RESEARCH ARTICLE

Determination of Growth Traits and Heritabilities of Growth Characteristics of Hemşin Sheep Reared in Artvin

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Summary

This research aimed to improve Hemşin sheep grown by local people in Artvin province between 2006 and 2010. Growth characteristics such as live weight and daily live weight gains of Hemşin lambs in the various periods were examined for this purpose. The effects of some environmental factors such as herd type, sex, birth type, age of dam, color and year on these factors were also examined. In the study, growth characteristics of lambs born from 6000 ewes and 300 dams were measured based on performance tests and a selection practice was performed. Elite, multiplyres elite and base herds were established. The heritabilities belonging to the properties in question were determined. The breeding value for daily live weight gains up to the end of grazing season in the fifth year was calculated. At the end of five years span of the research, to improve the growth characteristics of Hemşin sheep and to increase live weight gain to be obtained from each lamb were targeted. Except the daily live weight gain in the grazing period, all the other growth characteristics increased at the examined period. Heritabilities of the characteristics in the study is found as 0.213±0.114, 0.385±0.119, 0.411±0.144, 0.402±0.136, 0.418±0.143 ve 0.420±0.066, respectively. As a result, in terms of examined growth characteristics of Hemşin sheep measured by individual performance testing, it is determined that Hemşin sheep can be breed by local people to improve its growth traits.

Keywords: *Hemşin, Breeding, Growth, Heritability*

Artvin İlinde Yetiştirilen Hemşin Koyun Irkının Büyüme Gelişme Özellikleri ile Büyüme Gelişme Özelliklerine Ait Kalıtım Derecelerinin Belirlenmesi

Özet

Bu araştırma ile 2006-2010 yılları arasında Artvin ilinde yetiştirilen Hemşin koyun ırkının halk elinde ıslahı amaçlanmıştır. Bu amaç doğrultusunda Hemşin kuzularının çeşitli dönemlerde canlı ağırlık ve günlük canlı ağırlık artışları gibi özellikleri incelenmiştir. Büyüme özellikleri üzerine sürü tipi, cinsiyet, doğum tipi, ana yaşı, renk ve yıl gibi çevre faktörlerinin etkileri araştırılmıştır. Araştırmada, 6000 baş anaç ve 300 baş erkek materyalden doğan kuzuların mevcut şartlarda performans testine dayalı verim özellikleri tespit edilmiş ve seleksiyon işlemi uygulanmıştır. Elit, ara elit ve taban sürüler oluşturulmuştur. İncelenen özelliklere ait kalıtım dereceleri tespit edilmiş, 5. yılda kuzuların mera sonu günlük canlı ağırlık artışı için damızlık değeri hesaplanmıştır. Beş yıl süren araştırma sonunda, Hemşin koyunlarının büyüme ve gelişme özelliklerini ıslah etmek ve her baş kuzudan elde edilecek canlı ağırlık kazancını artırmak hedeflenmiştir. İncelenen dönemde büyüme özelliklerinden mera dönemi günlük canlı ağırlık artışı hariç üzerinde durulan bütün özelliklerde artış kaydedilmiştir. İncelenen özelliklerin kalıtım dereceleri sırasıyla 0.213±0.114, 0.385±0.119, 0.411±0.144, 0.402±0.136, 0.418±0.143 ve 0.420±0.066 olarak bulunmuştur. Sonuç olarak, bireysel performans testi ile Hemşin ırkının incelenen özellikler yönünden halk elinde ıslahının mümkün olabileceği tespit edilmiştir.

Anahtar sözcükler: *Hemşin, Islah, Döl verimi, Büyüme-gelişme, Kalıtım derecesi*

INTRODUCTION

The breeding studies in sheep husbandry have two basic purposes [1]. The first is to breed new races appropriate for regional conditions by using indigenous and foreign breed, and the second is to grow indigenous races as purebred

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and select the superior ones with regard to properties investigated. According to data [2] obtained from properties investigated in this field and registration system, the breeding studies were launched in Turkey a few years ago. The undisciplined breeding programs in all sheep breed grown along with these studies were carried out within a particular program [3]. Through this program, the indigenous breed initially underwent a stage to get purebred samples. Then, the superior samples in each race in terms of outstanding features were selected and they were kept in the herds. When the data obtained each year reached a considerable amount of stack, it was processed to achieve a selection in terms of offspring performance as well as achieve a phenotypic selection.

