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**THE FATTENING AND CARCASS
CHARACTERISTICS OF THE IMROZ AND KIVIRCIK
LAMBS RAISED UNDER INTENSIVE CONDITIONS***

(With 6 Tables)

By

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SUMMARY

This study was carried out to investigate the lamb-fattening and carcass characteristics under intensive conditions of the Imroz and Kivircik breeds which are usually bred under poor feeding and management conditions in Turkey. The Imroz and Kivircik sheep breeds are in the project of the conservation of the indigenous breeds as genetic resources. In the study, lambs were weaned at the age of 90 days and after weaning they were taken in a fattening program of 56 days. The inspected live-weights at the end of fattening of the Imroz and Kivircik lambs were 33.5 kg and 48.2 kg, the live-weight gains were 10.7 kg and 14.6 kg, the daily live-weight gains were 191 and 260 g, the daily concentrated feed consumptions were 1381 g and 1660 g and the daily concentrated feed consumed per 1 kg live-weight gains were 7.3 kg and 6.4 kg, respectively. The chilled-carcass weights, dressing percentages, eye muscle areas and back-fat thicknesses were 15.1 kg and 22.1 kg, 45.2% and 47.8%, 11.5 cm² and 15.1 cm² and 4.0 mm and 8.3 mm in the same order. From this study, it was concluded that the Kivircik lambs had superior fattening, slaughter and carcass characteristics than Imroz lambs and the later could only be taken in intensive fattening to produce carcasses with less fat. It was also concluded that a significant improvement in the meat production of Kivircik lambs could be achieved by the intensive fattening of the lambs after weaning.

Key Words: Imroz, Kivircik, Genetic resources, Fattening, Carcass characteristics.

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INTRODUCTION

The rapid human population growth in Turkey is increasing the need for foods of animal origin, especially that of mutton and lambs. The sheep population of 27 million heads (FAO, 2002) of the country is still an important potential to meet this demand.

The great majority (97%) of the sheep population in Turkey is composed of the indigenous sheep breeds (Akcapinar, 2000). The meeting of the need could be maintained by the improvement in the production traits of these breeds.

The economic income in sheep breeding is mostly gained from the meat production and the greatest source of this is the lamb meat (Akcapinar, 2000). In Turkey the feeding and husbandry concepts of sheep breeding is changing and the breeding aims has been moving towards the production of great numbers of high, quality fattened lambs. The lamb meat production potential of the country could be better utilized by the wide spreading of the lamb-fattening programs in the indigenous breeds. Studies should be carried out on different breeds and in different conditions to improve intensive production models.

In some studies carried out to determine the fattening performance of Kivircik lambs, the live-weights at the end of fattening were 28.5-33.9 kg, the live-weight gains were 9.3-14.9 kg, the daily live-weight gains were 167-226 g, daily concentrated feed consumptions were 900-1036 g and the concentrated feed consumptions per 1 kg live-weight gain were 4.3-6.9 kg (Akgunduz *et al.*, 1994, Bulmus and Demir, 1995, Ekiz, 2000, Ozcan *et al.*, 2001). In the crossbreeding studies with mutton breeds in which Kivircik was used as a dam line, the results of two-way crossbred lambs (Akgunduz *et al.*, 1994, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002) for the fattening characteristics mentioned above were 33.3-37.6 kg, 12.0-16.3 kg, 215-300 g, 980-1255 g and 3.9-4.9 kg, respectively. Tekin *et al.* (1993), reported that the 56th day live-weights at fattening were 37.5 kg and 38.5 kg, the live-weight gains were 13.6 kg and 14.3 kg, the daily live-weight gains were 243 g and 256 g and the concentrated feed consumptions per 1 kg live-weight gain were 4.7 kg and 4.6 kg in White Karaman and Awassi lambs, respectively.

