

# Effects of Different Fattening Systems on Fattening Performance and Body Measurements of Hemsin Male Lambs <sup>[1]</sup>

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<sup>[1]</sup> This study was supported by TUBITAK (Project code; TOVAG 111 O 456)

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Makale Kodu (Article Code): KVFD-2013-9823

## Summary

This study was conducted to determine effect of different fattening systems on fattening performance and body measurements of Hemsin male lambs. The materials of the study were consisted 39 male lambs weaned at 3 months of age (approximately live weight of 23 kg). In this study, Hemsin lambs were used in three group of extensive (n=13), semi-intensive (n=13) and intensive (n=13). The experiment was conducted for 90 days. Final live weights of groups of extensive, semi-intensive and intensive were 33.32, 41.16 and 42.09 kg, respectively, and for daily live weight gain (DLWG) were 121.11, 201.89 and 213.00 g, respectively. For semi-intensive and intensive of group, feed conversion ratios were 3.44 and 5.35 kg, respectively. As a result, intensive and semi-intensive groups of fattening performance were not statistically significant (P>0.05). The results of this study suggest that semi-intensive group might be appropriate for fattening male Hemsin lambs. Hemsin lambs had a generally similar or lower fattening performance compared to local sheep breeds.

**Keywords:** Hemsin lamb, Fattening systems, Fattening performance, Body measurements

## Hemşin Erkek Kuzularında Farklı Besi Sistemlerinin Besi Performansı ve Vücut Ölçülerine Etkisi

### Özet

Bu araştırma, Hemşin erkek kuzularında besi performansı ve vücut ölçülerine farklı besi sistemlerinin etkisini belirlemek için yapılmıştır. Araştırmanın hayvan materyalini, 3 aylık yaşta süttten kesilmiş, 39 baş Hemşin erkek kuzu oluşturmuştur (Yaklaşık 23 kg canlı ağırlığında). Araştırmadaki kuzulara ekstansif (n=13), yarı entansif (n=13) ve entansif (n=13) olmak üzere 3 farklı besi yapılmıştır. Araştırma 90 günde tamamlanmıştır. Ekstansif, yarı entansif ve entansif besi gruplarında besi sonu canlı ağırlıkları sırasıyla 33.32, 41.16 ve 42.09 kg, günlük canlı ağırlık artışları sırasıyla 121.11, 201.89 ve 213.00 g olarak belirlenmiştir. Yarı entansif ve entansif besi gruplarında yemden yararlanma oranları ise sırasıyla 3.44 ve 5.35 kg olarak tespit edilmiştir. Sonuç olarak, entansif ve yarı entansif besi gruplarının besi performansı, ekstansif besi grubundan yüksek bulunmuştur. Besi performansı bakımından entansif ve yarı entansif besi grupları arasında istatistiki bir fark bulunmamıştır (P>0.05). Bu sonuçlara göre Hemşin erkek kuzularında yarı entansif besinin en uygun olacağı ortaya çıkmıştır. Besi performansı bakımından, genel olarak Hemşin erkek kuzuların diğer yerli ırklara göre benzer ve biraz düşük olduğu söylenebilir.

**Anahtar sözcükler:** Hemşin kuzusu, Besi sistemleri, Besi performansı, Vücut ölçüleri

## INTRODUCTION

Sheep breeding is performed in many regions of the world, especially regions with extensive pastures, meadows and suitable climates. However, sheep breeding

is performed at pastures and meadows with low quality and areas with vegetation not utilized for crops or cattle breeding. Sheep obtain a large proportion of their nutrition



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from pastures. They are resistant to diseases and adverse environmental conditions, easily manageable, and have low costs <sup>[1,2]</sup>.

In the world there are around 200 sheep breed and this number is around 20 for Turkey. Some of them are Akkaraman, Morkaraman, İvesi, Kıvrıkcık, Dağlıç, Karayaka and Sakız. Many scientific studies have been and are being conducted on these breeds. Furthermore, there are also important many sheep breeds that are bred locally. There is literature information about their yield performance. Hemsin sheep is one of them. However, scientific studies on the Hemsin sheep are not adequate. The grazing area of the Hemsin sheep covers an extensive area, where there is a dominant Black Sea climate consisting of the eastern parts of Rize, Artvin, and northern district of Erzurum, particularly Artvin and its surroundings. This region is rich in terms of meadows and plateaus and utilized very well by the Hemsin sheep. During snowy periods the sheep are accommodated in open or semi open sheepfolds. Feeding consists of heavily roughage in the region <sup>[3,4]</sup>.