Our sheep races grown by local people under different breeding models are losing their purebred degrees through uncontrolled hybridization day by day even though this losing process is in different degrees on the basis of races. However, it is possible to achieve a real yield capacity in indigenous purebred sheeps and increase the yield per sheep by considering the performance properties and growing traditions and designing appropriate breeding and growing programs.

Turkey's sheep population is 21.74 million heads [4]. 20.7 million of this total is indigenous breed (97% of the total) and 1.1 million is merino. Akkaraman and Morkaraman sheep make up our sheep population. However, despite in small numbers, various sheep races and gene resources are grown in different regions. One of these indigenous gene resources is Hemşin sheep with combined performance property, grown widely in North East Anatolia region. The total number of Hemşin sheep in its growing area is approximately 54.924 heads [5]. Hemşin sheep has also been under the effect of a quantitative decline in our country due to various reasons [6]. This decline is a sign that substantial measures should be taken soon, as well as a sign that this race is in danger of extinction.

Because this is the first study on the growth characteristics of Hemşin sheep, the results obtained was compared with the studies on those of Morkaraman and Akkaraman sheep which is commonly grown in Turkey.

The criterion for prenatal growth of lambs is birth weight. The birth weight of lambs is affected by genotype as well as environmental factors such as age of dam, type of birth, sex and year. In their studies on Morkaraman sheep, reported birth weights as 4.06 kg [7] whereas calculated as 3.22 kg [8], as 4.26 kg [9], as 4.20 kg [10], as 2.93 kg [11] and as 4.03 kg [12]. For the birth weights of Akkaraman sheep, stated that the weight of Akkaraman sheep reared at Malya State Farm was 3.89 kg [13]; however, on another study conducted at the same Farm, calculated the weight as 4.19 kg [14] and calculated weight of Akkaraman sheep reared by the public in Van region as 3.81 kg [15].

In the study carried out for determining growth traits of Morkaraman breed lambs by average weight per grazing were reported as 16.2 kg [16] whereas calculated as 14.975 kg [10], as 22.0 kg [11]. The studies made on Akkaraman lambs by determined that 90-day live weight averages were 17.19 kg [17] whereas calculated the average as 24.17 kg [18] and as 26.11 kg [19]. However these values were calculated as 21.6 kg and 22 kg for Kangal type Akkaraman lambs respectively [20].

Calculated the average after-grazing live weight of Morkaraman sheep as 37.3 kg [16] on their studies whereas as 29.61 kg [9], as 32.33 kg [10], as 35.31 kg [12].

In the studies on Morkaraman sheep, calculated the average after-grazing live weight of lambs as 37.3 kg [16] whereas calculated as 29.61 kg [9], as 32.33 kg [10], calculated as 35.31 kg [12]. A number of researchers calculated 180-day average live weights of Akkaraman sheep as 35.91 kg [18] whereas the weight of Kangal type Akkaraman sheep was determined as 22 kg [21] and 21.6 kg [20].

Calculated average of daily live weight gains before and after grazing as 138 g and 124 g [10], respectively whereas calculated daily live weight gains at the grazing as 143 g [12]. Calculated the daily live weight gain average of Kangal type Akkaraman male lambs are 207.5 and female lambs as 190.3 g [20] for the period between birth and 90 days; calculated this average as 199.7 g [21].

Traits such as live weight and live weight gain can be determined by periodic growth measurements and the animals which will be breeding animals in the next generations can be selected based on such growth. Since the time and workforce requirement of growth measurements provided on selection programs carried out on the basis of growth measurements can sometimes be problematic, the measuring times might be preferably minimized. Early selection for future growth can be performed based on growth determined on the early periods by taking into consideration the relationships between characters [22].

Knowing parameters of growth traits such as heritability, repetitiveness and genetic correlation is highly important for studies to be carried out for the purpose of improving such characteristics by means of selection. Because determination of improvement potential of the population in terms of traits to be examined and the method to be chosen for genetic improvement depend on the amount of genetic parameters calculated over variance components such as heritability, repetitiveness and variance components [23].

This project aimed at launching breeding practices in herds under breeder conditions in Artvin province and providing the sheep breeders in the region with superior quality breeding sheep and rams with regard to their growth and development properties. In addition, the project also intended to create registered herds owned by local people and promote the establishment of this breed-specific growing union and finally increase the breeder income and profit.

