBTAINED FROM TURCANA LAMBS BRED IN MONTAIN AREA IN NORTH-EAST OF ROMANIA

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Abstract

The purpose of this paper was to demonstrate the influence of growth system on the main traits related with meat production from local sheep raised in mountain area in north-east of Romania. Growing systems covered by the study are: the traditional and semi-intensive. To conduct research was purchase a total of 20 lambs weaned from Turcana race, which were divided into two groups (10 lambs in each group). A lot was raised in a traditional mountain system in the shepherd of Bucovina, and the other group was subjected to semi-intensive fattening. The proportion of various parts of the carcass have been favorable to animals reared in semi-intensive system due to operation of disinfestations carried out on time and correctly, as well as a balanced diet which caused the gigot weight and in total shoulder carcass to be about 70%, and only 60% at individuals grown traditionally. Between individuals grown in different farming systems (semi-intensive and traditionally) were found significant differences ($p<0.001$) in most parameters that refer to quantitative and qualitative meat. From the point of view of the brute chemical composition, the meat from individuals grown in semi-intensive system had values significantly ($p<0.05$, $p<0.01$) higher in comparison with those obtained with lambs reared in the Traditional system.

Key words: lamb, dressing percentage, meat quality.

INTRODUCTION

The sheep meat represents an aside category into world meat production, because as concerns its qualities are considered meat with especial organoleptic and nutritive features [4]. Red meat forms part of the habitual balanced diet for many adults. It is recognized that over many years of evolution, humans have adapted to consuming large quantities of lean red meat [9]. Red meat contains high biological value protein and important micronutrients that are needed for good health throughout life. It also contains a range of fats, including essential omega-3 polyunsaturated fats. Recent analyses have shown that there has been a significant trend to leaner cuts of meat over the past two decades [17].

Because age and growth rate affect carcasses weight and meat quality could be difficult to discriminate between direct and indirect effects of diet on meat unique quality characteristics if animals have different growth rates. [13]. Moreover, most previous studies comparing animals that pasture with animals fed in stabulation in different environmental conditions and space, and physical activity could distort the interpretation of results. [3]. In addition, most studies cited focused on the production of beef, but little information is available for the lamb, which in many parts of Europe, is produced by exclusive exploitation of pastures.

Lamb meat quality is influenced by many factors such as race weight at slaughter [12, 14, 16], sex [2, 15,], nutrition [1], and age at weaning [15]. Other factors that may influence the quality of the meat can be pre-slaughter stress, the rate of cooling of the acrcasses and curing regime [16]. Meat is to be accepted as superior quality must to comply with certain physical-chemical characteristics, in particular color and fat content.

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MATERIAL AND METHOD

To conduct this research was purchase a total of 20 weaned lambs from Turcana breed, which were divided into two groups (10 lambs in each group). One lot was raised in a traditional fattening system in a mountain sheepfold in Bucovina area, and the other group was submitted to semi-intensive fattening system (on an improved mountain pasture and with additional concentrates) in the same area over a period of 120 days. Average weight of lambs at the time of purchase was 15 kg (and a mean age - 3 months).

The lot reared in traditional system was grown in loose housing; lambs were fed with natural hay and wheat bran (about 150 g/head/day) over the period. In terms of experimental group which has been maintained in the semi-intensive system it was fed with green mass at discretion on a improved mountain pasture, of which floristic composition was consisting mostly of grass (60%) and 40% legumes white clover respectively. In addition to green mass to the semi-intensive exploited lot has been administered wheat grain during the 120 days. The averaged amount of concentrates given was 150 g/head/day.

Fodder used was analyzed in terms of chemical composition by the standards existing:

- ISO 6496/2001 Fodder. Determination of moisture and other volatile substances.
- ISO 5984/2001 Fodder. Determination of crude ash.
- SR 13325/1995 Fodder. Determination of nitrogen content and calculation of protein content.
- ISO 6492/2001 Fodder. Determination of fat content.
- SR EN ISO 6865/2000 Fodder. Determination of crude fiber, intermediate filtering method.

Following these analyses was determined the chemical composition of feeds used in feeding both groups of animals (Table 1).

