

SOME SLAUGHTER AND CARCASS TRAITS OF THE LAMBS OF DALMATIAN PRAMENKA REARED IN THREE DIFFERENT FATTENING SYSTEMS

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Abstract

In order to determine the impact of different fattening system (I - milk, pasture; II - indoors, milk, grains, III - milk, pasture, concentrate) on slaughter value and carcass quality of the lambs of Dalmatian Pramenka, 18 lambs (100 ± 5 days old), 6 in each group, were slaughtered. Lambs of one group were from the same flock and selected by birth weight (2.00 ± 0.20 kg). After slaughtering and cutting the carcasses into halves, in order to determine the share of legs and shoulders as well as certain tissues in the halves, the legs and shoulders were separated from the halves and total dissection was made. The significant differences ($P < 0.05$) of slaughter weight (I - 21.17 kg, II - 23.25 kg, III - 26.25 kg) and hot carcass weight (I - 9.98 kg, II - 11.92 kg, III - 12.92 kg) among three groups were found. The legs II (1.65 kg) and III (1.71 kg) were significantly heavier ($P < 0.001$) than legs I (1.32 kg), as well as shoulders (I - 0.52 kg, II - 0.65 kg, III - 0.69 kg; $P < 0.01$). Total dissection of the halves established these tissues ratio: muscle 51.25 %, fat 10.18 %, connective 13.93%, bone 23.04% and other tissues 2.32%. The biggest quantity of muscle tissue was found in halves III (3.27 kg) what was more ($P < 0.05$) than in halves II (2.83 kg) and I (2.50 kg). However, the biggest quantity of fat was found in halves II (0.85 kg) what was more ($P < 0.01$) than in halves I (0.33 kg) and III (0.52 kg). Therefore, the addition of concentrate in pasture fattening system (III) increased the muscularity, without significantly increasing the amount of fat in the lamb carcass.

Key words: *carcass dissection, carcass quality, carcass tissue ratio, Dalmatian lamb*

Introduction

Across the Mediterranean region of Croatia, as well as the other Mediterranean countries, sheep are mainly farmed under extensive or semi-extensive systems based on natural pastures. The main features of those systems are minimum investment in facilities, equipment and nutrition. Throughout the year the animals are kept outside, staying on natural pastures and mountain slopes but during bad weather and cold days in winter they are mainly kept in stables and fed with hay (Mioč et al., 2013). With approximately

230,000 heads, native Dalmatian Pramenka is the most numerous sheep breed in Croatia (HPA, 2013). Although this sheep is characterized by combined production characteristics, they are mainly used for meat production, especially famous young Dalmatian lamb (Mioč et al., 2008 and 2012). The production of Dalmatian lamb is traditionally based on slaughtering of light lambs at 18 to 25kg of body weight at slaughter, and at the age of 90 and 120 days, and consequently the average carcass weight (with head) is between 8 and 14 kg. Considering the carcass weight, as well as colour of the meat, and fat covering score, according to the Croatian Regulation (NN 30/2010) the carcass of Dalmatian lamb belongs to the category of light lamb (L), class/grade B/1 or C/1 or C/2 (Krvavica et al., 2013). Lamb carcasses of these characteristics are also preferred by the Croatian market, and they are especially suitable for preparation of the traditional Dalmatian lamb roast on a spit. Consequently, carcass of the Dalmatian lamb always comes on the market with head, kidneys and kidney fat.

Although the sheep farming systems in Dalmatia are mostly extensive, especially if sheep are used just for lamb production, at the sheep farms which besides lambs also produce cheese, the farming system becomes more or less intensive. Besides the extensive system of the lamb fattening, where the nutrition of the lambs and ewes is based on milk and pasture, there are two more semi-extensive fattening systems which are also commonly used in the traditional sheep farming in Dalmatia. One of them implies raising the lambs exclusively indoors until the end of fattening. During the time that ewes and lambs stay together indoors, besides the milk available ad libitum, at the age of four weeks the lamb diet is supplemented with grains (oats, barley, corn). This way of lamb farming is applied until the slaughtering of the lambs (the lambs never go out on pasture and besides the salt and water ad libitum they do not get any other feed supplements). The other version of semi-extensive farming system is more intensive and includes separating the lambs from their mothers and controlled suckling several times a day, and lamb grazing on separate pasture, and adding the feed in daily meal after weaning at age of 60 days, as well.

