VOLUME 2, 2018
DOI: 10.31058/j.as.2018.24017

The Influence of Length of Fattening and Gender of Lambs on Yield of Basic Parts and Meat Categories in Half

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Received: 21 July 2018**; Accepted:** 30 August 2018**; Published:** 19 October 2018

Abstract:

Thirty six tests were performed on Pirot ennobled race, divided into three groups of 12 lambs (6 male and 6 female). The first group of lambs was fattened for 60 days, the second and the third 120 and 180 days. Nutrition of the lamb to rejection (40 days) is the mother's milk. After 40 days, it switched to pelleted concentrate (with 18% protein) and a quality seeds, which was ad libidum as the concentrate. At the end of the fattening, the lamb is slaughtered by the usual technique. After cutting the cooled of carcass to the half, the left and right halves were measured, and then the right half was removed from further testing. The cut off of the left carcass half was performed on basic parts: round, loin, back, shoulder, neck, breast, ribs, foreshank, belly and lower leg, as well as their measurement. The aim of the investigation is to determine the impact of the length of fattening and the gender of lambs on the yield of lambs meat of both sexes and to determine the moment when it is best to discontinue fattening. The meat of 1^{st} category participates by highest percentage in halves of the second group of lambs. Differences between groups were significant ($P<0.01$). The concerning participation of meat of 2^{nd} category, there are no differences between groups. The third category of meat is the most common ($P<0.01$) in lambs of the first group. Gender has no significant effect on the level of meat percentage in halves.

Keywords:

Lambs, Meat Yield, Basic Parts, Meat Categories

1. Introduction

The meat quality is influenced by consumer demand. Red meat consumers tend to prefer meat of grazed lambs, considering that such lamb meat is much healthier, tastier and more natural than meat from concentrate-based production systems [1].

Sheep breeding in Turkey is usually performed by the use of native breeds and also using traditional methods – which are similar to many countries in the Middle East. Sheep in the traditional production system proliferate according to natural breeding

period and lambs suckle their dams until the slaughter age [2]. The Swedish lamb industry and market has determined that the carcass of lamb should weigh between 16 and 22 kg [3]. In Slovakia, light lambs with carcass weight less than 13 kg (Decree of the Ministry of Agriculture No. 206/2007 of 4 April 2007) are produced before Easter (to a greater extent) and Christmas (to a lesser extent), [4].

Lamb meat is considered to be a highly nutritious, easy digestible and valued food with a positive fatty acid composition [5,6].

However, in some countries (France, Great Britain) lambs are widely used because of their nutrition. In other countries, however, (Belgium, Germany), lamb is the most expensive in terms of other types of meat. In the Republic of Serbia the most gorgeous are the mountain lambs ("Sjenicko, Pirotsko, Sharplaninsko, Homoljsko, Durmitorsko"). The type of sheep with triple production capabilities (meat, wool and milk) is very widespread in the Republic of Serbia (90%). The largest percentage belongs to the stool of about 80% of the total sheep population in the country. The name of the pomegranate is a term that denotes our domestic primitive sheep [7].

The research [8] relates to the impact of the intensity of fattening on the yield and quality of lamb and discovered that intensive fattened lambs achieve better meatiness of carcass (higher share of meat from category I and more meat in the body).

Thirty-six Kivircik male lambs were used to determine the effects of rearing season (winter rearing – WR; spring–summer rearing – SSR; and autumn rearing – AR) on carcass and meat quality characteristics. WR lambs had higher empty body weight, dressing percentage and back fat thickness. The increased dressing percentages of WR lambs might be explained by the higher fatness in their carcasses. In this study there are differences between rearing groups in terms of slaughter weight of lambs which were slaughtered at the same age –WR lambs had the highest slaughter weight compared with other groups. Back fat thickness of concentrate-fed lambs' carcasses were also higher than that of pasture-fed lambs. Feeding with high-energy nutrition and less physical activity might be the cause of the stored fat in carcasses of WR lambs which were fed with concentrate in addition to their mothers' milk in the sheepfold, [9].