MATERIAL and METHODS

Material

This study was carried out to increase live weight and daily weight gains for different periods, to reserve male and female lambs for breeding according to their breeding values based on performance testing under the current conditions, to improve in terms of their growth and development features and to increase the benefits to be obtained for each sheep in a breeding program of Hemşin sheep grown by local people in Artvin province between 2006 and 2010. 6000 ewes mated and 300 rams, Hemşin race grown by local people in the region, made up the animal material of the study. 5300 of the total was classified into base group (herd for breeding), 700 into multiplyres elite and 300 into elite *(Table 1)*. All the records to be taken up in elite, multiplyres elite and base herds were managed by contracted technical staff according to a plan created by project implementers.

Table 1. *The distribution of the number of breeders and animal material with respect to counties*

Tablo 1. *Projedeki yetiştirici sayılarının ve hayvan materyalinin ilçelere göre dağılımı*

Counties/Villages	The Number of Breeders	Sheep	Ram	Total
Ardanuç	19	4830	250	5080
Borçka	1	230	10	240
Hopa	2	940	40	980
Total	22	6000	300	6300

Method

Records and Live Weight Controls for Various Periods

Plastic ear tags were attached to both ears of study material sheep at the beginning of the project and lambs soon after their births. The lambs in all herds were weighed on a 100 g sensitive scale within 24 h following the birth. The features recorded were as follows: ear tag of the dam, date of birth, age of ewes, birth type and sex of lambs, fertility period, birth, live weights at the time of weaning or at the beginning and end of grazing season, live weight at one year and live adult weight, and the number of animals at the beginning and end of grazing season and the number of those reaching one year.

The number of lambs born per ewe mated, twin repro-duction rate or survival between beginning and end of grazing season and the live weight gains during these periods were determined. The lambs born were standardized according to their live weights at the end of grazing season (6-6.5 months), and macro environmental factors such as age of ewes, birth type, sex and operational factors. Then, the breeding values were determined according to the results of the performance obtained. For the heritability degree to be used for determining the breeding value for live weight

at the end of grazing season [24] the heritability degree to be determined in the herd as of second year was used. Manuel fertility method was applied in elite and multiplyres elite herds during the mating period. In base herd, random and natural mating methods were applied. Search rams were used for determining the heat so that the manual mating could be carried out healthily.

Statistical Analysis

Birth, beginning of grazing and after grazing live weights were subjected to variance analysis and daily live weight gains at the beginning of grazing, after the grazing and during the grazing were calculated. Duncan test was used to test the differences between levels of factors which were statistically significant. After-grazing live weights of lambs were adjusted according to factors such as age of dam, sex, type of birth, birth year, weight at the beginning of grazing and after-grazing age.

Data were analyzed basically by using [25-27] and then programs were used to estimate the model parameters. Open nucleus breeding system was taken as basis for developing selection models [28,29].

RESULTS

Live Weight

Birth Weight

The overall average birth weight was 3.57±0.026 kg. This average was determined to be 3.64±0.026 kg in male and 3.51±0.026 kg in female lambs. When the color factor was considered, the highest birth weight was determined in lambs born from sheep with pied color and the lowest was found in lambs born from sheep with black color. Regarding the herd type, the birth weight was determined as 3.96±0.030 kg, 3.46±0.027 kg and 3.30±0.026 kg in elite, multiplyres elite and base herds respectively. Twin and triplet births were observed in Hemşin sheep herds. Regarding the birth weight, single born lambs yielded the highest value, whereas twin and triplet born lambs yielded birth weight values close to each other. Regarding the birth weights over the years, the highest value was obtained from births in 2010 (3.65±0.026 kg). A 0.06 kg increase was observed in 2010 in comparison with the previous year. The effect of sex, age of dam, color, herd type, birth type and years on birth weight was determined to be statistically highly significant (P<0.01).