Numerous studies referred that intensification of the farming system increased carcass weight and dressing percentage in lambs, as well as fatness degree (Diaz et al., 2002; Priolo et al., 2002; Borton et al., 2005; Joy et al., 2008) and affects carcass tissue composition (Carrasco et al., 2009 and 2009a; Majdoub-Mathlouthi et al., 2013).

With respect to the three different fattening systems commonly used in the traditional sheep farming in Dalmatia, the aim of this study was to determine how these differences affect the quality of carcass and meat of the Dalmatian Pramenka lambs.

Materials and methods

A total of 18 lambs from Dalmatian Pramenka breed (birth weight 2 ± 0.2 kg; age 100 ± 5 days) originated from three different extensive and semi-extensive fattening systems (each group was composed of 6 lambs : 3 males and 3 females) which are all commonly used in traditional sheep farming in Dalmatia, were used in the research. All the lambs originate from three different farms (6 lambs per farm) selected according to the three types of fattening system. At the first farm (group I) lambs were raised outdoors in extensive system based on milk and pasture. First 15 days after birth, lambs were kept indoors and fed only by suckling. After that time, the lambs were grazed, but since lambs were raised together with ewes they were sucked ad libitum during the whole fattening period. At the second farm (group II) lambs were raised indoors under the semi-extensive system. During the day when the ewes were on pasture, the lambs were in stable and at the age of four weeks their daily diet was supplemented with grains (oats, barley and corn), ad libitum.

While the ewes were in stable (from late afternoon to early morning) the lambs were with them and they were sucked ad libitum. The lambs have never been out to pasture with ewes. At the third farm (group III) lambs were raised outdoors under the semi-extensive fattening system. First 15 days after birth the lambs were with their mothers all the time and they were sucked ad libitum. After that, the lambs were separated from the ewes and able to suck only few times a day, whereby the number of suckling was gradually reduced up to 2 times a day after 45 days. Also, at this time grazing on separate pasture, as well as small amounts of high quality hay, were introduced in the lamb meal. At the age of 60 days the lambs were weaned, after which they consumed pasture and hay ad libitum, as well as approximately 150 g of concentrate per day, distributed in two to three daily meals. Common characteristics of all three fattening systems were: first 4-5 days after birth ewes stayed indoors together with lambs; good quality hay was available to the lambs while they were indoors with or without ewes (commonly they start to nibble the hay at the age of 15-20 days); salt and water were available to lambs and ewes ad libitum all the times.

At the age of 100 ± 5 days lambs were slaughtered and cold carcasses were dissected according to the procedure described by Krvavica et al. (2013), including the methods of slaughter measurements (live body weight at slaughtering, hot and cold carcass weight, warm and cold dressing percentage). The measurements of the primal cuts and total dissection were conducted only on the right halves of lamb carcasses. Precise total dissection of the previously semi frozen halves was made manually, using a professional butcher knives, in such a way that different tissues, such as muscle, visible fat (external and internal surface fat, kidney fat, intermuscular fat) and connective tissue, and bones with cartilages were separated from each other. The tissues obtained by total dissection of leg shank portion, and shoulders and the rest part of the half carcass were measured separately.

Data were analysed using the SAS/STAT software (SAS, 2008). Effect of lamb fattening system on researched traits was analysed using the GLM procedure according to the ANOVA model that includes also the effect of fattening system and the weight of the hot carcass as a covariate.

