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Research Article

Effects of Different Fattening Systems on Fattening Performance, Slaughter and Carcass Characteristics of Male Tuj Lambs [1] [2]

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Abstract

The purpose of this study were to determine effects of fattening systems on fattening performance (n=39) and slaughter and carcass characteristics (n=24) in male Tuj lambs. Three different fattening groups were formed as extensive (n=13), semi-intensive (n=13) and intensive (n=13). Lambs in the extensive group were grazed in pasture. In addition to pasture, concentrated feed was given to lambs in the semi-intensive group. High quality fodder and concentrated feed were given to those in the intensive group. The study was completed in 90 d. Final live weights of extensive, semi-intensive and intensive groups were 31.19, 41.22, and 40.56 kg (P<0.001), respectively, and for daily live weight gain were (DLWG) 117.52, 229.66, and 221.11 g (P<0.001), respectively. Feed conversion rates (FCR) were 3.05 and 5.16 respectively in the semi-intensive and intensive fattening. It was found that hot carcass weight was 13.41, 19.51, and 19.89 kg (P<0.001) in extensive, semi-intensive, and intensive fattening groups respectively. Hot carcass yield was 43.11, 46.95, and 49.77% (P<0.001) in extensive, semi-intensive, and intensive fattening groups respectively. Consequently; leg, foreleg, shoulder, neck, flank, and kidney percentages, and spleen and full stomach weights of lambs in the extensive group were higher than in semi-extensive and entensive groups. Although there was no statistical difference between semi-extensive and entensive groups in respect to fattening performance, slaugher weight, hot and cold carcass weights, entensive group was higher than the other groups in respect to hot and cold carcass yield.

Keywords: *Tuj lambs, Fattening systems, Fattening performance, Slaughter and carcass characteristics*

Farklı Besi Sistemlerinin Erkek Tuj Kuzularında Besi Performansı, Kesim ve Karkas Özelliklerine Etkisi

Özet

Bu araştırma, erkek Tuj kuzularında besi sistemlerinin besi performansı (n=39), kesim ve karkas özelliklerine (n=24) etkisini belirlemek amacıyla yapılmıştır. Araştırmada ekstansif (n=13), yarı entansif (n=13) ve entansif (n=13) olmak üzere 3 değişik besi gruba oluşturulmuştur. Ekstansif grup merada otlatılmıştır. Yarı entansif gruba meraya ilaveten konsantre yem verilmiştir. Entansif gruba ise kaliteli kuru ot ve konsantre yem verilmiştir. Araştırma 90 günde tamamlanmıştır. Ekstansif, yarı entansif ve entansif besi gruplarında besi sonu ağırlığı sırasıyla 31.19, 41.22 ve 40.56 kg (P<0.001), günlük canlı ağırlık artışı sırasıyla 117.52, 229.66 ve 221.11 g (P<0.001) olarak belirlenmiştir. Yarı entansif ve entansif beside yemden yararlanma oranı sırasıyla 3.05 ve 5.16 olarak tespit edilmiştir. Ekstansif, yarı entansif ve entansif beside sıcak karkas ağırlığı 13.41, 19.51 ve 19.89 kg (P<0.001) olarak belirlenmiştir. Sıcak karkas randımanı aynı sıra ile %43.11, 46.95 ve 49.77 (P<0.001) olarak tespit edilmiştir. Sonuç olarak; ekstansif besi grubundaki kuzuların but, kol, omuz, boyun, etek ve böbrek oranları ile dalak ve dolu mide ağırlığı, yarı entansif ve entansif besi gruplarından yüksek bulunmuştur. Yarı entansif ve entansif gruplar arasında besi performansı, kesim ağırlığı, sıcak ve soğuk karkas ağırlıkları bakımından istatistiki bir fark bulunmamasına rağmen, sıcak ve soğuk karkas randımanı bakımından entansif grup, diğer gruplardan yüksek belirlenmiştir.

Anahtar sözcükler: *Tuj kuzusu, Besi sistemleri, Besi performansı, Kesim ve karkas özellikleri*

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INTRODUCTION

Sheep breeding occupies an important place in terms of its contribution to economy and human nutrition in the world. This significance is due to the sheep's ability to utilize lower quality grasslands and meadows, field crops and vegetation from which the cattle could not utilize and to convert them to animal products [1,2].

