Comparative Studies on Slaughter Performances of the European Mouflon (*Ovis orientalis musimon Lin.*) and the Hybrids Obtained by Crossbreeding between Mouflon and Sheep Breed Tigaie

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Abstract

The aim of this work was to determine slaughter performances and carcass characteristics at European Mouflon (*Ovis orientalis musimon Lin.*). Also, for studied characteristics were determined the differences between European Mouflon (*Ovis orientalis musimon Lin.*) and hybrids (F1) obtained by crossbreeding between European Mouflon (Ovis ammon musimon Pal.) and the Romanian sheep breed Tigaie, raised under identical conditions. First generation hybrids (F1) were obtained by crossbreeding between females of sheep breed Tigaie and males of mouflon (FT x MM). The studied characteristics were slaughter yield on hot and chilled carcass, the participation percentage of the cut parts from live weight and from the whole carcass structure. At the age of 90 days 10 lambs were sacrificed (5 mouflons and 5 hybrids FTxMM). For slaughter performances, superior values were obtained from the hybrid lambs. Thus, slaughter yield calculated had higher at FTxMM ($P<0.05$) as compared with values obtained at mouflon. The participation percentage of the cut parts from the live weight and from the whole carcass structure had the lower values at mouflon lambs compared to FTxMM hybrids. Results from this study showed that hybrid genotype significantly influenced the studied characteristics and have revealed the superiority of the hybrids lambs against mouflon lambs.

Keywords: carcass, hybrid, mouflon, sheep.

1. Introduction

The development of the lamb meat industry is the outcome of technological processes of growth, feeding and health with considerable investments being available in the private sector. In some European countries as well as in our country the sheep's meat is occasionally consumed. But, in Mediterranean countries as well as in some regions of the Romania, lamb meat is a common food and they are slaughtered at a few weeks of age [1]. Besides, if we refer to weight carcass the preferences European consumer is different. Thus, in the northern of Europe the consumers prefer lamb carcasses between 16 to 23 kg [2] while in Portugal and Spain consumers prefer lower lamb carcasses (8 kg [1], 11 kg [3] respectively).

In Romania the lambs is derived from local sheep breeds and is sacrificed at a low weight. Because in Romania the suckling lamb is a typical of Easter time at which a great number of lambs are slaughtered every year [4]. At local sheep breeds the carcasses have a high fat content compared with meat breeds [5]. Thus, the crossbreed between local sheep breeds with meat sheep breeds a good way to improve productive performance such as growth rate, slaughter yield, quantity of meat in carcass and meat quality [6-

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10]. Therefore, in many countries different crossbreeding systems are used, because from crossbreeding of two breeds the individual heterosis result [11-12].

In Romania the largest flocks of sheep's are represented by the local breeds Tigaie and Turcana, which falls in the mixed type of wool-milk-meat and have a good adaptability to hill and plateau zones [13].

The sheep meat is recommended in human nutrition because had the high content in lysine and polyunsaturated fatty acids (PUFA) [14-16]. Since in the meat of domestic animals the fat content ranges in widely limits (from 1 up to 45%) [17], a more studies state that in wild animal's meat fat content is lower (1-4%), the protein content is higher (21-25%) and the fatty acids ratio is favorable [18-21]. Several studies has shown that mouflon meat has a high protein content (22 to 23%), the fat content is low (bellow 1%) and consider that mouflon meat is „lean meat" with a high biological value [22-25].

The mouflon was widely spread throughout Europe and is thought to be one of the ancestors of domestic sheep. Today, mouflon lives into Europe from European southern countries up to some northern European countries such as Denmark, Sweden and Finland [26]. Therefore, in recent years different crosses have been made between mouflon with local domestic sheep, and lambs obtained had good productive performance [4, 27].

In Romania and other European countries, there are very few studies on hybrids obtained by crossbreeding domestic sheep breeds and mouflon, because majority of the studies has been carried out on various sheep breeds or their hybrids. For this reason, we consider that studies in this respect are necessary, in order to understand the hybrid genotype response as well as to investigate the slaughter performances and carcass characteristics.

Thus, in this work were investigate the slaughter performances and carcass characteristics of European Mouflon (*Ovis orientalis musimon Lin.*) and hybrids (F1) obtained by crossbreeding between European Mouflon (*Ovis orientalis musimon Lin.*) and the Romanian sheep breed Tigaie raised under identical conditions.