Results and discussion

As it is presented in Table 1, the significant differences of some slaughter traits and weight of primal cuts and tissue composition of the lamb halves among the three different fattening groups were found. The heaviest lambs at slaughter were of group III (26.25 kg), which were significantly heavier than group I (21.17 kg; $P < 0.001$) and group II (23.25 kg; $P < 0.001$). Differences between the groups I and II were also significant ($P < 0.05$). Consequently, the hot carcass weight among the groups was also significantly different ($P < 0.01$), but not between the groups II and III, while the differences of cold carcass weight were similar as of live body weight. However, the significant differences of dressing percentages among the groups were not found. These specified differences confirmed the assumption that differences in lamb fattening system such as supplementing the lamb diet by grains or concentrate significantly affect the slaughter traits which is similar to the results observed by several authors (Borton et al., 2005; Carrasco et al., 2009; Ekiz et al., 2012). However, in contrast to this research these authors found the differences of dressing percentage affected by fattening system.

Weight of leg shank portion and shoulder of lambs from group I fattened on milk and pasture (1.32 kg and 0.52 kg, respectively) were significantly lower ($P < 0.001$ and $P < 0.01$, respectively) than in the other two groups, but the same differences were not found

between the groups II and III. According to Ekiz et al., 2013, lambs grazed on pasture and stubble had significantly lighter pelvic limb in comparison to those grazed just on pasture or fed concentrate. However, concentrate supplement in lamb diet did not affect weight of the pelvic limb of Comisana (Maiorano et al., 2009) and Tensina light lambs (Carrasco et al., 2009 and 2009a) as well as weight of leg and shoulder of Barbarine lambs fed with two level of concentrate (Majdoub-Mathlouthi et al., 2013).

Table 1. *Effect of lamb fattening system on some slaughter traits and weight of individual primal cuts and tissue composition of the lamb halves of Dalmatian Pramenka*

Slaughter traits	Fattening system			SEM	Effect
	I	II	III		
Live body weight, kg	21.17 ^a	23.25 ^b	26.25 ^c	0.46	*
Hot carcass, kg	9.98 ^a	11.63 ^b	12.92 ^b	0.35	**
Warm dressing percentage, %	47.22	49.99	49.16	0.98	NS
Cold carcass, kg	9.75 ^a	11.37 ^b	12.65 ^c	0.34	*
Cold dressing percentage, %	46.12	48.85	48.14	0.97	NS
Half, kg	4.85 ^a	5.65 ^b	6.31 ^c	0.17	*
Carcass primal cuts, kg					
Leg shank portion	1.32 ^a	1.65 ^b	1.71 ^b	0.52	***
Shoulder	0.52 ^a	0.65 ^b	0.69 ^b	0.23	**
Rest of the half	2.99 ^a	3.32 ^a	3.88 ^b	0.15	*
Tissue composition of the half, kg					
Muscle tissue	2.50 ^a	2.83 ^b	3.27 ^c	0.09	*
Surface fat	0.21 ^a	0.48 ^b	0.24 ^a	0.04	**
Kidney fat	0.05 ^a	0.19 ^b	0.18 ^b	0.02	**
Total fat	0.33 ^a	0.85 ^b	0.52 ^a	0.06	**
Connective tissue	0.76 ^{ab}	0.65 ^a	0.92 ^b	0.06	**
Bones	1.20 ^a	1.25 ^a	1.42 ^b	0.05	*
Other tissues	0.08 ^a	0.11 ^a	0.19 ^b	0.02	*

SEM: standard error of mean; NS: not significant; a, b, c: means at the same row with different letters are significantly different; *P<0.05; **P<0.01; ***P<0.001

Half carcass tissue composition was significantly different among the groups. The most of the quantity of muscle tissue was found in group III (3.27 kg) fed with concentrate what was significantly more than in group I (2.50 kg; P<0.001) and group II (2.83; P<0.001), while the difference between groups I and II were on P<0.05 level of significance.