Despite having a significant place in terms of the number of sheep, Turkey has a lower place considering the yields obtained. According to the data of 2015, there were 31.507.934 sheeps in Turkey. 92.47% of these sheeps consisted of native breeds, and the remaining 7.53% were cultivated breeds [3]. The number of sheeps slaughtered was 5.008.411 and the amount of meat obtained was 100.021 tons. Carcass weight per animal obtained from sheep in Turkey varies between 13.00-19.97 kg [3]. The reasons for lower carcass weights may be native breeds with low yield, a great number of premature lamb slaughtered, and slaughtering of animals following the pasture fattening without intensive fattening [1,4,5].

Lamb breeding has been performed in various ways based on numerous factors such as establishment structure, genetic level of breed, pasture status, care and feeding methods, market conditions, livestock policy of the country. Profitability level of lamb breeding depends on production of high quality lamb meat in large amounts within a short period and inexpensive production. The quality and quantity of lamb meat are determined by some factors such as fattening systems, fattening period, final weight. There are various lamb breeding methods in which such factors can be regulated in different ways. It is possible to classify them as suckling lambs, pasture (extensive), intensive, and yearling breeding [1,5,6].

Suckling lamb fattening is based on the principle that lambs' attaintment of slaughter weight in a short period as a result of feeding lambs with milking, roughage and concentrated feed. In this system lambs are slaughtered when they are weaned, 3.5-4 months old, and have a 30-35 kg live weight. Pasture fattening is applied in regions with good pasture and in systems in which nomadic sheep breeding is performed. A certain slaughter weight has not been targeted and condition of lambs can be good or bad. This breeding type continues for long time, in which lambs reach to slaughter age late and they are marketed at low slaughter weight. The intensive fattening is applied more on lambs which are raised by using early weaning and motherless breeding methods. Lambs are fed with qualified concentrated feed and roughage after weaning when they are 2.5-3 months old, in order to obtain an increase of 250-300 g in weight in sheep fold for 2.5-3 months. Lambs can have 36-42 kg in 4 months [1,5].

This study was conducted for the purpose of comparing male Tuj lambs fed under extensive, semi-intensive, and intensive fattening conditions in terms of fattening performance, slaughter and carcass characteristics.

MATERIAL and METHODS

The ethical committee approval of Kafkas University (Official form date and number: 03.03.2011 and 2011-005) was obtained in order to conduct this study. The study was conducted at the Application and Research Farm of the Faculty of Veterinary Medicine, Kafkas University. The lambs were weaned at 3 months age old. After 10 d subsequent to their adaptation to pasture and concentrate mixture, the study was started. Medication against internal and external parasites was given lambs prior to the study. Three fattening groups were formed as extensive, semi-intensive, and intensive. Each group involved 13 lambs.

The lambs in the extensive and semi-intensive fattening groups were fed with pastures on a daily basis. Lambs in the semi-intensive group were fed *ad libitum* with both pastures and concentrated feed. Concentrated food contained 17.1% CP (crude protein) and 2710 kcal/kg ME (metabolic energy) [7]. Composition of concentrated feed is present in *Table 1*. Also information regarding to nutrient contents of concentrated feed and roughage is given in *Table 2*. A private feed factory prepared the concentrated feed whereas the Farm of Veterinary Faculty provided the roughage. FCR was determined with the concentrated feed consumption. Electronic scales having capacity of 150 kg and sensitivity of 10 g were used to weigh the feed. Clean water was given to lambs in the extensive and semi-intensive fattening groups at least three times a day. On the other hand, those in the intensive fattening group always drank clean water. The experiment took 3 months (June 5-August 5 in 2012).

Table 1. *Composition of the mixed feed used in intensive and semi-intensive fattening*
Tablo 1. *Entansif ve yarı entansif beside kullanılan karma yemin bileşimi*

Ingredient	%	Crude Protein (%)	Metabolic Energy (kcal/kg)
Barley	32.00	12.00	3110
Maize bran	10.00	9.20	2740
Maize	18.00	10.00	3300
Vegetable oil	2.60	-	7070
Sunflower cake	6.00	37.00	2250
Cotton seed cake	6.00	34.00	2300
Soy cake	14.00	48.00	3200
Molasses	8.50	7.80	2580
Lime stone	2.00	-	-
Sodium bicarbonate	0.20	-	-
Salt	0.50	-	-
Vit.-min. premix	0.20	-	-

The natural nutrient contents at various mowing times of the pastures, where the animals grazed, have been given in *Table 3*. For this purpose, samples were taken from various four locations of the pasture 3 times once a month (between June 5 and August 5) and the fodder of an area of 50 cm^2 of pasture was cut with a weed trimmer from 1 cm above the soil level. The pasture sample's dry matter (DM), organic matter (OM), crude protein (CP), crude ash (CA), crude cellulose (CC), crude fat (CF), and nitrogen free extract (NFE) levels were determined according to AOAC [8].