Table 1 Mean of gross chemical composition of feeds used in lambs feeding in semi-intensive fattening system (g/kg DM[1])

Specification	Improved pasture	Wheat grain	Corn grain
Organic matter	894	980	983
Crude ash	106	20	17
Crude protein	286	144	126
Crude fat	30	19	43
Gross fiber	175	26	20
Nitrogen free extract	404	791	794

[1] – Dry matter

During the four months, as it took the first stage of the project, were made weighing's at purchase and then on a monthly basis to the slaughter. For the weighing's has been used electronic scale Bosch, 4200 PPW measurement range 0.1 kg to 150 kg and with an accuracy of 10 g. Weighing of animals was done to determine average daily growth of each individual in the two farming systems.

Slaughtering of individuals in the two experimental groups has been performed at the same age. After slaughtering, weighing has been performed for carcasses, internal organs, skins and horns (where possible) at each individual studied. Weighing of the parts entering into the composition of the body (organs, gastro-intestinal mass) was made using electronic scale: KPS-ACFN type 30, with measurement range 0.01 – 30 kg, with an error of 5 g and that was manufactured and distributed in the year 2010 INTERNATIONAL SRL SC SWS.

Samples for histometric analyzes were processed using paraffin sectioning method. To analyze the samples, we used digital

photon microscope Motic DMWB1-223, calibrated 4-lens ocular associations. The measurements were performed by the computer, using the measurement line and area features computation of the application software previously describet. Thus, measurements were made of the large and small diameters of muscle cells as well as their and cross section area.

RESULTS AND DISCUSSIONS

Cut portions assessment plays an important role in determining the weight of each comercial portion of the carcass, especially those of Class I (eg leg). The valuable trade cuts have a higher weight, the more efficient growth of these types of animals for meat production. The data on the weight of commercial areas, and their weight in the carcass are shown in Table 2.

Table 2 Mean values of commercial cuts and their share in carcasses in young sheep studied (kg)

Specification	Semi-intensive system			Traditional system			*p-value*
	$\overline{X} \pm s_{\overline{x}}$	V%	% of carcass	$\overline{X} \pm s_{\overline{x}}$	V%	% of carcass	
Carcass weight	12.02±0.893	23.50	100.0	7.72±0.459	23.57	100.0	*0.00895***
Leg	4.72±0.320	15.17	39.27	2.56±0.188	16.49	33.16	*0.00039****
Shoulder	3.64±0.223	13.68	30.28	2.02±0.150	16.63	26.17	*0.00030****
Neck	0.92±0.074	18.03	7.65	0.54±0.094	38.96	6.99	*0.01315**
Rack	1.34±0.094	15.75	11.15	0.59±0.059	22.23	7.64	*0.00007****
Loin	0.80±0.109	30.45	6.66	0.38±0.078	45.93	4.92	*0.013912**
Breast	0.75±0.060	17.87	6.24	0.36±0.063	39.19	4.66	*0.00198***
Flap	0.83±0.082	22.01	6.91	0.50±0.076	34.02	6.48	*0.018796**
Short loin	0.35±0.030	19.27	2.91	0.40±0.073	40.95	5.18	*0.55180 ns*
Tail	0.23±0.036	34.94	1.91	0.14±0.023	36.81	1.81	*0.07423 ns*
Loss	0.46±0.090	43.54	3.83	0.24±0.052	49.27	3.11	*0.06031 ns*

ns- insignificant differences (P > 0.05); * - significant differences (P < 0.05); ** - distinct significant differences (P<0.01); *** - verry significant differences (P < 0.001)

The data in Table 2 show that the leg has the largest share of carcass, followed by shoulder, which together represent approximately 70% of carcass weight in semi-intensive reared animals and about 60% for the traditional system. With over 6% in forming commercial carcass are other parts such as leg, rack, breast and neck. For the main portion of the carcass were significant differences (P <0.05, P <0.01, P <0.001), but for short loin, tail, and the losses the diferferences was nonsignificant.