2. Materials and methods

Biological material used in this study was represented by European Mouflon (Ovis ammon musimon Pal.) and first generation hybrids (F1) obtained by crossbreeding between European Mouflon (Ovis ammon musimon Pal.) and the Romanian sheep breed Tigaie. Thus crossbreeding was made between females of sheep breed Tigaie and males of mouflon (FTxMM).

All the sheep and mouflon females were allowed to graze in a natural pasture. In the evening, all females and lambs were housed indoors. All the animals had received hay and water ad libitum. From birth to slaughter lambs were fed with milk, natural pasture and hay. At the age of 90 days ten lambs were sacrificed (5 male mouflons and 5 male hybrids FTxMM respectively). They were weighed after a 12 h fasting period to obtain pre-slaughter weight (PSW). After slaughter the following procedure was followed: skinning; separation of the head at atlas-occipital joint; cutting of the limbs at carpo-metacarpal and tarso-metatarsal joints; pelvic and perirenal excision for removal of the urogenital organs, gastrointestinal tract, kidney, heart, lungs, liver and gastrointestinal fat deposits. All elements were weighed and recorded. Hot carcasses were weighed (HCW) recorded and then were chilled at +4°C for 24 h. The next day, the cold carcass weight (CCW), dressing percentage and the weight loss (WL) were recorded. Assessment of carcasses was done according to Council Regulation EEC [28, 29].

The slaughter yield is ratio between HCW or CCW and PSW, in percent expressed. The WL was expressed as the percentage of HCW. The weight of each cut part was recorded and expressed as percentage of PSW and CCW.

After evaluation, carcasses were halved longitudinally along the midline in two symmetric parts and each carcass half were subsequently cut into: neck, shoulder, leg, rib, breast, flank, loin and leg. All measurements and joint dissections were conducted following ASPA methods [30].

Raw data obtained from measurements were processing using methods of biostatistics with Microsoft Excel spreadsheet application. Anova test was used to assess genotype effect on slaughtering, jointing and dissection performance. All the data expressed as a percentage was

statistically examined after angular transformation [31-32].

3. Results and discussion

Table 1 presents the data to slaughter performance at the two studied genotypes. For Live weight (PSW) of the two genotypes studied (FTxMM and mouflon) difference were statistic significantly (P≤0.05). So, at 90 days age the average live weight of the genotype FTxMM was 15.62 kg and the mouflon lambs had with 2.29 kg less. The differences between the hybrid FTxMM and mouflon were statistic significantly and are based on the phenomenon of heterosis that was present in the hybrid genotype [11].

Table 1. Slaughtering performance according to genotype

Studied traits	FTxMM Mean ± SD (n = 5)	Mouflon Mean ± SD (n = 5)
PSW (kg)	15.62^{a} ± 1.15	13.33^{b} ± 0.43
HCW (kg)	8.97^{a} ± 0.88	6.99^{b} ± 0.05
HC Slaughter yield (%)	58.56^{a} ± 0.97	52.51^{b} ± 1.75
CCW (kg)	8.92^{a} ± 0.82	6.83^{b} ± 0.09
CC Slaughter yield (%)	57.01^{a} ± 1.08	51.30^{b} ± 1.31
CWL (%)	2.65 ± 0.41	2.28 ± 0.73

Means followed by different superscript letters in the same row differ significantly to *P≤0.05*;
SD – standard deviation
PSW - pre-slaughter weight; HCW – hot carcass weight; HC – hot carcass; CCW – chilled carcass weight;
CC – chilled carcass; CWL – carcass weight loss

After slaughter the values for HCW at hybrid genotype was higher compared with mouflon lambs (8.33 kg vs. 6.85 kg), and after applying the Anova test this difference was statistically significant (P≤0.05). The carcass weight after chilling 24 h at +4°C the differences between the two studied genotypes, and although the weight loss (CWL) was slightly higher for FTxMM carcasses compared to the moflon (2.65% vs. 2.28%). This reducing trend was due to the carcasses dehydration process during refrigeration period. Similar results were obtained Nedeljkovic et al. [4] in the study on the carcass characteristics in hybrid lambs obtained from the crossbreeding of Tigaie breed with mouflon and Pascal and Nechifor [14] in the study on the carcass characteristics in hybrid lambs obtained from the crossbreeding between different sheep breeds.