Eight fattening lambs from each group (24 lambs in total) were slaughtered to determine slaughter and carcass characteristics. Before they were slaughtered, nothing was given them for 12 h other than water. Their slaughter live weights were registered. They were slaughtered at Kafkas University Veterinary Faculty slaughtering house. Then, their head, skin, feet, offal, and gastro intestinal tract were weighed and their hot carcass weights were recorded. The carcass was chilled at +4°C for 24 h before dissecting and taken on the intact cold carcass. Subsequently, carcasses were longitudinally cut into two parts. Remaining parts were divided into six pieces (shoulder, neck, foreleg, flank, leg, and back-loin) according to the method specified by Colomer-Rocher et al.[9]. The calliper was used to measure carcass fat thickness between 12^{th}-13^{th} ribs, the musculus longissimus dorsi (MLD) area was taken onto the acetate sheet, and measurement of its surface area was performed by the digital planimeter.

Statistical package for the social sciences (SPSS 20.0) [10] software program was used for analysis of variance for the purpose of determining the impact of different fattening systems on fattening performance, slaughter and carcass characteristics. Significance of the difference among the groups was assessed with Duncan's multiple range test.

Table 2. *Nutrient contents of concentrate feed and roughage*
Tablo 2. *Konsantre ve kaba yemin besin madde içeriği*

Ingredient	Concentrate Feed	Roughage
Dry matter (%)	88.80	90.69
Crude protein (%)	17.10	10.35
Crude cellulose (%)	5.70	32.38
Crude fat (%)	3.50	2.00
Crude ash (%)	6.40	8.86
Metabolisable energy (kcal/kg)*	2710	2000

**It was determined by calculation made over values of the table*

RESULTS

The fattening performance of lambs in the extensive, semi-intensive, and intensive fattening groups is shown in *Table 4*. The initial weights of fattening process were 20.62, 20.55 and 20.66 kg, and the final weights at the end of the 90 d fattening period were 31.19, 41.22 and 40.56 kg for extensive, semi-intensive, and intensive fattening groups, respectively. At the end of 90 d, the daily live weights gain (DLWG) was 117.52, 229.66 and 221.11 g for extensive, semi-intensive, and intensive fattening groups, respectively.

The daily concentrated feed consumption in semi-intensive and intensive fattening groups was 0.70 and 1.14 kg, respectively and the feed conversion rate was 3.05 and 5.16 kg, respectively.

Table 5 presents the slaughter characteristics of lambs in the extensive, semi-intensive, and intensive fattening groups. There were statistically significant differences among the groups in terms of slaughter weights, hot and cold carcass weight, hot and cold carcass percentage, head, feet, skin, liver, lung, omental, full and empty small intestinal weights ($P<0.001$); full stomach weight ($P<0.01$); heart and MLD area ($P<0.05$). The carcass characteristics of different fattening groups with regard to the slaughter weight are shown in *Table 6*. There were significant differences among the groups in terms of leg, shoulder, tail percentages ($P<0.001$); foreleg, kidney-pelvic fat percentages ($P<0.01$) and flank percentages ($P<0.05$).

DISCUSSION

Extensive group was lower than DLWG other groups. Final weight and DLWG values determined for extensive group in this study were lower compared to values stated by Işık and Kaya [11] in Tuj lambs for final weight (34.24 kg) and DLWG (181.60 g), reported by Sarı et al.[12] in Hemşin lambs for final weight (33.32 kg) and DLWG (121.11 g), stated by Kaya et al.[13] in Morkaraman and Tuj lambs for final weight (34.23 kg) and DLWG (207.74 g) in pasture (extensive) group. However, final weight at the end of fattening and DLWG determined in the extensive group of this study were higher compared to values stated by Sarıçiçek et al.[14] in Karayaka lambs for final weight (22.34 kg) and DLWG (78.14 g) in the pasture group. The reason for differences between studies was caused from differences in breed,

Table 3. *Natural nutrients of the pasture at various mowing times, %*
Tablo 3. *Çeşitli biçim zamanlarında meranın doğal besin içeriği, %*

