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CARCASS CHARACTERISTICS AT DIFFERENT AGES OF THE THREE-WAY CROSSBRED SLAUGHTER LAMBS PRODUCED BY THE USE OF GERMAN BLACK-HEADED MUTTON AS A SIRE LINE*

(With 2 Tables)

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SUMMARY

This study was carried out to investigate the possibilities to improve the lamb meat production and carcass quality by using German Black-Headed Mutton as a sire line. The carcass characteristics of the three-way crossbred lambs (German Black-Headed Mutton x F_1 (Chios x Kivircik)) slaughtered at different ages were investigated in comparison with the purebred Turkish Merino and indigenous Kivircik lambs. In terms of the carcass traits at 105th day of age of the three-way crossbred, Kivircik and Turkish Merino lambs the carcass weights were 16.7 kg, 16.5 kg and 16.7 kg; dressing percentages were 46.5%, 46.8% and 44.3%; lean percentages of the carcasses were 59.8%, 51.7% and 68.5%; fat percentages were 12.0%, 22.0% and 5.6% and bone percentages were 23.8%, 22.9% and 25.5%, respectively. The results of the three genotypes of lambs for the same traits at 180th day of age were 22.3 kg, 19.0 kg and 22.0 kg; 49.4%, 47.5% and 47.5%; 56.5%, 57.3% and 63.3%; 21.1%, 20.8% and 15.6% and 19.4%, 18.7% and 19.1%, respectively. The carcass production traits and quality of the three-way crossbred slaughter lambs were determined to be higher than those of indigenous Kivircik lambs and were near to/or similar to Turkish Merino which is the improved mutton breed of Turkey. The results of the study indicate that in Marmara Region, German Black-Headed Mutton can be used as a sire line to get lambs growing faster at early ages and giving a good carcass quality by the use of commercial crossbreeding.

Key Words: *German Black-Headed Mutton, Crossbreeding, Carcass Characteristics.*

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*: This study was produced from the Ph.D. Thesis of the first writer.

INTRODUCTION

The natural resources of the world could be capable to satisfy the food need of the human population. However, it is hard to say that a great improvement has been achieved in the under-developed and developing countries. On the contrary, there is a great challenge in the world market among the developed countries in animal breeding, and the under-developed and developing countries, facing the risk of loosing their own animal production potentials, are being chosen as animal products markets.

Turkey has a young and growing human population. The need for foods of animal origin is also increasing. The best way to meet this demand should be the effective use and improvement of the natural resources of the country. Turkey has a sheep population of 27 million heads (FAO, 2002) which is in the first and seventh place in Europe and the world, respectively. But of this sheep population 97% belong to indigenous breeds which have low production levels.

A great problem of sheep breeding in Turkey is the early and light slaughter of lambs giving light carcasses. Because of this the meat production potential of lambs can not be properly utilised and a significant economic loss is formed. One of the most effective methods to improve the lamb meat production of indigenous breeds is the use of commercial crossbreeding with mutton breeds. It is expected from the crossbred lambs to have better carcass yield and quality. Gillespie (1997), reported three-way crossbreeding as the most profitable method for the production of slaughter lambs. Sambraus (1992) described German Black-Headed Mutton sheep as a mutton breed which has fast growth, good carcass quality characteristics and could be used as a sire line in the production of crossbred slaughter lambs. In a study to determine the appropriate mutton breed to be used as a sire line in Turkey, it was reported that German Black-Headed Mutton showed a satisfactory adaptation and performed well (Baspinar *et al.*, 1991).

Chios sheep breed is well known for its prolific birth characteristic in Turkey. In this study, Kivircik ewes were crossbred with Chios rams to improve the prolific birth characteristic at F_1 level. Three-way crossbred lambs were produced by the crossbreeding of F_1 ewes (Chios x Kivircik) with German Black-Headed Mutton rams.