Analysis of tissue structure of portions in the carcass gives us very important data, especially when referring to the ratio established between tissues. In sheep, leg is most appreciated region of the carcass, the share in the carcass influencing directly its commercial value (over 75% muscle mass). The data relating to these aspects are presented in Table 3.

Data from the two groups of individuals studied shows that, with regard to the total weight of the two analyzed portions, the differences are mostly very significantly (p<0.001). Regarding the relationship between the tissues of two regions (meat/bones), it had a greater value in case of leg (p<0.01) compared with values obtained from the shoulder (p<0.001).

Table 3 Tissue structure of the main commercial parties in carcasses in young sheep studied (kg)

Specification	Semi-intensive system			Traditional system			*P - value*
	$\overline{X} \pm s_{\overline{x}}$	V%	% of carcass	$\overline{X} \pm s_{\overline{x}}$	V%	% of carcass	
Carcass weight	12.02±0.893	23.50	100.0	7.72±0.459	23.57	100.0	*0.00895***
Shoulder of which:	3.64±0.223	13.68	*30.28*	2.02±0.150	16.63	*26.17*	*0.00030****
- muscle+fat	2.70±0.166	13.74	*22.46*	1.28±0.096	16.80	*16.58*	*0.00007****
- bone	0.94±0.061	14.50	*7.82*	0.67±0.055	18.50	*8.68*	*0.01072**
- meat/bone ratio	2.87±0.087	6.75	-	2.03±0.092	10.16	-	*0.00015****
Leg of which:	4.72±0.320	15.17	*39.27*	2.56±0.188	16.49	*33.16*	*0.00039****
- muscle+fat	3.73±0.262	15.69	*31.03*	1.81±0.143	17.67	*23.45*	*0.00019****
- bone	0.99±0.085	19.19	*8.24*	0.75±0.053	15.73	*9.72*	*0.044625**
- meat/bone ratio	3.83±0.274	15.96	-	2.42±0.115	10.60	-	*0.00141***

* - significant differences (P < 0.05); ** - distinct significant differences (P < 0.01); *** - verry significant differences (P<0.001)

The results of this analysis can be considered as satisfactory for animals reared in semi-intensive system.

The microscopic analyzes of myocytes, it was found that the lowest values were recorded in loin muscles (mostly *Longissimus dorsi* muscle, with diameter of 13.7 μ for traditionally reared lambs to 19.3 μ for semi-intensive reared lambs) than muscle fibers in the leg muscles, diameter sizes from 18.6 μ for traditionally reared lambs to 24.9 μ obtained from lambs reared in semi-intensive system (Table 4).

Table 4 Average values of the main measurements of the striated muscle fibers in young sheep

Specification	n	Semi-intensive system		Traditional system		Statistical differences
		$\overline{X} \pm s_{\overline{x}}$	V%	$\overline{X} \pm s_{\overline{x}}$	V%	
Leg:						
- diameter (μm)	100	24.87±0.833	31.07	18.61±0.46	22.86	***
- area (μm^2)	100	1163.99±44.96	35.82	825.66±30.26	33.99	***
- perimeter (μm)	100	70.12±1.86	24.61	56.60±1.14	18.61	***
Loin:						
- diameter (μm)	100	19.33±0.64	26.49	13.65±0.37	20.02	***
- area (μm^2)	100	836.31±37.88	33.89	587.29±15.30	19.50	***
- perimeter (μm)	100	55.08±1.61	21.88	46.2±0.63	10.22	***

*** - verry significant differences (P < 0.001); n – number of readings.

The lower diameter of the muscle fibers in traditionally bred lambs, in this case, there isn't an advantage in terms of the fineness of the fibers, but shows insufficient development of the muscle groups of economic interest due to poor diet [6, 8].

Between the values of the dimensions analyzed in muscle fibers harvested from lambs raised in the two systems (traditional and semi-intensive) were recorded very significant statistical differences, which support the previously stated.

The analysis of the muscle fiber per each portion showed an area about 50% greater for leg compared with those harvested from loin. The same proportion was registered for the cross-sectional area of muscle fascicles of first order, however, the number of muscle fibers per muscle bundle I was higher in loin muscle, where you can detach the idea that

these muscles are characterized by softness and a water retention capacity improved in comparison with the other muscles examined.