Pasture Mow/Month	DM	OM	CA	CP	CF	CC	NFE
I. mow	26.25	23.85	2.30	3.55	0.69	8.40	11.35
II. mow	32.35	30.10	2.30	2.70	0.99	9.70	16.68
III. mow	36.40	33.90	2.75	3.50	1.05	12.66	16.70

Table 4. *The fattening performance of lambs in different fattening groups (X±Sx)*
Tablo 4. *Farklı besi gruplarında kuzuların besi performansı (X±Sx)*

Characteristics	Fattening Systems			
	Extensive (n = 13)	Semi Intensive (n = 13)	Intensive (n = 13)	P
Initial weight (kg)	20.62±0.76	20.55±0.74	20.66±0.73	-
Final weight (kg)	31.19±0.88^{b}	41.22±1.55^{a}	40.56±1.49^{a}	***
Daily live weight gain (g)	117.52±4.26^{b}	229.66±12.01^{a}	221.11±12.96^{a}	***
Daily concentrated feed consumption (kg)	NC	0.70±0.04	1.14±0.06	***
Feed conversion ratio	NC	3.05±0.18	5.16±0.25	***

*-: P>0.05; *** P <0.001;* ***a, b:*** *The differences between the means of groups carrying various letters in the same row are significant (P<0.05).* ***NC:*** *Not converged*

Table 5. *The slaughter characteristics of lambs in different fattening groups (X±Sx)*
Tablo 5. *Farklı besi gruplarında kuzuların kesim özellikleri (X±Sx)*

Characteristics	Fattening Systems			
	Extensive (n = 8)	Semi Intensive (n = 8)	Intensive (n = 8)	P
Slaughter weight (kg)	31.13±0.68^{b}	41.55±1.14^{a}	39.85±1.21^{a}	***
Hot carcass weight (kg)	13.41±0.32^{b}	19.51±0.61^{a}	19.89±0.87^{a}	***
Cold carcass weight (kg)	12.93±0.33^{b}	19.03±0.59^{a}	19.35 ±0.86^{a}	***
Hot carcass percentage (%)	43.11±0.69^{c}	46.95±0.58^{b}	49.77±0.74^{a}	***
Cold carcass percentage (%)	41.58±0.59^{c}	45.80±0.59^{b}	48.42±0.76^{a}	***
Head weight (g)	1826.20±25.07^{b}	2144.40±47.52^{a}	2071.90±68.40^{a}	***
Feet weight (g)	806.25±9.99^{b}	974.25±26.41^{a}	920.12±29.22^{a}	***
Skin weight (g)	3400.00±440.78^{b}	5370.90±137.78^{a}	5433.80±267.39^{a}	***
Heart weight (g)	170.00±5.35^{b}	198.89±6.76^{a}	186.12±7.52^{ab}	*
Liver weight (g)	447.50±10.98^{c}	766.00±35.49^{a}	642.50±31.76^{b}	***
Lung weight (g)	387.50±14.36^{b}	492.38±15.84^{a}	425.12±17.04^{b}	***
Spleen weight (g)	47.50±7.26	52.00±2.51	46.63±2.92	-
Omental weight (g)	27.50±1.64^{b}	80.13±19.52^{b}	149.00±28.71^{a}	***
Full stomach weight (g)	5508.80±143.83^{a}	5096.20±441.81^{a}	4046.00±121.12^{b}	**
Empty stomach weight (g)	1082.50±56.18^{b}	1466.10±65.38^{a}	1365.00±62.62^{a}	***
Full small intestine weight (g)	1362.50±43.78^{b}	2120.40±115.24^{a}	1395.00±38.94^{b}	***
Empty small intestine weight (g)	885.00±51.27^{b}	1212.50±44.17^{a}	944.12±30.84^{b}	***
Full large intestine weight (g)	1493.80±67.43	1713.40±116.49	1522.10±57.19	-
Empty large intestine weight (g)	456.25±22.03	525.00±31.34	475.00±25.00	-
Fat thickness (mm)	4.04±0.36	4.84±0.26	5.04±0.48	-
M. longissimus dorsi area (cm^{2})	12.42±0.54^{b}	14.84±0.39^{a}	13.30±0.71^{ab}	*

*-: P>0.05, * P<0.05, ** P<0.01, *** P<0.001.* ***a, b, c:*** *The differences between the means of groups carrying various letters in the same row are significant (P<0.05)*

initial weight, pasture quality, fattening period, final weight, care and feeding.