The four different production models tested in this study; indoor, cultivated pasture with or without supplemented concentrate or semi natural pasture, did not affect meat quality in terms of final pH and temperature in muscle as well as pH six days after slaughter. Parameters that on the other hand were affected by treatment and could be of importance in the actual production were days in experiment, weight at slaughter, growth, conformation and fatness. Lambs reared on cultivated pasture had better carcass classifications (conformation and fatness) than lambs reared on semi natural pasture even if the slaughter wieghts were similar. Even though the nutritional content of the two pastures were similar, the quantity was lower at the semi natural pasture. In addidtion, the parasite burden was higher on the semi natural pasture compared to the cultivated one, which affected the daily weight gain, [10].

2. Materials and Methods

2.1. Animals and Experimental Design

The experiment included a total of 36 lambs from the purified ennobled sheep divided into 3 groups (6 males and 6 females), according to the duration of the fattening period, as follows: I group 60 days fattening; II group 120 days

fattening and III group 180 days fattening, at the farm Djumruk on Vlasina Lake, Republic of Serbia.

The test is performed only in lambs, lambing as unions.

Figure 1. *"Pirot involved pramenka" with lamb (Farm Djumruk, Vlasina lake, Serbia).*

2.2. Feeding of Lambs

The daily meal of sheep breastfeeding from the beginning of the experiment to the 40th day consisted of: seeds 1.8 kg / lamb ; silage 1.5 kg / lamb and concentrate 0.5 kg / lamb .

In the first 10 days, the mother's milk was present in the diet of the lambs, and from the 11th day until the end of the fattening, all three groups of lambs had at their disposal a pelleted concentrate and a quality seeds at will, whose consumption was monitored and recorded every day. The lambing period of the lambs was completed on the 40th day of their life.

In the diet of all three groups of lambs, the pelleted concentrate and the quality seeds were represented until the end of the experiment and that no group was pasture or used any other foods.

2.3. Transport and Health Inspection of Lambs

After finishing the fattening, the lambs were slaughtered in the slaughterhouse Jugokop - Bujanovac, Serbia, which had an export character, which means that all necessary prerequisites for processing and storage of the meat received were met, according to the strict European standards.

Each group of lambs from farm to slaughterhouse was transported by truck. Twelve hours before slaughter, food was broken at the lambs, while water was available until loading in a truck.

Immediately after the landing of the lambs in the livestock depot, a visual inspection was carried out by the veterinary inspection, which concluded that all the lambs were in good condition, with good health and that they could go to slaughter.

2.4. Slaughter Procedure, Carcass Characteristics and Dissections

The slaughter of the lambs is carried out according to the technological procedure, according to the following phases: preparing lamb for slaughter; raising to the track; bleeding; removing the skin; evisceration and cooling.

After taking the linear measures is done cutting left half on basic parts, and their measurement. Then, the calculated values of the yield of individual tissues (meat, fat, bones) in the main parts of the carcass.

After slaughtering the lambs, the primary processing and cooling, the halves are cut into the main parts. The carcasses are cut into the following main parts: round, loin, back, shoulder, neck, breast, ribs, foreshank, belly and lower leg. The round is separated from the loin by a cut between the last loin and the first baptized vertebrae. The lower leg is separated from the round in the knee joint. Loin is separated from the back with a cut between the 12th and 13th rib. The abdominal wall is separated from the loin by a cut parallel to the spinal column. The back is separated from the subshoulder by a cut between the 6th and 7th rib. The subshoulder is separated from the shoulder and breast by the natural muscular connection. The subshoulder is separated by neck, cutlets, ribs and breast. The neck is separated from the subshoulder by a split between the last vertebra and the first lumbar vertebrae. The ribs are separated by breast, subshoulder, stomach wall and cutlets. The breast are separated from the subshoulder by a cut in the direction of the rib, so that only the ends of the first 6 ribs remain on the breast. The foreshank is separated from the shoulder in the elbow joint.

Figure 2. *Lamb carcass.*

2.5. Statistical Analysis

Variational statistical analysis was performed by analyzing the variance of two-factorial experiment (3 x 2), according to [11]. The differences in the mean values were tested with the Tukey test.

3. Results and Discussion

Table 1 presented data related to yield of the main parts and categories of meat of the halg for male lambs (kg).