The Hemsin sheep is a breed that is demanded by breeders and known for the quality and taste of its meat and preferred more by people in the region compared to other breeds in the region. Thus, it is necessary to study the fattening performance and body measurement, which are among the efficiency properties of the Hemsin breed to make a contribution to the literature. The total number of Hemsin sheep is 54 924 head <sup>[5]</sup> and each passing day their amount is decreasing due to various reasons. If measures are not taken urgently, they will be faced extinction <sup>[6]</sup>. The decrease in the number of sheep can be listed as the enterprises being small, scattered and unorganized, the inadequacy of the level of productivity of existing breeds, feeding being based on ever poor pastures, and the use of new production techniques and technology at the lowest level based on structural and economic factors <sup>[7]</sup>.

No studies have been conducted for the purpose of determining the fattening performance and body measurements of Hemsin lambs. Studies have been only conducted for the purpose of determining the growth and development characteristic while being bred by locals. In the study conducted with locals, Hemsin lambs were taken to the pasture when they were 3 months of age. At the beginning of pasture overall, male and female weights of Hemsin lambs were determined to be 28.09, 28.41, and 27.79 kg, respectively and at the end of pasture weights were determined to be 39.27, 39.95 and 38.58 kg, respectively. The pasture beginning weights of lambs obtained from elite, under elite and base flocks were determined to be 27.20, 29.28 and 27.82 kg, respectively and their pasture end weights were determined to be 39.14, 37.96 and 40.72 kg, respectively <sup>[8]</sup>.

This study was conducted for the purpose of determining the effect of different fattening systems on

the fattening performance and body measurements of Hemsin lambs.

## MATERIAL and METHODS

This study was undertaken after ethical approval of Kafkas University (Official form date and number: 03.03.2011 and 2011-005). The study was conducted at the Application and Research Farm of the Faculty of Veterinary Medicine, Kafkas University in 2012. The lambs were purchased from a breeder at the Bereket village at the district of Ardanuç in the province of Artvin. A total of 39 three month of age Hemsin ram lambs, with an average live weight of 23 kg were used and randomly allocated into three groups. The lambs were divided into the 3 different fattening groups of extensive, semi intensive, and intensive, with 13 head lambs in each group. Before the beginning of the study, the lambs were applied medication against internal and external parasites. The study was started after 10 days of adaptation of lambs to assess of pasture and concentrate mixture.

In extensive and semi intensive fattening the lambs were grazed on the pasture 8 h in a day. The semi-intensive group was grazed on pasture and additionally was given concentrated feed available ad libitum. The concentrated feed was given to the intensive group available ad libitum and 270.00 g of grass hay per lamb per day. Concentrated food was consisted of 17.10% CP and 2710 kcal/kg ME <sup>[9]</sup>. The composition of the concentrated feed has been given in [Table 1](#) and the nutrient contents of concentrated feed and roughage has been given in [Table 2](#). The concentrated feed has been prepared in a private feed factory and the fodder was obtained from the Faculty of Veterinary Medicine Farm. The analysis of the feed was performed at the Animal Nutrition and Nutrition Diseases at the Faculty of Veterinary Medicine of the Kafkas University. Clean water was provided as constantly for intensive fattening group lambs and it was ensured that the lambs of extensive and semi intensive feeding groups drank clean water at least three times a day. The feed was determined by means of a digital scale sensitive to 1 g.

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<sup>2</sup> of pasture was cut with a weed trimmer from 1 cm above the soil level. The pasture sample's DM (Dry Matter), OM (Organic Matter), CP (Crude Protein), CA (Crude Ash), Crude Cellulose (CC), Crude Fat (CF), and NFE (nitrogen free extract) levels were determined according to A.O.A.C. <sup>[10]</sup>.

