



Karasal İklim Şartlarına Adaptasyon Sürecindeki Bafra Kuzularda Büyüme ve Yaşama Gücü

Ömer Faruk GÜNGÖR^{1*}, Ceyhan ÖZBEYAZ², Necmettin ÜNAL², Halil AKÇAPINAR²

¹Department of Veterinary, Bolu Abant İzzet Baysal University, Mudurnu, Bolu 14800, Turkey, ^{2,3,4}Department of Animal Breeding and Husbandry, Ankara University Faculty of Veterinary Medicine, 06110, Ankara, Turkey

¹<https://orcid.org/0000-0002-7273-7242>, ²<https://orcid.org/0000-0002-3748-9992>, ³<https://orcid.org/0000-0001-5250-7063>,

⁴<https://orcid.org/0000-0002-9529-9441>

✉: gungoromerfaruk@ibu.edu.tr

ÖZET

Bu çalışma, karasal iklim koşullarında Bafra kuzularda yaşama gücü ve büyüme özelliklerinin incelenmesi amacıyla yapılmıştır. Araştırmada 179 baş Bafra kuzunun büyümenin çeşitli dönemlerinde yaşama gücü, büyüme özellikleri ve bazı vücut ölçüleri incelenmiştir. Büyüme ve vücut ölçülerinin analizinde En Küçük Kareler, yaşama gücünün analizinde Ki-Kare yöntemlerinden yararlanılmıştır. Kuzuların 30. ve 90. gün yaşama gücü sırasıyla %96.65 ve 90.50 olmuştur. Yaşama gücüne doğum tipi ve cinsiyetin etkisinin önemsiz ($P>0.05$) olduğu belirlenmiştir. Kuzuların doğum, 30., 60. ve 90. gün canlı ağırlıkları yönünden en küçük kareler ortalamaları sırasıyla 3.58 ± 0.541 , 8.10 ± 0.127 , 12.71 ± 0.223 ve 18.08 ± 0.326 kg olarak bulunmuştur. Kuzu canlı ağırlıklarına incelenen çevre faktörlerinden cinsiyetin etkisinin önemsiz ($P>0.05$), doğum tipinin etkisinin ise 60. güne kadar yüksek düzeyde önemli olduğu ($P= 0.000$), 60. günde ve sütten kesim döneminde (90. gün) ise tek doğanlarda canlı ağırlıklar rakamsal olarak yüksek olsa da doğum tipinin canlı ağırlığa etkisinin önemsiz ($P>0.05$) olduğu hesaplanmıştır. Kuzularda sütten kesim öncesi (ortalama 71. gün) cidago yüksekliği, göğüs derinliği, vücut uzunluğu, göğüs çevresi, incik çevresi ve kuyruk çevresi ölçüleri sırasıyla 47.86 ± 0.615 , 18.52 ± 0.246 , 45.68 ± 0.840 , 56.47 ± 0.881 , 6.50 ± 0.075 , ve 12.01 ± 0.502 cm olmuştur. İncelenen bu vücut ölçülerine doğum tipi ve cinsiyetin etkisi önemli ($P>0.05$) olmamıştır. Sonuç olarak karasal iklim koşullarında yetiştirilen Bafra kuzuların büyüme ve yaşama gücü özelliklerinin iyi düzeyde olduğu tespit edilmiştir.

Zootekni

Araştırma Makalesi

Makale Tarihi

Geliş Tarihi : 12.01.2022

Kabul Tarihi : 18.03.2022

Anahtar Kelimeler

Bafra Kuzu
Uyum Kabiliyeti
Büyüme
Yaşama Gücü
Step İklim Koşulları

The Growth and Survival of Bafra Lambs During Adaptation to Steppe Climate Conditions