The fattening system had clear influence on the total fat quantity despite the variation according to the fat depots. The treatment of group III (concentrate supplement in grazing pasture) had less effect on internal fat depots (kidney fat) which is similar to Carrasco et al., 2009. Quantity of total fat was the highest in group II (0.85 kg) fattened indoors based on milk and grains, while it was similar in group III (0.52 kg) grazed on pasture with concentrate and group I (0.33 kg) grazed on pasture without feed supplement but significantly lower in comparison to group II (P<0.01). Similar to this study, numerous authors also found highest level of muscle tissue and less fatness level in pasture grazed lambs compared to the lams raised indoors (Diaz et al., 2002; Carrasco et al., 2009 and 2009a; Ekiz et al., 2012) and some of them reported that the reason thereof might be

related with the changes in the metabolism of grazing lambs due to physical activities which cause mobilization of lipids from depots in order to build muscles what subsequently reduce the carcass fat (Diaz et al., 2002; Ekiz et al., 2012). Quantity of connective tissue and bones was highest in group III.

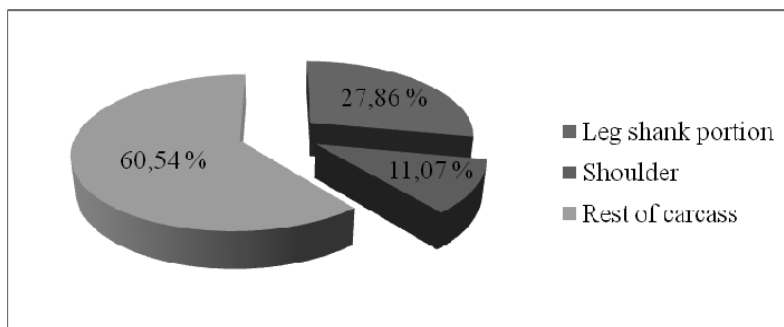


Figure 1. Percentage of leg and shoulder in the lamb carcass

The half lamb carcass of Dalmatian pramenka was made approximately from 27.86 % of leg shank portion and 11.07 % of shoulder (Figure 1). Tissue composition of the half carcass was as follows: 51.25 % of muscle tissue, 10.18 % of fat, 13.93 % of connective tissue, 23.04 % bones and 2.32 % other tissues (Figure 2).

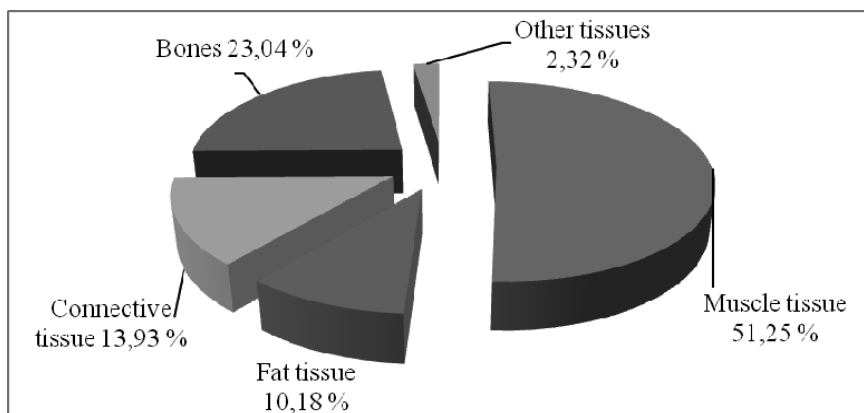


Figure 2. Proportion of certain tissues in the lamb carcass, %

Conclusion

Different lamb fattening systems, such as supplementing the lamb diet by grains or concentrate, significantly affect the slaughter traits and weight of primal cuts and tissue composition of the lamb carcass of Dalmatian Pramenka. Moreover, the addition of concentrates in pasture fattening system (group III) has positive effect, increasing the muscularity, without excessively significantly increasing the amount of fat in the lamb carcass. Although the addition of grains also has positive effect on muscle tissue the

indoors rearing system of group II probably has negative impact on increasing the fatness, especially on internal and external surfaces fat depots.

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