The aim of this study was to investigate the possibilities to improve the meat production and carcass quality of lambs by using German Black-Headed Mutton as a sire line. The carcass characteristics of the three-

way crossbred lambs slaughtered at different ages were investigated in comparison with the purebred Turkish Merino and indigenous Kivircik lambs.

MATERIALS and METHODS

The following genotype groups of lambs were used to determine the carcass characteristics of lambs: 1. Three-way crossbreed lambs produced by the crossbreeding of German Black-Headed Mutton rams with F_1 (Chios x Kivircik) ewes; 2. Purebred Kivircik lambs in the first control group; 3. Purebred Turkish Merino lambs in the second control group. The reason for the Turkish Merino lambs to be taken as a second control group in the study was to investigate the possible superiority or similarity in terms of carcass traits of the three-way crossbred lambs to Turkish Merino which is the improved mutton breed in Turkey.

Three genotype groups of lambs were managed together in the same flock in Marmara Animal Breeding Research Institute. Lambs were kept together with their dams in individual boxes for the first three days after birth. Then a flock composed of suckling lambs and their dams was formed. Suckling program of lambs lasted for three months on the average. During this program, grass hay and lamb grower feed were given to the lambs to get the rumen improved faster. The flock was kept indoors during the winter months and then taken to pasture as the weather conditions improved.

To determine the slaughter and carcass characteristics of the lambs, five single born, male lambs at similar ages, having nearest live weights to the live weight means of their genotype groups were slaughtered. The carcasses were kept for 24 hours at $+4^{O}C$. After this period the chilled-carcasses were weighed and were cut into 5 retail parts (Akcapinar *et al.*, 1996). The carcass parts are as follows: 1. Leg: Including 6^{th} lumbar vertebrae, coxa, sacrum, femur, tibia-fibula and tarsal joint bones and the muscles and fat that surround; 2. Shoulder: Including scapula, humerus, radius-ulna and carpal joint bones and muscles and fat that surround; 3. Back: Including $6\text{-}13^{th}$ thoracic vertebrae and 12-13 cm lateral from the midline of the ribs attached with muscles and fat that surround; 4. Loin: Including $1\text{-}5^{th}$ lumbar vertebrae and 9-10 cm of muscles and fat lateral from the midline; 5. Remainders: Including all the remaining parts of the carcass.

Then the carcass parts were weighed. The Musculus Longissimus Dorsi (eye muscle) area and subcutaneous back-fat thickness on this

muscle were determined by the measurements at both sides from the cut between 12-13th ribs (Boggs and Merkel, 1993). To investigate the carcass composition and its quality of the lambs the carcass parts were physically dissected into separable lean, fat and bone. By this method the total lean, fat and bone content and percentages of the carcasses were determined. All the weighing processes were done by a scale sensitive to 10 g.

The statistical comparisons among the genotype groups for carcass characteristics were made by the analysis of variance significance differences among groups were determined by Duncan test (Duncan, 1975). The statistical analyses were done by GLM (General Linear Models) procedure in SPSS programme (Ozdamar, 1999). The Model $Yij = M + T_i + Eij$.

RESULTS and DISCUSSION

The slaughter and carcass characteristics of lambs slaughtered at 105th and 180th days of age are summarized in Tables 1 and 2, respectively.

The differences between the three-way crossbred, Kivircik and Turkish Merino lambs in terms of live weight before slaughter, chilled carcass weight and dressing percentage at 105th and 180th days of age were not statistically significant ($P>0.05$). There were some significant differences for lean, fat and bone contents of the lamb carcasses among the different genotypes. The lean percentage of Turkish Merino lambs was significantly ($P<0.05$) higher than that of both three-way crossbred and Kivircik lambs at 105th and 180th days of age. Also, the lean percentage of the three-way crossbred lambs was higher ($P<0.05$) than that of the Kivircik lambs at 105th day.. At 105th day of age Kivircik lamb carcasses had the highest percentage of fat while the Turkish Merino lamb carcasses had significantly ($P<0.05$) the lowest fat. However, at 180th day of age the fat content of the carcasses of three-way crossbred lambs increased and was similar to that of Kivircik and both were significant ($P<0.05$) higher than that of the Turkish Merino lamb carcasses' fat content. Ringdorfer (1990) indicated that the lean percentage of three-way crossbred lambs at 180th day of age was similar to and the fat percentage was less than German Black-Headed Mutton x Tyrol Mountain crossbred lambs.