ABSTRACT

This study investigates the survival and growth characteristics of Bafra lambs born and reared under steppe climate conditions. The survival, growth and certain body measurements of 179 head of Bafra lambs were observed. Least Squares Method was applied for the analysis of growth and body measurements, and Chi square test was used for the analysis of survival rates. The survival rates of the lambs on days 30 and 90 were 96.65% and 90.50%, respectively. Birth type and sex had no significant effect on survival rates ($P>0.05$). The live weights of the lambs on days birth, 30, 60 and 90th were 3.58 ± 0.541 , 8.10 ± 0.127 , 12.71 ± 0.223 and 18.08 ± 0.326 kg, respectively. Among the environmental factors affecting the live weights of the lambs, the effect of sex was not significant ($P>0.05$), while the effect of birth type was highly significant ($P=0.000$) up until day 60, but decreased thereafter. Furthermore, the effect of birth type on live weight was not significant ($P>0.05$) in single lambs on day 60 and 90th, even though the live weights were numerically high. The pre-weaning (average 71 day) withers height, chest depth, body length, chest girth, cannon bone circumference and tail circumference of the lambs were 47.86 ± 0.615 , 18.52 ± 0.246 , 45.68 ± 0.840 ; 56.47 ± 0.881 , 6.50 ± 0.075 , and 12.01 ± 0.502 cm,

Animal Science

Research Article

Article History

Received : 12.01.2022

Accepted : 18.03.2022

Keywords

Bafra Lamb
Adaptation Capability
Growth
Survival Rate
Steppe Climate Conditions

respectively. The effect of birth type and sex on these body measurements were not significant ($P>0.05$). It was concluded that the growth and survival characteristics of Bafra lambs reared under the steppe conditions were at a satisfactory level.

Atıf Şekli: Güngör, Ö. F., Özbeyaz, C., Ünal, N., Akçapınar, H. (2023). Karasal İklim Şartlarına Adaptasyon Sürecindeki Bafra Kuzularında Büyüme ve Yaşama Gücü. *KSÜ Tarım ve Doğa Derg* 26 (1), 218-225. <https://doi.org/10.18016/ksutarimdog.vi.1056506>

To Cite : Güngör, Ö. F., Özbeyaz, C., Ünal, N., Akçapınar, H (2023). The Growth and Survival of Bafra Lambs During Adaptation to Steppe Climate Conditions. *KSU J. Agric Nat* 26 (1), 218-225. <https://doi.org/10.18016/ksutarimdog.vi.1056506>

INTRODUCTION

There are sheep breeding in various parts of the world in terms of importance and the type of production. It is worthy of note, however, that the common purpose is meat production, and there have been many studies investigating approaches to increase fertility characteristics, given the importance for meat production. As a result of these improvement studies, the growth, development and fertility characteristics of sheep breeds have been improved in developed countries (Akçapınar, 2000; Ünal, 2002).

In Turkey, sheep breeding is a form of livestock husbandry that is generally practiced extensively with large flocks. Most of the sheep breeds that are reared are dual-purpose and their fertility characteristics and milk production are low (Akçapınar, 2000). As a result, many foreign breeds have been introduced to the country to improve the production characteristics of native breeds, and crossbreeding has been carried out to this end, although the popularity of the obtained genotypes, excluding the Turkish Merino, Anatolian Merino, Tahirova and Ramlıç breeds, has remained low among local breeders. According to 2019 data, Merino sheep and their crossbreeds account for only 8.2% of the total sheep population in Turkey (TURKSTAT, 2020). This has been attributed to the extensive nature of sheep breeding, in other words, their pasture-dependency – local breeds being well adapted to the conditions in the region in which they are reared – and the preferences of breeders. For this reason, it is necessary to determine the production characteristics of Bafra sheep in different parts of Turkey, being a crossbreed genotype (75% Chios and 25% Karayaka) that is gaining popularity among local breeders as a breed with high fertility and meat quality as well as high milk production.