In the studies conducted on the carcass characteristics of Kivircik and two-way crossbred lambs produced by the mating of Kivircik ewes with mutton rams, the chilled-carcass weights were 13.7-15.6 kg and 15.7-20.0 kg, the chilled-dressing percentages were 45.5-48.8% and 46.7-50.1%, the eye muscle areas were 10.6-11.8 cm² and 13.4-15.6

cm², the leg percentages were 30.5-33.8% and 31.0-33.2%, the shoulder percentages were 17.5-18.8% and 18.6-18.7%, the back percentages were 7.7-9.1% and 7.8-8.1%, the loin percentages were 6.7-8.7% and 7.8-8.6% and the percentages of the other parts were 28.0-31.1% and 30.3-31.3%, respectively (Akgurduz *et al.*, 1994, Ekiz, 2000, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002). Akcapinar (1981) reported for Kivircik, White Karaman and Daglic lambs slaughtered at the weight of 35 kg and 45 kg that the chilled-carcass weights were 15.8 kg, 16.7 kg and 17.4 kg and 21.9 kg, 23.3 kg and 23.0 kg, the chilled-dressing percentages were 46.9%, 47.6%, and 49.0% and 48.9%, 51.9% and 52.6%; the leg percentages were 34.5%, 30.4% and 28.5% and 31.1%, 27.6% and 26.0%; the shoulder percentages were 18.2%, 15.3% and 13.9% and 16.6%, 14.0% and 12.8%; the back percentages were 8.1%, 7.5% and 7.8% and 9.7%, 7.3% and 8.2% the loin percentages were 7.8%, 5.6% and 7.7% and 7.6%, 6.8% and 7.8% and the percentages of the other parts were 29.0%, 22.8% and 24.1% and 29.5%, 22.2% and 24.1%, respectively.

The indigenous sheep breeds in Turkey are capable of continuing their productions under poor feeding and management conditions. The individual production levels of these breeds are very low under such environmental conditions. It was reported by Yalcin (1986) that there is the need to determine the real production levels of the indigenous sheep breeds under intensive conditions. No fattening or carcass studies of the Imroz breed was observed in the references.

As a result of the crossbreeding and the lessening of the breeding areas, the numbers of the purebred samples of Imroz and Kivircik sheep breeds are getting fewer. Because of this, these breeds have taken place in the project of the conservation of the indigenous breeds as genetic resources. It also has importance that by means of conserving, the determination and improvement of the production levels of these breeds and so a more efficient use of the natural resources of the country should be made.

This study was carried out to investigate the lamb-fattening and carcass characteristics under intensive conditions of the Imroz and Kivircik breeds which are usually bred under poor feeding and management conditions in Turkey.

MATERIALS and METHODS

This study was carried out at Marmara Animal Breeding Research Institute in the years 2000 and 2001. The purebred lambs of the Imroz and Kivircik genotypes which were collected in the Institute for the conservation of these breeds as genetic resources, were used in the study.

The lambs were given alfalfa hay and lamb grower feed plus ewes' milk up to weaning. This was done to enhance the rumen improvement of the lambs faster and to get them ready for the fattening program.

The lambs were weaned at the age of three months. After weaning, 10 single born male lambs which were at similar days of age from each genotype were chosen for the fattening program. They were weighed and put into separate paddocks according to their genotypes to start their fattening program. Group fattening was applied to the lambs.

The concentrated feed which was used in the fattening program was produced in the institute. The concentrated feed was given to the lambs ad libitum and the concentrated feed consumed by each group was recorded. Also 100 g of alfalfa hay per lamb was given daily during the fattening program. The contents and percentages of the concentrated feed ration given to the lambs for 56 days in the investigation of the fattening performance are presented in Table 1.

Table 1: The feed contents of the ration used for the lamb-fattening program.

Feed contents	Amount
Wheat	62.0%
Wheat oilcake	20.0%
Sunflower oilcake	15.3%
Salt	1.2%
Marble powder	1.4%
Vitamin + Mineral Premix	0.1%
TOTAL	100%

The fattening program lasted for 56 days. To determine the performance of the lambs during fattening, the lambs, the feed given and the excess feed were weighed in every 14 days by a scale sensitive to 0.1 kg. A lamb in the Imroz group became ill and was removed from the group in the first week of the fattening.

At the end of the fattening program, 5 single born male lambs from each genotype were slaughtered to determine the slaughter and carcass characteristics of the lambs. The hot-carcass and some organs weights were weighed. The carcasses were kept for 24 hours at +4°C. After this period the chilled-carcasses were weighed and some carcass measurements were taken by means of cm (Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002). Then the carcasses were cut into 5 retail parts (Akcapinar *et al.*, 1996). The carcass parts were as follows: 1. Leg: Including 6th 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 6-13th thoracic vertebrae and 12-13 cm lateral from the midline of the ribs attached with muscles and fat that surround; 4. Loin: Including 1-3th lumbar vertebrae and 9-10 cm of muscles and fat lateral from the midline; 5. Remainders: Including all the remaining parts of the carcass. The carcass parts were weighed and the eye muscle areas and back fat thicknesses were also determined (Boggs and Merkel, 1993).