Even though final weight at the end of fattening period stated in this study for semi-intensive group was lower than final weights (44.92 and 46.88 kg) of Tuj lambs in the groups which were given with 200 and 400 g concentrated feed along with pasture in the study conducted by Kaya et al.[15], DLWG was higher than DLWG values (160.57 and 183.14 kg) stated by the same researchers. DLWG in semi-intensive group in this study was higher than DLWG values (98 and 118 g) in groups fed additionally in the study conducted by Saatcı et al.[16].

Live weights gain (221.11 g) determined for intensive group in this study was lower than DLWG (250.00 g) stated by Altın et al.[17] in Kıvırcık intensive group lambs and DLWG (235.56 g) reported by Macit et al.[18] in Tuj intensive group lambs and DLWG (270.4 g) reported by Sen et al.[19] Karayaka male intensiv group lambs. It was similar to DLWG (211 g) reported by Yıldırım et al.[20] in Karayaka male intensive group lambs; Final weight at

Table 6. *The carcass characteristics of lambs in different fattening groups (X±Sx)*
Tablo 6. *Farklı besi gruplarında kuzuların karkas özellikleri (X±Sx)*

Characteristics	Fattening Systems			
	Extensive (n = 8)	Semi Intensive (n = 8)	Intensive (n = 8)	P
Leg (%)	33.40±0.32^{a}	30.12±0.54^{b}	29.95±0.46^{b}	***
Foreleg (%)	17.40±0.19^{a}	16.06±0.39^{b}	15.53±0.54^{b}	**
Back-loin (%)	13.27±0.39	13.39±0.72	13.24±0.39	-
Shoulder (%)	7.12±0.32^{a}	5.42±0.36^{b}	5.12±0.35^{b}	***
Neck (%)	6.47±0.14	6.12±0.28	5.88±0.25	-
Flank (%)	11.34±0.36^{a}	10.39±0.28^{ab}	9.81±0.50^{b}	*
Tail (%)	9.48±0.59^{b}	17.14±1.12^{a}	18.82±1.23^{a}	***
Kidney (%)	0.78±0.03	0.76±0.02	0.77±0.03	-
Kidney-pelvic fat (%)	0.78±0.03^{a}	0.62±0.07^{b}	0.89±0.05^{a}	**

*-: P>0.05, * P<0.05, ** P<0.01, *** P <0.001.* ***a, b, c:*** *The differences between the means of groups carrying various letters in the same row are significant (P<0.05)*

the end of fattening determined for intensive group in this study was higher than final weight (34.70 and 29.92 kg) reported by Altın et al.[17], for Kıvırcık and Karya lambs and lower than final weight (44.00 kg) stated by Macit et al.[18] for Tuj lambs. While FCR (5.16) in intensive group in this study was similar to FCR (5.30) stated by Macit et al.[18] for Tuj lambs and by Altın et al.[17] for Kıvırcık lambs, it was lower than FCR (6.25) specified by Altın et al.[17] for Karya lambs. Differences observed between studies were due to differences in breed, initial weight, fattening period, final weights, care and feeding.

Slaughter weight stated in the extensive group in this study was lower than slaughter weights (32.00, 34.70 and 33.70 kg) stated by Ulusan et al.[21] for Morkaraman, Tuj, and their cross-breed yearlings in pasture group and slaughter weight reported by Sarı et al.[22] for Tuj lambs in pasture group. Slaughter weight specified for semi-intensive group in this study was similar to slaughter weights (41.36 and 42.48 kg) by Kırmızıbayrak et al.[23] for Tuj and Morkaraman lambs, and also similar to slaughter weights (39.30 and 40.97 kg) stated by Öztürk et al.[24] in Morkaraman and Kıvırcık x Morkaraman (F_1) lambs under semi-intensive conditions.

Hot and cold carcass weights for all three fattening groups in the study were higher than hot carcass (11.79, 12.35 and 12.15 kg) and cold carcass (11.52, 12.03 and 11.89 kg) weights stated by Yaralı and Karaca [25] for Karya lambs in pasture, pasture+feed, and intensive groups and those reported by Carrasco et al.[26] for Churra Tensina light lambs reared under grazing, grazing+supplement, drylot lambs with rationed graz-dams and drylot lambs with dams fed in confinement. Hot and cold carcass weight values determined for intensive group in this study were lower than those reported by Macit et al.[18] for Tuj intensive group lambs. Cold carcass weight values determined for intensive group in this study was lower than the value reported by Bjelanovic et al.[27].