The crossbreeding studies of the Bafra breed, conducted by the Ankara University Faculty of Veterinary Medicine Department of Animal Breeding and Husbandry in cooperation with the Ministry of Agriculture and Forestry, began in 1982 at the Samsun Karaköy SF (State Farm). These studies investigated the crossbreeding of Chios sheep, which are not suited to steppe conditions, with Karayaka sheep, and the resulting Bafra breed was registered

on behalf of the General Directorate of Agricultural Enterprises in 2010 (Akçapınar et al., 2002; Akçapınar & Ünal, 2011).

The vitality trait can be assessed in two periods, namely gestation and birth. The gestation period, as well as the period between birth and weaning, are important times when deaths affect the lambing and weaning rate, as the most important fertility criterion in breeding. The survival rate is the ratio of living lambs at a certain period to the number of lambs born alive (Akçapınar & Özbeyaz, 1999; Akçapınar, 2000).

Growth refers to the increase in the number of tissue cells and is investigated in two main periods – namely before and after birth. The process depends on genotype and continues until 2–3 years of age (Akçapınar, 1978; Akçapınar and Özbeyaz, 1999). Birth weight is an outcome of many factors during the gestation period, such as maternal age, maternal nutrition, genotype, birth type and sex, while growth after birth is greatly influenced by maternal milk production as well as the caring and feeding conditions (Akçapınar, 1978; Akçapınar & Özbeyaz, 1999; Akçapınar, 2000).

The Bafra genotype, known for its high milk production and fertility, was obtained under sea climate conditions. Studies of the breeding performance of Bafra ewes have been conducted in different regions, such as the Gökhöyük SF in the Amasya province (Ünal et al., 2003; Akçapınar et al., 2005), the Lalahan Livestock Research Centre (Ankara province) (Akçapınar et al., 2002), the Çubuk district of Ankara province by local farmers (Güngör & Akçapınar, 2013), the Kazım Karabekir SF in Iğdır province (Işık & Aksoy, 2015a; Işık & Aksoy, 2015b) and the village of Elmalı in Niğde province by local farmers (Yerlikaya & Ulutaş, 2019). Given the preference for the Bafra breed among breeders in different regions, it is necessary to investigate the performance of the breed in different regions. From this point of view, aim of this study was to determine the survival and growth characteristics of Bafra lambs reared under steppe climate conditions.

MATERIALS and METHOD

The farm located in 38° 29' N and 32° 27' E, 1020 m of altitude Konya province in the central Anatolia region

of Turkey and have steppe climate conditions.

Animals

The study was conducted under State Farm conditions in the Konya province with 500 Bafra sheep brought from the Central Black Sea region. Totally 380 ewes were exposed to rams, and 287 ewes have given birth in this season in this study. The survival and growth characteristics of 179 head of Bafra lambs born from 97 ewes (higher than 3 years old) in the second birth season on the state farm were examined. Body measurements were determined from 42 lambs.

Method

For per ewe, 1.5 kg roughage and 0.8 kg concentrate feed (16% CP and 2600 kcal kg⁻¹ ME) was given in the last 1.5 month of gestation. However, the ewes had multiple birth had an additional 0.4 kg concentrate feed after delivery. Birth weights were measured 10–18 hours after birth, and live weights controls have started around 15 days after the births started. Live weight gain and lamb mortalities were monitored at 30-day intervals, from the birth season until 180 days. Birth weights were determined using a 1 g precision scale. Other live weights were made at 30-days intervals, using a 50 g precision scale. The wither height, chest depth, body length, chest girth, cannon bone circumference, and tail's widest circumference of the lambs were measured at an average of 71 and 206 days old. The survival rate was the ratio of the number of living lambs on days 30 and 90 (weaning) to the number of lambs born alive. The live weights of the lambs on days 30, 60, 90 and 180 were determined using an interpolation method (Akçapınar et al., 2005).