In terms of the leg and shoulder percentages which have the highest meat content in the carcasses, the three-way crossbred and Turkish Merino lambs had higher results than those of the indigenous

Kivircik lambs at both 105th and 180th days of age and these results are similar to those of crossbred slaughter lambs in different studies (Ekiz, 2000, Yilmaz *et al*., 2002).

The eye-muscle area of Turkish Merino lambs was higher than the other two genotypes. There was not significant differences among the genotype groups in terms of back-fat thickness (P>0.05).

The weight of leg and shoulder carcass parts of the three-way crossbred lambs displayed a significant rise than those of Kivircik lambs. However, together with the weight gain until 180th day of age the fat content of the carcasses of the three-way crossbred lambs raised by more two times that at 105th day of age. These results suggested that if carcasses with too much fat are not desired, the slaughter of the three-way crossbred lambs should not be delayed to180 days of age.

The carcass production traits and quality of the three-way crossbred slaughter lambs were determined to be higher than those of indigenous Kivircik lambs and were near and similar to Turkish Merino which is the improved mutton breed in Turkey. These results of the study indicated that in Marmara Region, German Black-Headed Mutton can be used as a sire line to get crossbred lambs growing faster at early ages and giving a good carcass quality by the use of commercial crossbreeding. The use and widening of the commercial crossbreeding method in the region would be an alternative to early and light slaughter of lambs and so would provide an increase in the meat production and economic income of sheep breeding.

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Table 1: The carcass characteris ics of the three-way crossbred, Kivircik and Turkish Merino lamt s slaughtered at 105th day of age. (*n*: number of lambs, $\bar{x}$: Mear s, $S\bar{x}$: Standard error)

Carcass Characteristics	Three-wa / crossbred			Kivircik			Turkish Merino		
	n	$\bar{x}$	$S\bar{x}$	*n*	$\bar{x}$	$S\bar{x}$	*n*	$\bar{x}$	$S\bar{x}$
Live weight before slaughter, kg	5	35.9	1.6	5	35.1	2.0	5	37.2	0.9
Chilled carcass weight, kg	5	16.7	1.2	5	16.5	1.1	5	16.7	0.4
Chilled dressing percentage, %	5	46.5	1.6	5	46.8	0.8	5	44.3	0.8
Lean weight of carcass, kg	5	10.0^{ab}	0.8	5	8.5^{b}	0.5	5	11.3^{a}	0.2
Fat weight of carcass, kg	5	2.0^{b}	0.3	5	3.7^{a}	0.4	5	0.9^{c}	0.1
Bone weight of carcass, kg	5	4.0	0.2	5	3.8	0.3	5	4.2	0.1
Lean percentage of carcass, %	5	59.8^{b}	1.7	5	51.7^{c}	0.9	5	68.5^{a}	0.6
Fat percentage of carcass, %	5	12.0^{b}	1.8	5	22.0^{a}	1.2	5	5.6^{c}	0.6
Bone percentage of carcass, %	5	23.8^{ab}	0.8	5	22.9^{b}	0.8	5	25.5^{a}	0.7
Leg weight, g	5	5256	324	5	4976	318	5	5774	173
Shoulder weight, g	5	3296	194	5	2926	158	5	3236	58
Back weight, g	5	932	83	5	930	94	5	840	25
Loin weight, g	5	1202	132	5	1268	124	5	1230	67
Remainder weight, g	5	5396	450	5	5750	642	5	5160	90
Leg percentage, %	5	31.6^{b}	0.6	5	30.2^{b}	0.3	5	34.7^{a}	0.9
Shoulder percentage, %	5	19.8^{a}	0.4	5	17.9^{b}	0.6	5	19.4^{a}	0.3
Back percentage, %	5	5.6	0.8	5	5.7	0.5	5	5.0	0.2
Loin percentage, %	5	7.2	0.5	5	7.8	0.8	5	7.4	0.4
Remainder percentage, %	5	32.1	0.6	5	34.5	1.5	5	31.0	0.9
Eye muscle area, cm^2	5	11.6^{b}	0.7	5	12.1^{b}	0.9	5	14.5^{a}	0.3
Back fat thickness, mm	5	3.2	0.6	5	3.0	0.5	5	2.1	0.2