The live weights and body measurements of lambs were determined fortnightly. All lambs were weighed after

**Table 1.** Compositon of the mixed feed used in semi intensive and intensive fattening process

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	-	-

**Table 2.** Nutrient contents of concentrated feed and roughage, %

Ingredient	Concentrated 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
Metabolic energy (kcal/kg)*	2710	2000

\*It was determined through calculation over the table values

**Table 3.** Natural nutrients of the pasture at various mowing times, %

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.** Live weight (kg) changes in groups based on periods (Mean±SE)**Table 4.** Dönemlere göre gruplardaki ortalama canlı ağırlık (kg) değişimleri (Ortalama±Standart hata)

Days	Extensive	Semi-intensive	Intensive	Significance
0	22.42±0.56	22.99±0.54	22.92±0.55	-
14	23.92±0.49	24.99±0.72	24.13±0.70	-
28	26.42±0.62 <sup>b</sup>	28.99±0.82 <sup>a</sup>	25.35±0.60 <sup>b</sup>	***
42	27.42±0.62 <sup>b</sup>	30.72±0.81 <sup>a</sup>	29.33±0.71 <sup>ab</sup>	***
56	29.21±0.64 <sup>b</sup>	33.95±0.94 <sup>a</sup>	33.96±0.75 <sup>a</sup>	***
70	31.86±0.56 <sup>b</sup>	37.45±1.13 <sup>a</sup>	37.00±0.79 <sup>a</sup>	***
84	33.05±0.66 <sup>b</sup>	40.36±1.22 <sup>a</sup>	40.29±1.04 <sup>a</sup>	***
90	33.32±0.64 <sup>b</sup>	41.16±1.36 <sup>a</sup>	42.09±1.09 <sup>a</sup>	***

-:  $P > 0.05$ , \*\*\*  $P < 0.001$ , **a, b**: The difference between groups in the same line with different letters is significant ( $P < 0.05$ )

being fasted for 12 h. At the end of the 90 day fattening process they were measured and their final live weights were measured. Weights were determined by means of a digital scale sensitive to 1 g.

In order to determine the effects of different fattening systems on fattening performance, variance analysis method was employed using SPSS 12.0 statistical package software [11]. Duncan multiple range tests were used to evaluate the significance of the difference among the groups.

## RESULTS

The average live weights of lambs in the groups during various periods and the periods in fattening have been given in Table 4, the daily live weight gain (DLWG) has been provided in Table 5, the amount of daily consumed feed (DCF) has been provided in Table 6, and the feed conversion ratio (FCR) has been provided in Table 7.

The live weights at the beginning of fattening process for extensive, semi intensive, and intensive fattening were determined to be 22.42, 22.99 and 22.92 kg, respectively, and the live weights at the end of the 90 day fattening period were determined to be 33.32, 41.16 and 42.09 kg, respectively. In extensive, semi intensive, and intensive fattening process the DLWG for weights at the end of 90 day fattening were determined to be 121.11, 201.89 and 213.00 g, respectively. The daily consumed concentrated feed in semi-intensive and intensive fattening were determined to be 0.70 and 1.14 kg, respectively and the concentrated FCR was determined to be 3.44 and 5.35 kg, respectively.

**Table 5.** Daily live weight gain (g/day) in the groups according to periods (Mean±SE)**Tablo 5.** Dönemlere göre gruplardaki günlük canlı ağırlık artışı, (g/gün)

Days	Extensive	Semi intensive	Intensive	Significance
0-14	107.14±18.55	142.86±17.35	86.43±26.38	-
15-28	178.57±18.53 <sup>b</sup>	285.71±23.59 <sup>a</sup>	87.14±33.30 <sup>c</sup>	***
29-42	71.43±13.14 <sup>b</sup>	123.57±29.16 <sup>b</sup>	284.29±30.28 <sup>a</sup>	***
43-56	127.86±9.17 <sup>c</sup>	230.71±24.56 <sup>b</sup>	330.71±25.44 <sup>a</sup>	***
57-70	189.29±17.34	250.00±35.56	217.14±28.23	-
71-84	85.00±14.44 <sup>b</sup>	207.86±38.86 <sup>a</sup>	235.00±27.80 <sup>a</sup>	**
85-90	19.29±15.48 <sup>b</sup>	57.14±34.69 <sup>b</sup>	128.57±18.65 <sup>a</sup>	***
0-90	121.11±6.25 <sup>b</sup>	201.89±13.84 <sup>a</sup>	213.00±9.86 <sup>a</sup>	***