First of all, it should be noted that sufficient care and feed were provided for the sheep giving birth to multiple lambs and their lambs during the birth season. For this reason, the number of people working on the farm has increased in this period. The lambs were kept with their mothers in individual pens for 1–2 days after birth and then they were included in the groups occurred newborn lambs and their dams. Multiple born lambs were provided bottle milk obtained from sheep high milk yield. In addition, some of these lambs were suckled from mothers giving birth to a dead lamb or mothers with high milk production. Lambs and their dams are kept in this group for 10–15 days were then taken out of these groups and included in larger groups. In this period, groups of lambs were joined with the groups of mothers every morning and evening, and the lambs were allowed to suckle their mothers twice a day. In these groups, the lambs started to consume high quality alfalfa hay and lamb starter feed (18% CP and 2800 kcal kg⁻¹ ME) ad libitum. The milking of the

sheep began on around day 45, and the lambs started being fed an average total of 500 g concentrated feed (16% CP 2500 and kcal kg⁻¹ ME) every morning and evening. The lambs began to be introduced to the pasture with their mothers after the start of milking, and the lambs were weaned on around day 90.

Statistical Analyses

The Least Squares Method was used for the comparison of the live weights and body measurements of the lambs and the effect of birth type and sex. A Chi square test was used to compare the survival rates of lambs. A Tukey's test was applied for the comparison of significance within more than two groups for the effect of birth type, which was investigated in four groups. SPSS software was used for the statistical analyses (SPSS Software 2005).

RESULTS and DISCUSSION

Bafra sheep were a crossbred 75% Chios and 25% Karayaka native sheep breeds, and known for their impressive high fertility, meat quality and milk production characteristics. The growing preference for the breed among breeders means it is highly important to determine the adaptation and production characteristics of the breed under Turkey's different climate and farm conditions.

Konya region, with its steppe climate, its Turkey's largest agricultural area, and is home to the largest proportion of livestock in the country. Accordingly, there is a need to assess the adaptation of the Bafra breed to steppe conditions as part of a larger study of its potential.

Lamb Survival Rates

Lamb survival was determined during the suckling period, and the rates based on birth type and sex are presented in Table 1. The effects of birth type and sex on survival in lambs were not significant, although the survival rate of female lambs was higher than for male lambs.

A comparison of the survival rates recorded in the present study with those of previous studies of Bafra lambs is presented in Figure 1.

In this study, the survival rate on day 30 (96.65%) was slightly lower than the rate found in 2005 at Gökhöyük SF (Akçapınar et al., 2005) and higher than the rates found in other studies involving the Bafra genotype (Figure 1). The average survival rate of lambs on day 90 was 90.50% in this study. This rate was slightly lower than the rates found during the same period in the two studies conducted at Gökhöyük SF (95.1% and 91.9%) (Ünal et al., 2003; Akçapınar et al., 2005) and the rate found on 140 days in Niğde province by local farmers (90.7%) (Yerlikaya & Ulutaş, 2019). It was, however, much

higher than the survival rates on day 90 found in the studies conducted in the Çubuk district of Ankara province, Kazım Karabekir SF and the Lalahan

Livestock Research Institute in Ankara province (Akçapınar et al., 2002; Güngör & Akçapınar, 2013; Işık & Aksoy, 2015b).

Table 1. Survival rates of the lambs

Çizelge 1. Kuzularda yaşama gücü

Item	Number of live lambs			Survival rate (%)	
	Birth	30 th day	90 th day	30 th day	90 th day
<i>Birth type</i>					
Single	29	28	25	96.55	86.21
Twin	108	105	99	97.22	91.67
Triplet	32	30	29	93.75	90.63
Quad	10	10	9	100.00	90.00
<i>P-Value</i>				0.732	0.850
<i>Sex</i>					
Female	77	76	72	98.70	93.51
Male	102	97	90	95.10	88.24
<i>P-Value</i>				0.18	0.234
Means	179	173	162	96.65	90.50