T-test Ozdamar (1999) was applied for statistical comparisons between genotype groups in respect of the fattening and carcass characteristics.

RESULTS

Fattening Performance of Lambs:

The Kivircik lambs recorded higher values for the live-weights, live-weight gains and daily live-weight gains than the Imroz lambs and the differences were statistically significant ($P < 0.05$). The Kivircik lambs consumed more concentrated feed daily and needed less concentrated feed per 1 kg live-weight gain than the Imroz lambs.

For the 56 days lasting fattening program of the lambs, the average live-weights, total and daily live-weight gains are given in Table 2 and the daily feed consumptions and concentrated feed consumptions per 1 kg live-weight gain are presented in Table 3.

Slaughter and Carcass Characteristics:

In this study, with regard to the entire carcass characteristics despite the ones given by percentages and the kidney fat weight, the Kivircik lambs gave higher results than the Imroz lambs and the differences were statistically significant ($P < 0.05$). The back fat thickness of the Imroz lambs was significantly lower ($P < 0.05$) than that of the

Kivircik lambs. The differences between the two genotypes in terms of the hot and chilled-dressing percentages and the percentages of carcass parts were not statistically significant ($P>0.05$). The carcass measurements of the Kivircik lambs were higher than the Imroz lambs and the differences in terms of the body length, leg width, breast width, breast circumference, rump width and rump circumference were statistically significant ($P<0.05$).

Table 2: The live-weights, total and daily live-weight gains during fattening of the Imroz and Kivircik lambs.

Fattening characteristics	Imroz			Kivircik			t
	n	\bar{x}	S \bar{x}	n	\bar{x}	S \bar{x}	
The live-weights and total live-weight gains (kg)							
Beginning live-weight	9	22.80	1.00	10	33.64	1.02	7.537*
14 th day live-weight	9	24.96	1.09	10	36.90	0.99	8.097*
28 th day live-weight	9	26.99	1.20	10	39.15	0.91	8.210*
42 nd day live-weight	9	30.72	1.35	10	44.62	1.00	8.379*
56 th day live-weight	9	33.47	1.34	10	48.21	1.25	8.064*
Live-weight gain (0-56)	9	10.67	0.61	10	14.57	0.78	3.883*
The daily live-weight gains (g)							
Beginning-14 th day	9	153.97	25.48	10	232.86	25.18	2.197*
Beginning-28 th day	9	149.60	17.35	10	196.79	19.31	1.802
Beginning-42 nd day	9	188.62	15.54	10	261.43	14.48	3.431*
Beginning-56 th day	9	190.48	10.81	10	260.18	13.96	3.883*

* $P<0.05$

Table 3: The daily concentrated feed consumptions and the concentrated feed consumptions per 1 kg live-weight gain during fattening of the Imroz and Kivircik lambs.

Fattening characteristics	Imroz		Kivircik	
	n	\bar{x}	n	\bar{x}
The daily feed consumptions (g)				
Beginning-14 th day	9	1029	10	1488
Beginning-28 th day	9	1153	10	1584
Beginning-42 nd day	9	1335	10	1652
Beginning-56 th day	9	1381	10	1660
The concentrated feed consumptions per 1 kg live-weight gain (kg)				
Beginning-14 th day	9	6.68	10	6.39
Beginning-28 th day	9	7.71	10	8.05
Beginning-42 nd day	9	7.08	10	6.32
Beginning-56 th day	9	7.25	10	6.38

The slaughter and carcass characteristics of the lambs are given in Tables 4 and 5 and the carcass measurements are presented in Table 6.

Table 4: The slaughter and carcass characteristics of the Imroz and Kivircik lambs.

Carcass characteristics	Imroz			Kivircik			t
	n	\bar{x}	$S\bar{x}$	n	\bar{x}	$S\bar{x}$	
Live-weight before slaughter (kg)	5	33.34	1.32	5	46.24	0.66	8.763*
Hot-carcass weight (kg)	5	15.44	0.61	5	22.62	0.72	7.615*
Hot-dressing percentage (%)	5	46.32	0.48	5	48.90	1.20	1.995
Skin weight (g)	5	3060	120.83	5	4660	265.71	5.482*
Head weight (g)	5	1840	74.83	5	2480	96.95	5.226*
Four feet weight (g)	5	660	24.50	5	900	44.72	4.707*
Liver+heart+lungs weight (g)	5	1720	96.95	5	2240	40.00	4.958*
Four stomachs weight (full) (g)	5	4080	263.44	5	5550	297.49	3.699*
Four stomachs weight (empty) (g)	5	1200	104.88	5	1640	50.99	3.773*
Intestines weight (full) (g)	5	3020	165.53	5	4200	189.74	4.686*
Inner fat weight (g)	5	680	66.33	5	1140	97.98	3.888*
Testicles weight (g)	5	420	58.31	5	640	40.00	3.111*

* P<0.05

Table 5: The carcass characteristics of the Imroz and Kivircik lambs.