Carcass dressing percentage is a singificant factor for carcas quality in meat production [28]. Hot and cold carcass dressing percentage in all three fattening groups in this study were between 41.58-49.77%, the highest yield was determined in the intensive fattening group. Hot and cold carcass dressing percentage determined in the extensive group were higher than those (40.00% and 38.00%) stated by Ulusan et al.[21] for Tuj lambs grazed in pasture. Hot carcass dressing percentage determined in the semi-intensive group was lower than the value (49.09%) reported by Macit et al.[29], for Tuj lambs under semi-intensive conditions, similar to the values under semi-intensive conditions (46.78%) stated by Kırmızıbayrak et al.[23] for Tuj lambs and (47.56% and 47.64%) stated by Sarı et al.[22]. The highest cold carcass dressing percentage was in intensive group and it is in agreement with the results in intensive group observed by Carrasco et al.[26], Aksoy and Ulutaş [30], Akçapınar et al.[31], and Joy et al.[32]. Cold carcass dressing percentages (41.58-48.42%) of Tuj male lambs of the present study were similar to values of the different fatting systems reported by Aksoy and Ulutaş [30] (45.34-48.44%), Akçapınar et al.[31] (47.15%) and Koçak et al.[33] (44.17-45.57%).

While weights of skin, spleen, omental fat, full and empty stomach, empty small and large intestine reported in the extensive fattening in this study were lower than those values under extensive fatting system stated by Ulusan et al.[21], value of MLD area in this study was higher than the value stated by the same researchers. Weights of head, feet, hearth, liver, and lung determined in the semi-intensive group were higher than those determined by Macit et al.[29] for Tuj semi-intensive group lambs. This difference could be resulted from origin, initial weight, fattening period, final weight of lambs and different environmental conditions. Weights of feet, skin, empty stomach and MLD area specified in the intensive group in this study were similar to those reported by Macit et alfor Tuj lambs in

the intensive fattening. Weights of head, feet, skin, empty stomach, empty small intestine and full large intestine in the intensive group in this study were higher than weights stated by Aksoy [34] for Tuj intensive group lambs in 40 kg weight group, lower than weights of spleen, omental, full stomach and empty large intestine and MLD area reported by the same researcher.

Carcasses of lambs are mostly sold by separating them into parts, and different dishes are prepared by using different carcass parts. Leg, and back-loin are considered as valuable parts. Leg, back-loin, kidney and kidney-pelvic fat percentages reported in the extensive fattening in this study were higher than percentages of leg (31.45%), back-loin (11.60%), kidney (0.62%), kidney fat (0.48%), stated in the study conducted by Ulusan et al.[21] on male Tuj yearlings fed in pasture and similar to percentages of foreleg (17.45%) and tail (10.33%). Percentages of leg and foreleg determined in all three groups in the study were lower than leg percentages (34.71, 34.28 and 34.12%) and foreleg rates (21.02, 21.07 and 20.19%) determined by Yaralı and Karaca [25] for Karya lambs in pasture, pasture + feed, and intensive groups.

Consequently; fattening performance and the other slaughter characteristics of lambs in intensive and semi-intensive groups were higher than extensive group. Although there was generally no statistical difference between semi-intensive and intensive groups in terms of fattening performance, slaughter weight, hot and cold carcass weights, intensive group had higher hot and cold carcass yield compared to the other groups. However, leg, foreleg, shoulder, neck, flank, and kidney percentages, and spleen and full stomach weights of lambs in the extensive group were higher than in semi-extensive and entensive groups.

Lamb breeding in Kars is generally performed according to pasture, and the period when pastures are green and nutritious is a very short like 3-4 months [35]. Other than this season, pastures largely lose their valuableness and live weight loss, decrease in carcass amount and quality, and significant economic loss occur since lambs cannot feed enough and are slaughtered early [12]. Even though this situation changes depending on factors such as nutrient contents of pasture, grazing, climate, flora, etc.[36], results obtained from this study indicate that feeding along with pasture will be more suitable. Therefore, considering the demand for red meat in the country and the producer preferences, beside intensive system, semi-intensive feeding system can be recommended for fattening performance, slaughter weight, hot and cold carcass weights, hot and cold carcass yield for male Tuj lambs.