∴ P>0.05, \*\* P<0.01, \*\*\* P<0.001, a, b, c: The difference between groups in the same line with different letters is significant (P<0.05)

**Table 6.** Daily feed consumption (kg) per animal according to periods (Mean±SE)**Tablo 6.** Dönemlere göre hayvan başına tüketilen yem miktarları (kg) (Ortalama±Standart hata)

Days	Concentrate Feed			Roughage	Intensive Total Feed
	Semi Intensive	Intensive	Significance	Intensive	
0-14	0.14±0.02 <sup>b</sup>	0.36±0.02 <sup>a</sup>	***	0.36±0.04	0.72
15-28	0.26±0.02 <sup>b</sup>	0.62±0.01 <sup>a</sup>	***	0.30±0.03	0.91
29-42	0.68±0.02 <sup>b</sup>	1.04±0.04 <sup>a</sup>	***	0.30±0.02	1.34
43-56	0.97±0.01 <sup>b</sup>	1.47±0.01 <sup>a</sup>	***	0.24±0.01	1.71
57-70	1.01±0.01 <sup>b</sup>	1.56±0.01 <sup>a</sup>	***	0.23±0.001	1.79
71-84	1.08±0.01 <sup>b</sup>	1.76±0.01 <sup>a</sup>	***	0.23±0.001	1.99
85-90	0.77±0.001 <sup>b</sup>	1.23±0.001 <sup>a</sup>	***	0.15±0.001	1.39
0-90	0.70±0.04 <sup>b</sup>	1.14±0.06 <sup>a</sup>	***	0.27±0.01	1.48

\*\*\* P<0.001, a, b: The difference between groups in the same line with different letters is significant (P<0.05)

**Table 7.** Feed utilization rates according to periods, feed conversion ratio**Tablo 7.** Dönemlere göre yemden yararlanma oranları

Days	Semi Intensive	Intensive	
	Concentrate Feed	Concentrate Feed	Roughage
0-14	0.98	4.18	4.15
15-28	0.91	7.00	3.40
29-42	5.47	3.64	1.06
43-56	4.19	4.44	0.73
57-70	4.04	7.19	1.06
71-84	5.21	7.48	0.98
85-90	13.46	9.57	1.20
0-90	3.44	5.35	1.26

The body measurements of the lambs at different phases of the study are presented in [Table 8](#) and [Table 9](#).

## DISCUSSION

In fattening process of lambs, shortest fattening period, the best fattening systems and highest feed conversion ratio were preferred. In this research, the DLWG of the

fattening in the first 0-14<sup>th</sup> and 15<sup>th</sup>-28<sup>th</sup> day periods are ordered as the semi intensive, extensive, and intensive groups. This can be the result of the animals in the intensive group not being completely used to the feed and environment. At the end of fattening period, the DLWG in groups of extensive, semi intensive and intensive was found 121.11, 201.89 and 213.00 g, respectively. The reason of the DLWG in the extensive group being so low may be the result of the pasture quality and nutritional value decreasing each day. Because the lambs were grazed between 08.00 in the morning and 17.00 in the evening and the lambs were affected by the heat during these hours. In terms of DLWG, it was determined that in the periods between days 29-42, 43-56, 71-84 and 85-90 that of the intensive group is higher than the semi intensive and extensive groups. This is due to the animals in the intensive group getting used to the feed in this period, the amount of concentrated feed being high for feed consumed for a 1 kg increase in live weight, the temperature being high during these periods and the quality and nutrition of the pasture decreasing after the solstice on June 21.