Carcass characteristics	Imroz			Kivircik			t
	n	\bar{x}	$S\bar{x}$	n	\bar{x}	$S\bar{x}$	
Chilled-carcass weight (kg)	5	15.06	0.59	5	22.12	0.76	7.369*
Chilled-dressing percentage (%)	5	45.18	0.52	5	47.81	1.27	1.914
Leg weight (g)	5	626	174.37	5	6622	272.84	6.164*
Shoulder weight (g)	5	730	125.46	5	3714	77.43	6.674*
Back weight (g)	5	1430	59.83	5	2198	133.80	5.240*
Loin weight (g)	5	1084	81.34	5	1636	80.04	4.837*
Other parts weight (g)	5	618	214.44	5	7052	241.23	7.541*
Kidney weight (g)	5	118	5.83	5	166	8.72	4.577*
Kidney fat weight (g)	5	518	67.93	5	746	108.75	1.778
Leg percentage (%)	5	30.75	0.67	5	29.95	0.85	0.740
Shoulder percentage (%)	5	18.13	0.49	5	16.84	0.50	1.829
Back percentage (%)	5	9.49	0.14	5	9.91	0.29	1.303
Loin percentage (%)	5	18	0.35	5	7.39	0.21	0.525
Other parts percentage (%)	5	30.65	0.67	5	31.92	0.76	1.246
Eye muscle area (cm ²)	5	11.48	0.84	5	15.11	0.74	3.237*
Back fat thickness (mm)	5	4.00	0.32	5	8.30	0.54	6.886*

* P<0.05.

Table 6: The carcass measurements of the Imroz and Kivircik lambs (cm).

Carcass measurements	Imroz			Kivircik			t
	n	\bar{x}	$S\bar{x}$	n	\bar{x}	$S\bar{x}$	
Body length	5	56.10	0.40	5	60.10	0.86	4.228*
Back length	5	45.10	0.64	5	45.50	0.96	0.346
Exterior leg length	5	34.90	1.24	5	37.40	1.01	1.567
Inner leg length	5	18.80	0.90	5	20.20	0.12	1.537
Leg circumference	5	35.80	1.20	5	38.20	0.66	1.750
Leg width	5	10.10	0.33	5	11.80	0.52	2.776*
Breast width	5	17.70	0.97	5	21.10	0.60	2.982*
Breast depth	5	24.60	0.40	5	25.50	0.50	1.406
Breast circumference	5	68.40	0.53	5	75.00	0.89	6.336*
Rump width	5	15.10	0.40	5	17.10	0.29	4.041*
Rump circumference	5	53.70	0.94	5	60.90	0.33	7.200*

* P<0.05

DISCUSSION

In this study it was concluded that the Kivircik lambs had a better performance in the intensive fattening than the Imroz lambs and the differences between the genotypes were found statistically significant (P<0.05).

The fattening performance of the Imroz lambs in terms of the live-weight at the end of fattening, live-weight gain and daily live-weight gain was similar with Kivircik lambs in different studies (Akgunduz *et al.*, 1994, Bulmus and Demir, 1995, Ekiz, 2000, Ozcan *et al.*, 2001); was lower than two-way crossbred lambs produced by the mating of Kivircik ewes with different mutton breeds (Akgunduz *et al.*, 1994, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002) and White Karaman and Awassi lambs (Tekin *et al.*, 1993). The Imroz lambs consumed more concentrated feed daily and needed more concentrated feed per 1 kg live-weight gain than the genotypes of lambs mentioned above (Tekin *et al.*, 1993, Akgunduz *et al.*, 1994, Bulmus and Demir, 1995, Ekiz, 2000, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002). The fattening results of the Kivircik lambs in terms of the live-weight at the end of fattening were higher than those of Kivircik lambs in different studies, two-way crossbred, White Karaman and Awassi lambs (Tekin *et al.*, 1993, Akgunduz *et al.*, 1994, Bulmus and Demir, 1995, Ekiz, 2000, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002) and were similar to these genotypes of lambs for the live-weight gain. The daily live-weight gain of the Kivircik