Weight at the Beginning of Grazing Season

The overall average live weight in herds up to the time (94.4 days) before going to pasture was determined to be 28.09±0.085. The average live weight at the beginning of grazing season was found to be 28.41±0.089 kg and 27.79±0.089 in males and females respectively. While the

Table 2. *Overall average weights and average daily live weight gains for different periods in herds*
Tablo 2. *Sürü genelinde çeşitli dönemlere ait ağırlık ortalaması ve günlük canlı ağırlık artışı ortalamaları*

Factors	Average Weights for Different Periods (kg)						Average Daily Live Weight Gains for Different Periods (g)					
	BW N	BW X±Sx	WBGS N	WBGS X±Sx	WEGS N	WEGS X±Sx	DLWGBGS N	DLWGBGS X±Sx	DLWGEGS N	DLWGEGS X±Sx	DLWGDGS N	DLWGDGS X±Sx
OVERALL	23303	3.57±0.026	22402	28.09±0.085	22402	39.27±0.187	22402	266.38±1.311	20510	220.64±1.423	20510	162.48±4.237
SEX		**		**		**		**		**		**
Male	11972	3.64±0.026[a]	11511	28.41±0.089[a]	11511	39.95±0.190[a]	11511	269.94±1.382[a]	10442	225.22±1.442[a]	10442	170.16±4.292[a]
Female	11331	3.51±0.026[b]	10891	27.79±0.089[b]	10891	38.58±0.190[b]	10891	262.81±1.385[b]	10068	216.05±1.445[b]	10068	154.79±4.302[b]
AGE of DAM		**		**		**		**		**		**
2	2367	3.57±0.028[bc]	2234	28.91±0.105[a]	2234	39.84±0.203[a]	2234	282.91±1.631[a]	2134	234.04±1.543[a]	2134	172.36±4.594[a]
3	2847	3.57±0.027[b]	2769	27.49±0.096[e]	2769	38.64±0.196[de]	2769	257.70±1.487[e]	2583	214.23±1.492[e]	2583	161.67±4.442[de]
4	3327	3.56±0.027[bc]	3275	28.38±0.091[b]	3275	39.51±0.193[bc]	3275	262.53±1.407[d]	3128	219.53±1.466[cd]	3128	162.25±4.365[d]
5	4961	3.53±0.026[c]	4858	28.19±0.079[bc]	4858	39.26±0.187[c]	4858	267.18±1.224[c]	4491	220.62±1.419[c]	4491	163.73±4.224[c]
6	4631	3.45±0.025[d]	4452	27.87±0.080[cd]	4452	39.17±0.186[c]	4452	266.79±1.245[cd]	3897	221.23±1.412[c]	3897	164.06±4.203[b]
7	3223	3.50±0.026[d]	3022	27.90±0.093[cd]	3022	39.39±0.192[bc]	3022	269.07±1.446[b]	2615	223.77±1.461[b]	2615	161.12±4.349[e]
8	1489	3.62±0.030[bc]	1384	27.94±0.130[c]	1384	38.89±0.216[de]	1384	266.86±2.009[cd]	1277	218.77±1.643[d]	1277	154.51±4.890[g]
9	356	3.64±0.044[bc]	344	27.71±0.239[d]	344	39.09±0.309[d]	344	256.65±3.701[f]	325	213.34±2.351[f]	325	159.03±6.998[f]
10>	68	3.72±0.087[a]	64	28.49±0.535[b]	64	39.59±0.607[b]	64	267.71±8.282[c]	60	220.18±4.611[c]	60	163.58±13.727[cd]
COLOR		**		**		**		**		**		**
White	10361	3.56±0.026[b]	9941	28.04±0.084[a]	9941	39.39±0.187[a]	9941	269.90±1.307[a]	9007	222.19±1.420[a]	9007	165.80±4.226[a]
Black	11317	3.55±0.026[b]	10877	28.22±0.083[a]	10877	39.29±0.187[b]	10877	268.43±1.290[b]	10008	220.76±1.418[b]	10008	158.73±4.222[c]
Pied	1625	3.62±0.031[a]	1584	28.04±0.133[b]	1584	39.11±0.219[c]	1584	260.80±2.054[c]	1495	218.95±1.661[c]	1495	162.88±4.945[b]
HERD TYPE		**		**		**		**		**		**
Elite	1824	3.96±0.030[a]	1796	27.20±0.028[c]	1796	39.14±0.094[b]	1796	233.50±1.986[b]	1758	206.80±1.634[b]	1758	164.83±4.864[b]
Mutiplyres elite	3879	3.46±0.027[b]	3712	29.28±0.102[a]	3712	37.96±0.143[c]	3712	311.74±1.572[c]	3275	240.71±1.477[a]	3275	155.93±4.395[c]
Base	17600	3.30±0.026[c]	16894	27.82±0.077[b]	16894	40.72±0.497[a]	16894	253.89±1.188[a]	15477	214.39±1.418[b]	15477	166.68±4.222[b]
BIRTH TYPE		**		**		**		**		**		**
Single	21206	3.91±0.014[a]	20453	27.42±1.042[c]	20453	38.25±0.215[c]	20453	265.87±1.009[a]	18841	217.89±0.715[b]	18841	151.67±2.129[c]
Twin	1983	3.40±0.020[b]	1853	25.73±1.047[c]	1853	41.19±0.194[a]	1853	253.89±2.189[c]	1582	213.25±1.089[c]	1582	157.11±3.243[b]
Triplets	114	3.41±0.067[b]	105	26.76±1.120[a]	105	38.41±0.187[b]	105	264.79±1.245[c]	87	230.76±3.755[a]	87	178.65±11.177[a]
YEARS		**		**		**		**		**		**
2007	5718	3.57±0.028[b]	5659	24.78±0.105[c]	5659	40.09±0.201[b]	5659	226.97±1.626[d]	5643	205.14±1.525[d]	5643	185.91±4.541[a]
2008	5722	3.57±0.028[c]	5619	29.99±0.105[b]	5619	40.65±0.203[a]	5619	260.99±1.626[a]	4661	209.11±1.540[c]	4661	172.70±4.585[c]
2009	5909	3.59±0.026[d]	5541	22.65±0.100[d]	5541	35.55±0.191[d]	5541	254.01±1.549[d]	5078	212.35±1.455[b]	5078	174.53±4.330[b]
2010	5954	3.65±0.026[a]	5583	34.98±0.096[a]	5583	40.77±0.195[a]	5583	323.68±1.482[c]	5128	255.93±1.482[a]	5128	116.80±4.412[d]