Table 1. *Yield of the main parts and categories of meat of the half for male lambs (kg).*

Part of half	Group								
	I			II			III		
	$\overline{X}$	SD	Cv	$\overline{X}$	SD	Cv	$\overline{X}$	SD	Cv
Half	4.08 ^{a}	0.78	19.12	6.57 ^{b}	0.65	9.94	7.74 ^{c}	0.51	6.53
Round	1.02 ^{a}	0.20	20.08	1.93 ^{b}	0.17	8.75	2.02 ^{c}	0.13	6.38
Loin (without kidney and fat)	0.44 ^{a}	0.13	29.49	0.69 ^{b}	0.09	9.27	0.82 ^{c}	0.17	20.42
Back	0.26 ^{a}	0.05	18.32	0.47 ^{b}	0.06	13.34	0.49 ^{bc}	0.05	9.98
Shoulder	0.81^{a}	0.09	11.54	1.45 ^{b}	0.24	16.74	1.59 ^{c}	0.14	8.90
Neck	0.34 ^{a}	0.10	28.42	0.47 ^{b}	0.16	34.09	0.68 ^{c}	0.10	14.75
Breast with foreshank	0.86 ^{a}	0.21	25.03	1.11 ^{b}	0.11	9.91	1.66 ^{c}	0.13	7.64
Lower leg	0.26 ^{a}	0.05	19.69	0.34 ^{b}	0.05	15.39	0.43 ^{c}	0.06	14.71
Part of 1st category	1.46 ^{a}	0.29	20.13	2.62 ^{b}	0.26	9.91	2.83 ^{c}	0.26	9.32
Part of 2nd category	1.42 ^{a}	0.22	15.80	2.40 ^{b}	0.33	13.56	2.76 ^{c}	0.17	6.04
Part of 3rd cetegory	1.12 ^{a}	0.26	23.45	1.45 ^{b}	0.15	10.27	2.09 ^{c}	0.18	8.71

abc – The mean values in a single row marked with different letters are significantly different (P < 0.01)

Various studies [2,12,13] showed that lambs fed concentrate diet in sheepfold had higher growth rate than lambs fed on pasture. Growth rate increases with rising proportion of concentrate in the diet [14]. Also, great energy deprivation might occur because of increasing physical activities and basal metabolism due to grass consumption in their diet for pasture-fed lambs [15].

Some studies have indicated that lambs fed with concentrate diet generally have higher carcass weight [15,16].

Some authors reported higher fatness level in lambs fed concentrate in sheepfold than lambs fed on pasture and concomitant dressing percentage increase [2,12,15,17]. Also, [18] reported an increase in fatness level of carcass with increasing slaughter weight of lambs.

Table 2 presented data related to yield of the main parts and categories of meat of the halg for female lambs (kg).

Significant differences (P <0.01) are expressed among all three groups in male and female lambs (Table 1 and 2) in: half, round, loin (without kidneys and fat), shoulder with a subshoulder, neck, breast with a foreshank, lower leg, parts of 1st, 2nd and 3rd category. Back significant difference at the level (P <0.01) exists in the first and second group and in the first and the third group.

Table 2. *Yield of the main parts and categories of meat of the half for female lambs (kg).*

Part of half	Group								
	I			II			III		
	$\overline{X}$	SD	Cv	$\overline{X}$	SD	Cv	$\overline{X}$	SD	Cv
Half	3.90 [a]	0.33	8.54	5.50 [b]	0.32	5.81	7.16 [c]	0.72	10.10
Round	1.01 [a]	0.11	10.59	1.61 [b]	0.08	5.06	1.99 [c]	0.21	10.38
Loin (without kidney and fat)	0.43 [a]	0.03	6.61	0.65 [b]	0.07	10.61	0.81 [c]	0.08	10.49
Back	0.25 [a]	0.05	21.14	0.41 [b]	0.03	6.91	0.47 [bc]	0.05	10.48
Shoulder	0.73 [a]	0.10	14.35	1.23 [b]	0.04	3.26	1.43 [c]	0.14	9.87
Neck	0.32 [a]	0.39	4.75	0.36 [b]	0.05	13.17	0.60 [c]	0.05	8.86
Breast with foreshank	0.83 [a]	0.13	15.91	0.94 [b]	0.12	13.17	1.43 [c]	0.23	16.23
Lower leg	0.24 [a]	0.02	6.88	0.29 [b]	0.02	6.97	0.39 [c]	0.07	16.70
Part of 1st category	1.44 [a]	0.13	9.15	2.26 [b]	0.14	6.07	2.71 [c]	0.29	10.48
Part of 2nd category	1.30 [a]	0.17	13.23	1.99 [b]	0.13	6.34	2.50 [c]	0.22	8.77
Part of 3rd cetegory	1.07 [a]	0.13	11.86	1.23 [b]	0.13	10.96	1.82 [c]	0.24	13.23

abc – The mean values in a single row marked with different letters are significantly different (P < 0.01)