In this study, the initial and final live weights, and DLWG in the extensive group were found to be lower than those reported by Sezgin et al.<sup>[8]</sup> for Hemsin lamb possessed by

**Table 8.** Changes in body measurement (cm) according to periods (Mean±SE)  
**Table 8.** Dönemlere göre vücut ölçülerindeki (cm) değişiklikler (Ortalama±Standart hata)

Traits	Body Length	Withers Height	Chest Depth	Chest Girth	Circumference of Cannon Bone Forelimb	Circumference of Cannon Bone Hindlimb
0. day	-	-	-	-	-	-
Extensive	54.08±1.06	53.85±0.82	20.68±0.29	62.98±0.79	7.32±0.08	8.33±0.06
Semi intensive	55.12±0.88	54.22±0.66	20.92±0.45	64.14±0.81	7.33±0.06	8.38±0.05
Intensive	55.89±0.76	53.36±0.65	21.04±0.24	63.92±0.72	7.39±0.08	8.44±0.08
14. day	-	-	-	-	-	-
Extensive	57.65±0.72	55.37±0.87	21.81±0.23	64.90±0.70	7.67±0.03	8.57±0.04
Semi intensive	59.24±0.59	56.45±0.45	22.13±0.28	65.82±0.89	7.72±0.05	8.68±0.05
Intensive	57.68±0.54	55.10±0.69	21.99±0.30	66.22±0.89	7.67±0.06	8.65±0.04
28. day	***	-	-	*	-	-
Extensive	59.68±0.59 <sup>b</sup>	58.19±0.71	22.44±0.63	68.69±0.77 <sup>b</sup>	8.04±0.04	9.04±0.03
Semi intensive	61.40±0.52 <sup>a</sup>	58.32±0.69	22.76±0.67	70.99±0.72 <sup>a</sup>	8.09±0.03	9.11±0.04
Intensive	58.69±0.39 <sup>b</sup>	57.48±0.55	21.17±0.25	68.70±0.70 <sup>b</sup>	8.12±0.02	9.15±0.02
42. day	-	-	-	***	-	-
Extensive	61.77±0.57	59.02±0.60	22.72±0.68	69.74±0.56 <sup>b</sup>	8.13±0.03	9.13±0.03
Semi intensive	62.42±0.50	60.46±0.63	23.07±0.18	72.85±0.54 <sup>a</sup>	8.21±0.03	9.17±0.03
Intensive	61.11±0.44	58.75±0.56	22.79±0.22	71.47±0.60 <sup>a</sup>	8.21±0.04	9.24±0.04

a, b: The difference between groups in the same column with different letters is significant (P<0.05), -: P>0.05, \* P<0.05, \*\*\* P<0.001

**Table 9.** Changes in body measurement (cm) according to periods (Mean±SE)  
**Table 9.** Dönemlere göre vücut ölçülerindeki (cm) değişiklikler (Ortalama±Standart hata)

Traits	Body Length	Withers Height	Chest Depth	Chest Girth	Circumference of Cannon Bone Forelimb	Circumference of Cannon Bone Hindlimb
56. day	-	-	*	**	**	**
Extensive	63.49±0.29	60.25±0.60	23.52±0.25 <sup>b</sup>	73.95±0.80 <sup>b</sup>	8.31±0.05 <sup>b</sup>	9.32±0.06 <sup>b</sup>
Semi intensive	64.25±0.47	61.04±0.56	24.31±0.20 <sup>a</sup>	76.66±0.66 <sup>a</sup>	8.65±0.08 <sup>a</sup>	9.65±0.09 <sup>a</sup>
Intensive	64.49±0.47	60.68±0.32	24.32±0.20 <sup>a</sup>	78.14±0.95 <sup>a</sup>	8.49±0.06 <sup>ab</sup>	9.43±0.05 <sup>b</sup>
70. day	**	-	*	***	***	***
Extensive	63.89±0.17 <sup>b</sup>	60.85±0.53	24.45±0.14 <sup>b</sup>	76.61±0.73 <sup>b</sup>	8.60±0.05 <sup>b</sup>	9.54±0.04 <sup>c</sup>
Semi intensive	66.53±0.66 <sup>a</sup>	61.85±0.54	25.22±0.19 <sup>a</sup>	81.96±1.03 <sup>a</sup>	9.22±0.08 <sup>a</sup>	10.09±0.09 <sup>b</sup>
Intensive	66.22±0.61 <sup>a</sup>	61.65±0.27	24.92±0.22 <sup>ab</sup>	81.69±0.88 <sup>a</sup>	9.32±0.10 <sup>a</sup>	10.35±0.09 <sup>a</sup>
84. day	***	-	***	***	***	***
Extensive	64.27±0.17 <sup>b</sup>	61.73±0.38	24.65±0.13 <sup>b</sup>	81.69±1.27 <sup>b</sup>	8.90±0.05 <sup>b</sup>	10.03±0.09 <sup>b</sup>
Semi intensive	66.99±0.61 <sup>a</sup>	62.32±0.54	25.50±0.16 <sup>a</sup>	87.00±1.16 <sup>a</sup>	9.43±0.07 <sup>a</sup>	10.56±0.08 <sup>a</sup>
Intensive	66.81±0.55 <sup>a</sup>	62.38±0.32	25.42±0.11 <sup>a</sup>	88.00±1.07 <sup>a</sup>	9.43±0.10 <sup>a</sup>	10.59±0.07 <sup>a</sup>
90. day	***	-	***	***	***	***
Extensive	64.67±0.17 <sup>b</sup>	62.13±0.38	24.80±0.13 <sup>b</sup>	84.09±1.27 <sup>b</sup>	9.00±0.05 <sup>b</sup>	10.18±0.09 <sup>b</sup>
Semi intensive	67.39±0.61 <sup>a</sup>	62.76±0.54	25.65±0.16 <sup>a</sup>	89.37±1.13 <sup>a</sup>	9.53±0.07 <sup>a</sup>	10.71±0.08 <sup>a</sup>
Intensive	67.21±0.55 <sup>a</sup>	62.78±0.32	25.57±0.11 <sup>a</sup>	90.40±1.07 <sup>a</sup>	9.53±0.10 <sup>a</sup>	10.74±0.07 <sup>a</sup>