Herd Type Overall

*** significant (P<0.01), a-g: different in the same columns, BW: Birth weight, WBPS: Weight at the beginning grazing season, WEGS: Weight at the end of grazing season, DLWGBGS: Daily live weight gains up to the beginning of grazing season, DLWGEGS: Daily live weight gains up to the end of grazing season, DLWGDGS: Daily live weight gains during grazing season*

weights of lambs from sheep having white and pied wool at the beginning of grazing season yielded similar results, the same value for lambs from sheep having black wool was the highest at the beginning of grazing season with 28.22 ±0.083 kg. Regarding this property, the highest live weight value was determined in multiplyres elite herds (29.28±0.102 kg) and the lowest was obtained from elite herds (27.20±0.028 kg). Live weight at the beginning of grazing season was determined the highest in single born lambs with 27.42±01.042 kg.

Weight at the End of Grazing Season

While the overall average live weight at the end of grazing season (164.4 days) was determined as 39.27±0.187 kg, this value was found as 39.95±0.190 kg and 38.58±0.190 kg in males and ewes respectively. The average live weight at the end of pasture season in lambs born from sheep with white wool was found as 39.39±0.187 kg, which was higher than that of lambs born from sheep with black or pied colored wool. When the herd type is considered and the average weights at the end of grazing season are ranked in ascending order, the values are ranked as 37.96±0.143 kg in multiplyres elite, 39.14±0.094 kg in elite and 40.72±0.497 kg in base herds. The twin born lambs yielded the highest weight value (41.19±0.194 kg) at the end of grazing season. They were determined to have 2.94 kg and 2.78 kg more live weight gains than single and triplet born lambs respectively.

Daily Live Weight Gains

Daily Live Weight Gains up to the Beginning of Grazing Season

Average daily live weight gains in overall herds in sheep fold up to the beginning of grazing season was determined to be 266.38±1.311 g. It was 269.94±1.382 g and 262.81±1.385 g in males and females respectively; 269.90±1.307 g in lambs with white wool, 268.43±1.290 g in lambs with black wool and 260.80±2.054 g in pied colored lambs; 233.50±1.986 g, 311.4±1.572 g and 253.89±1.188 in elite, multiplyres elite and base herds respectively; 265.87±1.009 g, 253.89±2.189 g and 264.79±1.245 g in single, twin and triplet born lambs respectively; 226.97±1.626 g, 260.99±1.626 g, 254.01±1.549 g and 323.68±1.482 g in 2007, 2008, 2009 and 2010 respectively.