The chemical analyzes have revealed significant and distinct significant differences for meat samples collected from lambs raised in the two systems.

The water content in to loin and leg muscles studies for traditional growth has averaged 75%, with about 4 percentage points more than in meat from lambs reared semi-intensive, differences reflected in statistical terms, were significant differences was recorded (Table 5).

Table 5 Gross chemical composition of lamb meat raised in traditional and semi-intensive system

Comercial cuts	Chemical compozition (%)	Fattening system	n	$\overline{X} \pm s_{\overline{x}}$	V%	Statistical differences
Loin	Moisture	T	10	75.35±0.32	0.72	*
		SI	10	71.27±0.17	0.67	
	Dry matter	T	10	24.65±0.24	1.83	**
		SI	10	28.73±0.19	1.79	
	Crude protein	T	10	19.55±0.09	0.27	**
		SI	10	21.19±0.21	0.49	
	Crude fat	T	10	5.11±0.12	3.35	*
		SI	10	5.45±0.06	2.17	
	Nitrogen free extract	T	10	0.37±0.01	5.27	*
		SI	10	0.46±0.03	3.25	
	Crude ash	T	10	1.15±1.10	1.15	ns
		SI	10	1.07±0.90	2.20	
Leg	Moisture	T	10	75.74±0.49	0.41	*
		SI	10	73.03±0.38	0.53	
	Dry matter	T	10	24.26±0.18	1.57	**
		SI	10	26.97±0.16	1.65	
	Crude protein	T	10	18.35±0.03	0.44	*
		SI	10	20.12±0.02	0.39	
	Crude fat	T	10	4.40±0.07	0.91	**
		SI	10	5.29±0.01	1.37	
	Nitrogen free extract	T	10	0.43±0.05	5.41	ns
		SI	10	0.45±0.01	7.30	
	Crude ash	T	10	1.07±0.02	3.17	ns
		SI	10	1.14±0.02	0.62	

T – traditional; SI - semi-intensive; n – number of individual; ns- insignificant differences (P > 0.05); * - significant differences (P < 0.05); ** - distinct significant differences (P < 0.01);

Significant proportion of dry matter (about 29% to 27% for chop and leg) of the two muscles studied where in semi-intensive growth system is given by the higher content of protein and fat in these muscles. Quality of meat is generally length with meat protein and fat content. Feeding add-libitum and balanced energy-protein forage determined that samples from lambs reared semi-intensive to have a crude protein content increased by approximately 2 percentage points compared with samples from lambs reared traditionally justified by the fact the optimal development of mass muscle.

The fat contents of meat intended for consumption is lately a much debated topic, therefore, the proportion of fat in the samples was studied. After chemical measurements, it was observed that the lamb which was traditionally grown is about 1% lower than that those obtained from lambs reared semi-intensive, revealing and significant differences between groups for both muscle groups. Data within the values found by other researchers as [7, 10, 11, 5,], for the lamb (dry matter 71.0-75.15%, crude protein 17.27-23.39, crude fat 2.83-10.4, and ash 0.73-0.98), where it appears that the chemical properties of Ţurcană bred lamb, and particularly those derived from animals raised semi-intensive is more quality comparing with those of traditional nursery.

CONCLUSIONS

The fattening system by the combined effects of race, weight, food, sex, and age may affect lamb meat, but its proportion in the carcass.

The proportion of the main commercial cuts in carcass was favorable for livestock in semi-intensive system due to disinfestation operations carried out on time and accurately, but also a balanced diet, which made the share of leg and shoulder in total carcass to be about 70 %, and only 60% of individuals traditionally grown.

Regarding the dimensional elements of muscle fibers in the two lots of sheep studied, it was found that the loin muscles (*Longissimus dorsi*) is characterized by smoothness significantly ($p < 0.001$) higher compared with muscles coming from the leg.

Also, among individuals reared in different systems (semi-intensive and traditional) have highlighted significant differences ($p < 0.001$) in most parameters that refer to quantitative and qualitative meat.

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