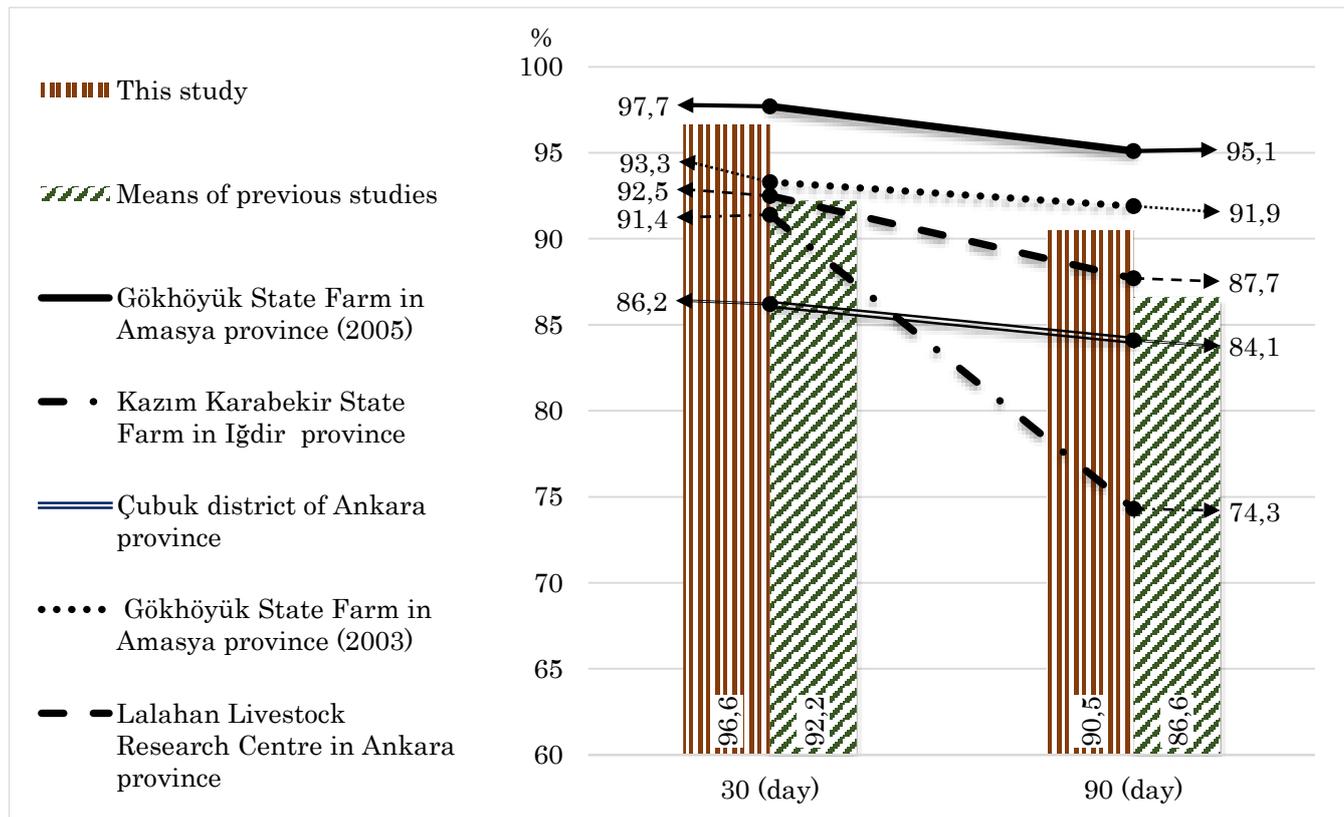


Figure1. Comparison of the survival rates recorded in the present study with those of previous studies (Akçapınar et al., 2002; Ünal et al., 2003; Akçapınar et al., 2005; Güngör & Akçapınar, 2013; Işık & Aksoy, 2015b)

Şekil 1. Bu çalışmada elde edilen yaşama gücü oranlarının daha önce yapılmış çalışmalarda elde edilen sonuçlarla karşılaştırılması (Akçapınar ve ark., 2002; Ünal ve ark., 2003; Akçapınar ve ark., 2005; Güngör & Akçapınar, 2013; Işık & Aksoy, 2015b)