Daily Live Weight Gains up to the End of Grazing Season

Average daily live weight gains in the lambs up to the end of grazing season was determined to be 220.64±1.423 g. It was 225.22±1.442 g in males and 216.05±1.445 g in females; 222.19±1.420 g in white lambs, 220.76±1.418 g in black lambs and 218.95±1.661 g in pied colored lambs; 206.80±1.634 g, 240.71±1.477 g and 214.39±1.418 in elite, multiplyres elite and base herds respectively; 217.89±0.715 g, 213.25±1.089 g and 230.76±3.755 g in single, twin and triplet born lambs respectively; 205.14±1.525 g, 209.11±1.540 g, 212.35±1.455 g and 255.93±1.482 g in 2007, 2008, 2009 and 2010 respectively.

Daily Live Weight Gains During Grazing Season

Average daily live weight gains in the lambs during grazing season (70 day) was found to be 162.48±4.237 g. Male lambs had the highest live weight gains (170.16±4.292 g) in all herds during the time (94.4 days) the lambs grazed in pasture. It was 154.79±4.302 g in females. While the highest live weight gains in pasture during grazing time was in lambs born from sheep with white wool (165.80±4.226 g), the lowest gains during this period was in lambs born from sheep with black wool (158.73±4.222 g). In elite and base herds, this value was determined to be close to each other, whereas it was the lowest in multiplyres elite herds. While the average daily live weight gains in single born lambs during pasture period was 151.67±2.129 g, it was 157.11±3.243 g in twins and 178.65±11.177 g in triplets. The highest value regarding average daily live weight gains during grazing period was obtained in 2007 with 185.91±4.54 g and the lowest in 2010 with 116.80±4.41 g. The average daily live weight gains over years naturally yielded different values due to different pastures where the lambs grazed by years, different sheep herds, the difference in grazing times and changes in the quality of pastures.

Estimation of Heritability, Genetic and Environmental Correlations

When Table 3 is examined, it can be seen that the heritability degree regarding birth weight was low. The heritability degree for weight at the beginning of grazing season and

Table 3. Estimates of heritability, genetic and environmental correlation between investigation traits
Tablo 3. Üzerinde durulan parametrelere ait kalıtım derecesi, çevresel ve genotipik korelasyonları

h²	BW	WBGS	WEGS	DLWGBGS	DLWGEGS	DLWGDGS
BW	0.213±0.114	-0.688	-0.505	-0.405	-0.396	0.607
WBGS	-0.141	0.385±0.119	-0.685	-0.394	-0.308	0.457
WEGS	-0.183	0.585	0.411±0.144	-0.702	-0.898	-0.042
DLWGBGS	-0.237	0.691	0.555	0.402±0.136	-0.623	0.260
DLWGEGS	-0.274	0.532	0.845	0.824	0.418±0.143	-0.016
DLWGDGS	-0.044	-0.389	0.470	-0.175	0.347	0.420±0.066

weight at the end of grazing season increased with age. The largest value in the determined heritability degrees for daily live weight gains was estimated daily live weight gains during grazing season.

DISCUSSION

The birth weight calculated on this study for Hemşin sheep is less than the values reported by certain researchers for Morkaraman sheep [7,9,10,12], however the value is also higher than values reported [8,11]. As for the studies on Akkaraman sheep, birth weight is founded to be less than those reported [13-15]. The birth weight of multicolored Hemşin sheep were similar in case of sheep having white and black fleece whereas the multicolored ones had the highest values. The elite herds which are selected and more controlled herds had the highest value of birth weight with 3.96 kg whereas intermediate herds had the lowest value with 3.30 kg. As for the type of birth, single births had the highest birth weight whereas twin and triple births had lower and similar values. When reviewed in terms of years, the values were the same in 2007 and 2008 whereas the highest value was in 2010. The differences between age of dam, color, type of herd, type of birth and years were significant (P<0.01) in terms of birth weight.

The study concluded that grazing period of lambs started approximately when they are 94.4-day old, the live weight of lambs at the beginning of grazing (28.09±0.085 kg) was higher than the live weights of Morkaraman lambs determined at the beginning of grazing period and Kangal type Akkaraman lambs within 90-day period [10,11,16-21]. The live weight at the beginning of grazing was higher in lambs of multiplyres elite herds, in comparison to elite and base herds. This increase was a result of good care and feeding conditions offered at the locations of multiplyres elite herds. The live weight average of single-birth lambs at the beginning of grazing was 1.69 kg higher than twins and 0.66 kg higher than triplets. The triplets had live weight higher than the twins at the beginning of grazing because the triplets were born at one location and the breeder provided special care and feeding to those lambs. From 2007 until 2010, 2009 had the lowest live weight average at the beginning of grazing (22.7±0.1 kg) whereas the highest value was in 2010 (34.98±0.09 kg). The low value achieved in 2009 can be explained with animals suffering from Foot Disease which is caused by mud in the barns since there were heavy rains in that year. The yearly change of such weight can also be explained with different, improved conditions of care, feeding and barn offered each year at different locations. This study showed that the differences between age of dam, color, type of herd, type of birth and years were highly significant (P<0.01) in terms of live weight at the beginning of grazing.