Data for the participation of the cut parts in the whole carcasses structure at the two studied genotypes are shown in Table 2.

After dissection of refrigerated carcasses each anatomical part was weighed and the participation percentage in the live weight and the whole carcasses structure was calculated.

The results presented in Table 2 show that the percentage of participation of the cut parts in the live weight and the whole carcasses structure it was different at the two studied genotypes with statistically ensured differences.

Meat percentage of leg and loin was: 46.05% of CCW and 25.72% of PSW, at hybrid and 41.48% of CCW and 21% of PSW for mouflon, respectively. Therefore, for the FTxMM genotype statistically significant (P≤0.05) higher values were obtained compared with the mouflon (loin 8.29% vs. 7.51% and leg 37.76% vs. 33.97%). These differences were obviously influenced by the heterosis present at the hybrid genotype [11].

The values from this study for the FTxMM genotype were similar to those reported by Vacca et al. [27] from crossbreeding the mouflon males with female sheep's of Sarda breed (MxS), and Nedeljkovič et al. [4] from crossbreeding the mouflon males with female sheep's of Tigaie breed and mouflon females with Tigaie males.

Table 2. Quota of participation of the cut parts of PSW and CCW at the two studied genotypes

Studied traits	FTxMM Mean ± SD (n = 5)	Mouflon Mean ± SD (n = 5)
PSW (kg)	**15.62^{a} ± 1.15**	**13.33^{b} ± 0.43**
Leg (%)	21.09^{a} ± 0.33	17.20^{b} ± 0.51
Loin (%)	4.63^{a} ± 0.28	3.80^{b} ± 0.29
Shoulder (%)	10.17^{a} ± 0.31	9.01^{b} ± 0.49
Neck (%)	5.12^{b} ± 0.37	5.85^{a} ± 0.36
Rib (%)	6.38^{a} ± 0.38	5.71^{b} ± 0.30
Flank (%)	2.52^{b} ± 0.20	2.88^{a} ± 0.25
Breast (%)	5.95^{b} ± 0.33	6.19^{a} ± 0.43
CCW (kg)	**8.92^{a} ± 0.82**	**6.83^{b} ± 0.09**
Leg (%)	37.76^{a} ± 0.44	33.97^{b} ± 0.56
Loin (%)	8.29^{a} ± 0.26	7.51^{b} ± 0.33
Shoulder (%)	18.21^{a} ± 0.34	17.78^{b} ± 0.46
Neck (%)	9.16^{b} ± 0.33	11.55^{a} ± 0.39
Rib (%)	11.43 ± 0.33	11.27 ± 0.26
Flank (%)	4.50^{b} ± 0.20	5.69^{a} ± 0.25
Breast (%)	10.65^{b} ± 0.31	12.24^{a} ± 0.38

Means followed by different superscript letters in the same row differ significantly to *P≤0.05*;
SD – standard deviation
PSW - pre-slaughter weight; CCW – chilled carcass weight

Meat percentage of shoulder, neck and rib was 38.80% and 40.60% from the carcasses structure with the values to be superior for the FTxMM hybrid genotype, with statistically significant differences (P≤0.05) for shoulder and neck. If we refer to the live weight for the three cut parts: shoulder, neck and rib the percentage participation was: 10.17%, 5.12%, 6.38% at hybrid and 9.01%, 5.85%, 5.71% for mouflon. In this case, for the three cut parts were statistically differences.

The flank and breast had superior values at mouflon and in both cases were statistically significant differences (P≤0.05). Based on these results we state that the system of crossbreeding had positive effect on the percentage of breast and flank which are considered to be meat of inferior category. Also, values obtained in this study are consistent with the results of Nedeljkovič et al. [4] and Vacca et al. [27].

4. Conclusions

The results of our study showed differences between the two studied genotypes and had revealed superiority of the FTxMM hybrid for slaughter yield and meat percentage of category I (leg and loin) compared the mouflon. Also, our results showed a statistical differences (P≤0.05) between the two studied genotypes which is due to the heterosis phenomenon present in the hybrid as result different genetic combinations between the two parental forms (maternal and paternal) used.

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