-: P>0.05, \* P<0.05, \*\* P<0.01, \*\*\* P<0.001, a, b, c: The difference between groups in the same column with different letters is significant (P<0.05)

locals (initial live weight 28.09 kg, final live weight 39.27 kg, and DLWG 220.64 kg). These differences result from the differences between initial live weight, the quality of the pasture, fattening period, and care and feeding.

The DLWG in the extensive group was found to be higher than those reported by Saricicek et al.<sup>[12]</sup> reporting a DLWG of 78.14 g for Karayaka lambs feed on pasture. Again, in this study, the DLWG in the semi intensive group

was found to be higher than those reported by Saricicek et al.<sup>[12]</sup> reporting a DLWG of 145.43, 152.29 and 166.71 g for Karayaka lambs feed on pasture and additionally barley, barley + the fattening feed for lamb-calf (25%) and barley + the fattening feed for lamb-calf (50%), respectively. The reason for differences observed between studies are due to breed, pasture beginning and pasture end weight, fattening period, pasture quality, care and nutrition programs, and various environmental conditions.

In this study, the pasture end weight obtained at the end of the 90 day pasture fattening period and the DLWG values were found to be lower than the values determined by Isik and Kaya<sup>[13]</sup> in the study conducted for the purpose of determining the fattening performance of Tuj breed lambs grazing at a pasture (pasture initial live weight 8.78 kg, pasture end weight at the end of a 140 day pasture fattening period 34.24 kg, DLWG 181.60 g for ram lambs).

Values regarding the fattening performance reported in the semi intensive and intensive group in this study were found to be lower than the values of the pasture grazing, and the groups receiving 200 and 400 g concentrated feed in addition to pasture of Tuj lambs in the study of Kaya et al.<sup>[14]</sup> (initial live weight 30.35, 30.47, and 30.40 kg, fattening end weights at the end of the 90 day fattening period of 44.10, 44.92 and 46.88 kg, and the DLWG of 152.78 g in the pasture group) and higher than the DLWG of groups receiving 200 and 400 g concentrated feed in addition to pasture (160.57 and 183.14 kg).

The final live weight and DLWG in the extensive group were found to be lower than those reported by Kaya et al.<sup>[15]</sup> reporting a final live weight of 34.23 kg and DLWG of 207.74 g for Tuj lambs feed on pasture. But, in this research, the final live weights in the semi intensive group was found to be higher than those reported by Kaya et al.<sup>[15]</sup> reporting a final live weight of 37.02 kg for Tuj lambs feed on pasture+concentrate. Again, in this study, the DLWG determined for the extensive group were higher than those reported by Saatci et al.<sup>[16]</sup> reporting a DLWG of 77.00, 98.00 and 118.00 g for Tuj lambs in group T, group TC and group C, respectively.