The general average of after-grazing live weight, which is also considered as marketing weight at the region where Hemşin lambs are reared, was higher than general averages of after-grazing live weight determined for Morkaraman lambs by various researchers [9,10,12,16]. The after-grazing live weight average of base herds, which had the most number of lambs among other herd types, was higher than the values in elite and multiplyres elite herds. The lambs on base herd were directed to grazing since the pastures of the region had a wide range of flora and the area per animal was a lot and thus these lambs had a higher level of live weight increase. In this study, twin lambs had low live weight at the beginning of grazing but had higher after-grazing live weight averages since they highly benefited from grazing. If we review the average in terms of years, 2009 had the lowest value due to foot disease suffered that year. The differences between after-grazing weight averages were confirmed to be statistically very significant (P<0.01) in terms of sex, age of dam, color, type of herd, type of birth and years.

The daily live weight gain achieved as a result of the study for the period up to the beginning of grazing (266.238 g) and the daily live weight gain until the after-grazing period had higher values in comparison to daily live weight gain averages of Morkaraman breed calculated by [10,12] for the same period and daily live weight average of Kangal type Akkaraman breeds from birth until 90-day old. The ones having white fleece had the highest daily live weight gain in both categories whereas speckled Hemşin sheep had the lowest value. multiplyres elite had the highest value according to both herd types and in terms of such traits. When reviewed in terms of years, 2010 had the highest values in terms of both traits. Since the pastures used for grazing, herdsmen, periods of grazing and quality of pastures were different in all those years, naturally, daily live weight averages during grazing periods displayed differences. It is determined that factors having impact on the average of daily live weight gain at the beginning of grazing and until the after-grazing period were confirmed to be highly significant (P<0.01).

When we review the daily live weight gain averages during grazing period, the lambs that benefited the most from grazing were lambs having a dam at the age of 2, having white fleece, which were members of base herds and born in 2007 whereas the triplet lambs had the most benefit in terms of type of birth. The differences between daily live weight gain averages on grazing period were confirmed to be statistically very significant (P<0.01) in terms of sex, age of dam, color, type of herd, type of birth and years.

When the phenotypic correlations were reviewed, it was determined that there is a negative relationship between the birth weight and weight and daily live weight gain. A negative phenotypic correlation was determined between birth weight and daily live weight gain during grazing, in terms of weight at the beginning of grazing and positive phenotypic correlation was determined with other traits. The phenotypic correlation between birth weights and weights at the beginning of grazing was negative and there was a positive relationship with the daily live weight gains.

When we review estimations of phenotypic correlations of daily weight gains in various periods; daily live weight gain at the beginning of grazing was estimated to have a positive relationship only with after grazing live weight gains whereas the relationships with other traits were negative; after grazing live weight gain was estimated to have positive relationship only with grazing period whereas the relationships with other traits were estimated to be negative. It was estimated that daily live weight gain during grazing period have positive phenotypic correlation with birth weight, live weight at the beginning of grazing and after-grazing daily live weight gains whereas the relationship with other traits were negative.

In terms of only one of traits emphasized on this study, namely birth weight, it is confirmed to be lower than Akkaraman lambs and to be higher than Morkaraman, Akkaraman and Kangal type Karaman lambs, in terms of other traits emphasized.

Genetic parameters related on growth traits were estimated and a general evaluation of the figures calculated according to relevant studies on different breeds in Turkey were submitted. This study showed that Hemşin sheep according to growth traits is in a good place among the breeds mentioned above. Our research can serve as a good head start for the future studies aimed at protection of the breed in current conditions, improvement of genetic potential and breeding of Hemşin sheep which is a significant fraction of sheep presence in Turkey. Establishment and organization of related breeding animal breeder unions can be crucial to achieve these targets. Rearing breeding rams and sheep having superior breeding traits and providing breeders with these breeding animal must be first effort.

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