REFERENCES

1. Akçapınar H: Koyun Yetiştiriciliği. Genişletilmiş 2. Baskı, İsmat Matbacılık, Ankara, 2000.

2. Kaymakçı M, Özder M, Karaca O, Torun O, Baş S, Koşum N: Turkey breeding sheep strategy. *Uludag Univ Zir Fak Derg*, 23, 67-77, 2009.

3. TUİK: Türkiye İstatistik Kurumu. 2016. http://www.tuik.gov.tr/PreTablo.do?alt_id =1002, *Accessed:* 07.04.2016.

4. Ekiz B, Yılmaz A, Özcan M, Kaptan C, Hanoğlu H, Erdoğan I, Yalçıntan H: Carcass measurements and meat quality of Turkish Merino, Ramlic, Kıvırcık, Chios and Imroz lambs raised under an intensive production system. *Meat Sci*, 82, 64-70, 2009. DOI: 10.1016/j.meatsci.2008.12.001

5. Tekin ME: Kasaplık Kuzu Üretimi. Selçuk Universitesi Basımevi, Konya, 2009.

6. Zervas G, Tsiplakou E: The efect of feeding system on the characteristics of products from small ruminants. *Small Ruminant Res*, 101, 140-149, 2011. DOI: 10.1016/j.smallrumres.2011.09.034

7. NRC: Nutrient Requirements of Sheep. 6th rev. edn., National Academy Press, Washington, DC, USA, 1985.

8. AOAC: Official Methods of Analysis. 14th edn., Arlington, Virginia, USA, 1990.

9. Colomer-Rocher F, Morand-Fehr P, Kirton AH, Delfa R, Sierra-Alfranca I: Standardized methods for the study of the quantitative and qualitative characters of sheep and goat carcasses. Ministerio de Agricultura, Pesca y Alimentacion. *Cuadernos/NIA*, No. 17, 41, 1988.

10. SPSS: IBM SPSS for Windows, Version 20.0. IBM corporation, Armonk, NY, USA, 2011.

11. Işık S, Kaya İ: The Effect of vegetation period on the qualilty of pasture and performance of grazing Tujhin sheep and lambs. *Kafkas Univ Vet Fak Derg,* 17, 7-11, 2011. DOI: 10.9775/kvfd.2010.1964

12. Sarı M, Önk K, Aydın E, Tilki M, Tufan T: Effects of different fattening systems on fattening performanceand body measurements of Hemsin male lambs. *Kafkas Univ Vet Fak Derg*, 20, 209-215, 2014. DOI: 10.9775/kvfd.2013.9823

13. Kaya İ, Saatcı M, Ünal Y, Öncüer A, Kırmızıbayrak T: Effect of grazing on green growing pasture and concentrate supplementation on pasture quality and growth, rumen ph, total volative fatty acids, ammonium nitrojen in Morkaraman and Tuj. *Lalahan Hay Araşt Enst Derg,* 44, 33-39, 2004.

14. Sarıçiçek BZ, Ocak N, Erener G: The effects of different concentrates on pasture on fattening performance of Karakaya lambs. *J Agric Sci*, 2, 27-31, 1996.

15. Kaya İ, Şahin T, Elmalı Aksu D, Ünal Y: The effects of grazing and concentrate supplementation at pasture on performance and rumen parameters in lambs. *Kafkas Univ Vet Fak Derg*, 17, 693-697, 2011. DOI: 10.9775/kvfd.2011.3699

16. Saatci M, Yıldız S, Kaya I: New rearing systems for Tuj (Tushin) lambs. *Small Ruminant Res,* 50, 23-27, 2003. DOI: 10.1016/S0921-4488(03)00115-9

17. Altın T, Karaca O, Cemal I, Yılmaz M, Yılmaz O: The fattening and carcass characteristics of Kıvırcık and Karya lambs. *J Anim Prod,* 46, 19-29, 2005.

18. Macit M, Karaoğlu M, Yaprak M, Kopuzlu S: Determination of the fattening performance, and slaughtering and carcass characteristics of Tushin lambs under intensive farm conditions. *Atatürk Üniv Ziraat Fak Derg*, 28, 64-73, 1997.