lambs was similar to two-way crossbred lambs (Akgunduz *et al.*, 1994, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002) and was higher than the results of Kivircik lambs in different studies, White Karaman and Awassi lambs (Tekin *et al.*, 1993, Akgunduz *et al.*, 1994, Bulmus and Demir, 1995, Ekiz, 2000, Ozcan *et al.*, 2001). The amount of the concentrated feed consumed by the Kivircik lambs per 1 kg live-weight gain was similar to that of Kivircik lambs in other studies (Akgunduz *et al.*, 1994, Bulmus and Demir, 1995, Ekiz, 2000, Ozcan *et al.*, 2001) and was higher than two-way crossbred (Akgunduz *et al.*, 1994, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002), White Karaman and Awassi lambs (Tekin *et al.*, 1993) and the Kivircik lambs consumed more concentrated feed daily than those genotypes (Tekin *et al.*, 1993, Akgunduz *et al.*, 1994, Bulmus and Demir, 1995, Ekiz, 2000, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002). As a result of the intensive feeding and husbandry conditions maintained in this study, the Imroz and Kivircik lambs exhibited a fast growth rate up to the weaning and the beginning to fattening live-weights at 90th day of age was high. This might be the reason for the Kivircik lambs having higher results than the genotypes reported in the references and the Imroz lambs having similar results to Kivircik lambs in other studies in terms of the live-weight at the end of fattening.

The results showed that the carcass and carcass parts weights and the eye muscle areas of the Kivircik lambs were superior to those of the Imroz lambs. There were no significant differences in terms of the percentages of the carcass parts ($P>0.05$). The back-fat thickness of the Imroz lambs being less than half of that of the Kivircik lambs ($P<0.05$) a matter which show that Imroz lambs can give carcasses with less fat at the end of fattening.

The chilled-carcass weight, dressing percentage and eye muscle area of the Imroz lambs were similar to Kivircik lambs in other studies (Akgunduz *et al.*, 1994, Ekiz, 2000, Ozcan *et al.*, 2001) and was lower than two-way crossbred lambs produced by the mating of Kivircik ewes with mutton breeds (Akgunduz *et al.*, 1994, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002). The chilled-carcass weight of the Kivircik lambs was higher and the dressing percentage was similar for the same kind in other studies and two-way crossbred lambs (Akgunduz *et al.*, 1994, Ekiz, 2000, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002). The eye muscle area of the Kivircik lambs in this study was found higher than that of the Kivircik lambs in other studies (Akgunduz *et al.*, 1994, Ekiz, 2000, Ozcan *et al.*, 2001) and was similar to two-way crossbred lambs (Akgunduz *et al.*, 1994, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002). The

carcass percentages of both the Imroz and Kivircik lambs were similar to the results reported for Kivircik and two-way crossbred lambs (Akgunduz *et al.*, 1994, Ekiz, 2000, Ozcan *et al.*, 2001, Yilmaz *et al.*, 2002). The chilled-carcass weight and chilled-dressing percentage of the Imroz lambs were less than the results of Kivircik, White Karaman and Daglic lambs slaughtered at the weight of 35 kg in Akcapinar (1981)'s study. It was seen that in terms of the percentages of valuable carcass parts, the results of the Imroz lambs were similar to Kivircik lambs (Akcapinar, 1981) and were higher than White Karaman and Daglic lambs (Akcapinar, 1981). This may be due to that the Imroz and Kivircik genotypes are thin tailed. When the carcass results of the Kivircik lambs in this study were compared with Kivircik, White Karaman and Daglic lambs slaughtered at the weight of 45 kg in Akcapinar (1981)'s study, the chilled-carcass weight was similar but the dressing percentage was lower than the lambs of the other three genotypes, and the percentages of the valuable carcass parts was similar to Kivircik lambs and was higher than those of White Karaman and Daglic lambs.

It could be concluded that the Kivircik lambs had superior fattening, slaughter and carcass characteristics to the Imroz lambs and that the Imroz lambs could only be taken in intensive fattening to produce carcasses with less fat. It was also determined that a significant improvement in the meat production of Kivircik lambs could be made by the intensive fattening of the lambs after weaning.

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