In the present study, the FCR determined in the intensive group found to be similar reported by Altin et al.<sup>[17]</sup> reporting a FCR of 5.30 kg for Kivircik lambs. The same weight values of FCR were found to be lower than those reported by Altin et al.<sup>[17]</sup> reporting a FCR of 6.25 kg for Karya lambs. This difference between researchers is due to breed, fattening start weights, fattening periods, and care and nutrition.

In this study, the FCR in intensive group found to be similar reported by Kucuk et al.<sup>[18]</sup> reporting a FCR 5.38 and 5.75 kg for Morkaraman and KivircikxMorkaraman (G,) crossbreed lambs in intensive fattening. However, the DLWG in this study was found to be lower than those

reported in the same study reporting a DLWG of 272.00 and 324.00 g.

In this study, the body measurement values reported at 56 days of age were found to be higher than those reported by Bayram and Odabasioglu<sup>[19]</sup> reporting a body length (61.00 and 64.17 cm), withers height (55.25 and 55.00 cm), circumference of cannon bone forelimb (8.25 and 8.50 cm) for Kivircik and KivircikxMorkaraman F<sub>1</sub> lambs at the end of the 60 day fattening period in the pasture and pasture + feed group, but in this study the chest depth and chest girth lower than those reported by Bayram and Odabasioglu<sup>[19]</sup> reporting a chest depth (26.83 and 26.67 cm) and chest girth (84.50 and 84.75 cm).

The body measurement values reported for Hemsin lambs in the 56 day of age in extensive and semi intensive groups were found to be lower than those reported by Arik et al.<sup>[20]</sup> reporting a withers height (64.83 and 66.08 cm), chest depth (26.43 and 26.80 cm) and chest girth (85.30 and 81.90 cm) for Malya and Akkaraman lambs at the end of the 56 day fattening period in fattened with full rations based on barley and formed with various roughages.

In this study, the body measurement determined on day 70 of intensive fattening were found to be lower than those reported by Karabacak et al.<sup>[21]</sup> reporting a withers height (64.40, 60.00, 62.70, 64.60 and 63.40 cm) and chest girth (84.10, 79.80, 83.70, 88.50 and 86.30 cm) for Akkaraman, Dağlıç, Kivircik, Malya and Karacabey Merinos lambs at the end of fattening periods in intensive fattening, but in this study the chest depth were found to be similar reported by Karabacak et al.<sup>[21]</sup> reporting a chest depth (24.60, 23.80, 24.00, 24.80 and 24.50 cm).

In the 90 day fattening study conducted on Hemsin lambs DLWG was found to be the lowest in the extensive group. This varies according to the quality of the pasture, where fattening was conducted, temperature and the average period of lambs in the pasture. No statistical difference was determined between the semi intensive and intensive groups in terms of DLWG. The DLWG was found to be the highest in the intensive fattening group. Due to animals grazing in pastures in the extensive and semi intensive groups, the amount of roughage that they consumed was not determined. The amount of concentrated feed consumed daily in semi intensive fattening corresponds to nearly half of the amount of feed consumed daily. Thus, due to there being no statistical difference between semi intensive and intensive groups in terms of DLWG, it appears that semi-intensive fattening would be more appropriate. Furthermore, it can be said that the fattening performance of the Hemsin lamb in extensive, semi intensive and intensive fattening is similar or a slightly lower than indigenous breeds.

The statistical differences in the body measurements of Hemsin lambs were generally observed on day 56 of

fattening. On the ninetieth day the extensive group was found to have the lowest body measurement values and no statistical difference was observed between the body measurements of the semi intensive and intensive fattening groups. When the body length values reported in various fattening groups of Hemsin lambs are compared with other studies conducted with different breeds, the obtained values were found to be higher or similar. When the values obtained in various fattening groups in terms of withers height, chest girth, and chest depth are compared with other studies conducted with different breeds, they were found to be lower or similar. This is due to the Hemsin breed having a longer and narrower body shape compared to other breeds.

In conclusion, the fattening performance and body measurement in intensive and semi intensive groups were found to be higher than that of the extensive group. No statistical difference was determined between semi intensive and intensive groups in general in terms of fattening performance and body measurements. Thus, it was revealed that semi intensive would be more appropriate.

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