19. Şen U, Şirin E, Ulutaş Z, Kuran M: Fattening performance, slaughter, carcass and meat quality traits of Karayaka lambs. *Trop Anim Health Prod,* 43, 409-416, 2011. DOI: 10.1007/s11250-010-9707-y

20. Yıldırım A, Ulutaş Z, Ocak N, Kaptan M: Effects of birth weight and feeding system on fattening performance and feedin behaviour of karayaka male lambs. *Ital J Anim Sci*, 12, 546-550, 2013. DOI: 10.4081/ijas.2013.e89

21. Ulusan HOK, Aksoy AR, Uzun N, Karabulak C, Laçin E: Slaughter and carcass traits of Morkaraman, Tuj and their crosses (Morkaraman x Tuj) male lambs fedon natural pasture. *Kafkas Univ Vet Fak Derg,* 2, 28-33, 1996.

22. Sarı M, Aksoy AR, Tilki M, Kaya I, Işık S: Effect of different fattening methods on slaughter and carcass characteristics of Tuj male lambs. *Archiv Tierzucht*, 55, 480-484, 2012.

23. Kırmızıbayrak T, Saatcı M, Aksoy AR: Slaughter and carcass characteristics of Tushin and red Karaman lambs raised in semi intensive conditions. *Kafkas Univ Vet Fak Derg*, 9, 75-78, 2003.

24. Öztürk Y, Küçük M, Karslı MA: Yarı entansif şartlarda yetiştirilen Morkaraman ve Kıvırcık x Morkaraman (F_1) kuzularda büyüme, kesim ve karkas özelliklerinin arştırılması. *Kafkas Univ Vet Fak Derg*, 18, 1-6, 2012. DOI: 10.9775/kvfd.2011.4351

25. Yaralı E, Karaca O: The fattening performance, slaughtering and carcass merits of Karya lambs fattened in different systems. *J Anim Prod,* 52, 1-9, 2011.

26. Carrasco S, Ripoll G, Sanz A, Alvarez-Rodriguez J, Panea B, Revilla R, Joy M: Effect of feeding system on growth and carcass characteristics of Churra Tensina light lambs. *Livest Sci*, 121, 56-63, 2009. DOI: 10.1016/j.livsci.2008.05.017

27. Bjelanovic M, Grabez V, Vucic G, Martinovic A, Lima LR, Markovic B, Ehelandsdal B: Effect of different production systems on carcass and meat quality of sheep and lamb from Western Balkan and Norway. *Biotechnol Anim Husb,* 31, 203-221, 2015. DOI: 10.2298/BAH1502203B

28. Tufan M, Akmaz A: Slaughter and carcass traits of Güney Karaman, Kangal Akkaraman and Akkaraman lambs at different slaughter weights. *Turk J Vet Anim Sci,* 25, 405-504, 2001.

29. Macit M, Şahin S, Esenbuğa N, Karaoğlu M: Growth and carcass characteristics of three fat-tailed pure breeds under grazing with concentrate supplementation. *Turk J Vet Anim Sci*, 27, 331-337, 2003.

30. Aksoy Y, Ulutaş Z: Effect of different slaughter weights on slaughter carcass traits of Male Karayaka lambs reared under intensive production systems. *TURJAF,* 3, 406-412, 2015.

31. Akçapınar H, Atasoy F, Ünal N, Aytaç M, Aylanç A: The feeding and carcass characteristics of Bafra (Chois x Karayaka (B_1) lambs. *J Lalahan Livest Res Inst,* 42, 19-28, 2002.

32. Joy M, Ripoll G, Delfa R: Effects of feeding system on carcass and non-carcass composition of Churra Tensina light lambs. *Small Ruminant Res,* 78, 123-133, 2008. DOI: 10.1016/j.smallrumres.2008.05.011

33. Koçak Ö, Ekiz B, Yalçıntan H, Yılmaz A: Slaughter and carcass characteristics of Chios x Tahirova crossbred lambs under intensive, traditional and organic production system. *Ankara Univ Vet Fak Derg*, 63, 187-193, 2016. DOI: 10.1501/Vetfak_0000002728

34. Aksoy AR: Fattening performance, slaughtering and carcass characteristics of Morkaraman and Tushin ram lambs at different slaughtering weights. *Ankara Univ Vet Fak Derg*, 42, 15-23, 1995. DOI: 10.1501/Vetfak_0000000799

35. Kaya I, Karademir B: The role of grassland in livestock animal nutrition and performation-contamination of diseases in Kars district. *Lalahan Hay Arast Enst Derg*, 42, 59-66, 2002.

36. Holmes W: Grass Its Production and Utilization. Blackwell Scientific Publications, London, 1994.