a, b, c: The differences between the means of ge iotype groups denoted by different letters in the same line are significant (P<0.05).

Table 2: The carcass characteristics of the three-way crossbred, Kivircik and Turkish Merino lambs slaughtered at 180th day of age. (*n*: number of lambs, $\bar{x}$: Means, $S\bar{x}$: Standard error)

Carcass characteristics	Three-way crossbred			Kivircik			Turkish Merino		
	n	$\bar{x}$	$S\bar{x}$	*n*	$\bar{x}$	$S\bar{x}$	*n*	$\bar{x}$	$S\bar{x}$
Live weight before slaughter, kg	5	45.1	0.9	5	39.8	3.0	5	46.3	1.1
Chilled carcass weight, kg	5	22.3	0.5	5	19.0	1.7	5	22.0	0.7
Chilled dressing percentage, %	5	49.4	0.5	5	47.5	0.9	5	47.5	1.1
Lean weight of carcass, kg	5	12.6^{ab}	0.4	5	10.9^{b}	1.1	5	13.9^{a}	0.5
Fat weight of carcass, kg	5	4.7^{a}	0.3	5	4.0^{ab}	0.4	5	3.4^{b}	0.3
Bone weight of carcass, kg	5	4.3^{a}	0.1	5	3.5^{b}	0.2	5	4.2^{a}	0.1
Lean percentage of carcass, %	5	56.5^{b}	0.9	5	57.3^{b}	0.9	5	63.3^{a}	1.1
Fat percentage of carcass, %	5	21.1^{a}	1.0	5	20.8^{a}	0.9	5	15.6^{b}	0.9
Bone percentage of carcass, %	5	19.4	0.4	5	18.7	0.7	5	19.1	0.7
Leg weight, g	5	7487^{a}	295	5	5949^{b}	523	5	7466^{a}	294
Shoulder weight, g	5	4445^{a}	206	5	3569^{b}	276	5	4246^{ab}	167
Back weight, g	5	1416	45	5	1274	104	5	1411	55
Loin weight, g	5	2229	131	5	2054	226	5	2006	136
Remainder weight, g	5	6148	277	5	5605	536	5	6452	202
Leg percentage, %	5	33.5^{a}	0.6	5	31.5^{b}	0.7	5	34.0^{a}	0.6
Shoulder percentage, %	5	19.9	0.6	5	18.9	0.3	5	19.4	0.4
Back percentage, %	5	6.3^{b}	0.1	5	6.7^{a}	0.1	5	6.4^{b}	0.1
Loin percentage, %	5	10.0	0.7	5	10.8	0.4	5	9.1	0.4
Remainder percentage, %	5	27.6	1.0	5	29.5	0.3	5	29.4	0.8
Eye muscle area, cm^2	5	13.1	0.9	5	12.3	1.0	5	14.9	0.7
Back fat thickness, mm	5	5.4	0.8	5	4.6	0.7	5	4.3	0.7

a, b. The differences between the means of genotype groups denoted by different letters in the same line are significant ($P<0.05$).