The yield of meat in the main parts of the half as well as in all categories of meat, is higher in male lambs (Table 3). However, statistically significant differences (P <0.05) between male and female lambs are determined only in the second group, in the mass of the half, the round, the shoulder with subshoulder, the neck, the breast with the foreshank and the parts of 2nd and 3rd category.

The differences in the mass of the breast with the foreshank and the mass of the parts of 3rd category among the male and female lambs of the third group (P <0.05) are also significant.

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Table 3. *Yield of the main parts and categories of meat of the half according to the sex of the lambs (kg).*

Basic parts	Group	Male	Female	Difference
Left half	I	4.08	3.90	0.18 ^{ns}
	II	6.57	5.50	1.07 *
	III	7.74	7.16	0.58 ^{ns}
Round	I	1.02	1.01	0.01 ^{ns}
	II	1.93	1.61	0.32 *
	III	2.02	1.99	0.03 ^{ns}
Loin (without kidney and fat)	I	0.44	0.43	0.01 ^{ns}
	II	0.69	0.65	0.03 ^{ns}
	III	0.82	0.81	0.01 ^{ns}
Back	I	0.26	0.25	0.01 ^{ns}
	II	0.47	0.41	0.06 ^{ns}
	III	0.49	0.47	0.02 ^{ns}
Shoulder	I	0.81	0.73	0.08 ^{ns}
	II	1.45	1.23	0.22 *
	III	1.59	1.43	0.16 ^{ns}
Neck	I	0.34	0.32	0.02 ^{ns}
	II	0.47	0.36	0.11 *
	III	0.68	0.60	0.08 ^{ns}
Breast with foreshank	I	0.86	0.83	0.03 ^{ns}
	II	1.11	0.94	0.17 *
	III	1.66	1.43	0.23 *
Lower leg	I	0.26	0.24	0.02 ^{ns}
	II	0.34	0.29	0.05 ^{ns}
	III	0.43	0.39	0.04 ^{ns}
Part of 1st category	I	1.46	1.44	0.02 ^{ns}
	II	2.62	2.26	0.00 ^{ns}
	III	2.83	2.71	0.12 ^{ns}
Part of 2nd category	I	1.42	1.30	0.12 ^{ns}
	II	2.40	1.99	0.41 *
	III	2.76	2.50	0.26 ^{ns}
Part of 3rd cetegory	II	1.45	1.23	0.22 *
	III	2.09	1.82	0.27 *

****-*** *$P < 0.05$;* ***ns*** *- is not significant*

When comparing muscle, fat and bone percentages in left carcass half, the significant differences between AR and TR lambs (AR: artificial rearing, TR: traditional rearing) were found. Muscle percentage in left carcass half was significantly higher ($P < 0.001$) in TR lambs (59.4 % in AR lambs vs. 63.5 % in TR lambs). Bone percentage in left carcass half was significantly higher ($P < 0.01$) in AR lambs (29.2 % in AR lambs vs. 27.0 % in TR lambs), [4]. Similar muscle, fat and bone percentages were found by [18], in suckling lambs (carcass weight ranging between 8.1 and 10 kg).

4. Conclusions

Meat of 1st category in the halves participates with the highest percentage in lambs of the second group, followed by the third and the first group. The differences between the groups are significant ($P < 0.01$). There was no significant difference between the groups in the participation of meat from 2nd category. Meat of 3rd category with the highest percentage is present in the lambs of the first group, and

the lowest with the second group. The differences between the first and the second, as well as between the second and third groups are significant (P <0.01). The sex of the lambs does not have a significant influence on the level of participation of the meat category in the halves.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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