The effect of birth type on survival rate was found to be insignificant. This result was in line with the results of studies conducted at Kazım Karabekir SF (Işık & Aksoy, 2015b) and the Lalahan Livestock

Research Institute in Ankara province (Akçapınar et al., 2002) but different from the results of other studies concerning the Bafra genotype. The fact that the effect of birth type on survival is insignificant can

be attributed to caring and feeding opportunities, such as being able to bottle feed twin lambs with milk obtained from sheep with high milk production or allowing twin lambs to suckle from mothers that have given birth to a dead lamb or mothers with high milk production. This is because the number of shepherds that work at the enterprise increases during the birth season. Usually, single-born lambs are expected to have a higher chance of survival. In this study, the survival rate of twin-born lambs on day 90 was not statistically significant, but higher than single-born lambs. This result was also noted in the study conducted in Niğde province with the Bafra lambs (Yerlikaya & Ulutaş, 2019). The reason for this is that the milking process begins at around day 45 in sheep (this will cause the milk intake of lambs to be lower) and it could be said that this is caused by the stress that occurs due to weaning in lambs (day 90). It can also be said that single-born lambs are more dependent on their mothers compared to twin-born lambs and are more affected by these situations.

The effect of sex on survival was found to be insignificant in this study. The survival rate on day 30 was found to be different in male lambs in one study and different in female lambs in the other, between two studies conducted at Gökhöyük SF (Ünal et al., 2003; Akçapınar et al., 2005), where both differences were statistically significant. Other than

these two studies, in other studies involving the Bafra lambs it was found that sex did not have a significant effect on survival in male lambs or female lambs. However, there are reports that the survival rate is higher for female lambs in general. The survival rate of female lambs was also high in this study but the difference between male lambs and female lambs in terms of survival was not significant.

Growth Traits of Lambs

Mean values regarding the birth and growth characteristics found in the study are given in Table 2. Effect of birth type on birth weight and live weights of lambs on day 30 was found to be highly significant ($P= 0.000$). However, this level of significance decreased on day 60 ($P= 0.059$) and differences between live weights in terms of birth type was found insignificant on day 90 ($P= 0.309$). The effect of sex on live weights is not significant. Even though male lambs have higher birth weights than female lambs, this difference is not considered statistically significant. The male lambs and female lambs had similar mean live weights on 30, 60 and 90 days.

A comparison of growth characteristic data recorded in the present study with those of studies of Bafra lambs conducted in different parts of Turkey is presented in Figure 2.

Table 2. Least Squares means (\pm SE) of the lamb live weights at different ages (kg)

Çizelge 2. Kuzu canlı ağırlıklarının farklı yaşlardaki en küçük kareler ortalamaları (\pm SE), (kg)

Item	Birth weight		30 th day		60 th day		90 th day		180 th day	
	n	$\bar{X}\pm S_{\bar{X}}$	n	$\bar{X}\pm S_{\bar{X}}$	n	$\bar{X}\pm S_{\bar{X}}$	n	$\bar{X}\pm S_{\bar{X}}$	n	$\bar{X}\pm S_{\bar{X}}$
<i>Birth type</i>										
Single	29	4.00 \pm 0.119 ^b	28	9.03 \pm 0.299 ^c	28	13.66 \pm 0.536 ^b	25	18.71 \pm 0.812	17	23.20 \pm 0.972
Twin	108	3.65 \pm 0.062 ^b	105	8.08 \pm 0.156 ^{bc}	104	12.60 \pm 0.282 ^{ab}	99	17.78 \pm 0.410	52	21.78 \pm 0.531
Triplet	32	3.09 \pm 0.115 ^a	30	7.54 \pm 0.291 ^{ab}	30	12.38 \pm 0.523 ^{ab}	29	18.44 \pm 0.760	13	21.45 \pm 1.065
Quad	10	2.86 \pm 0.206 ^a	10	6.87 \pm 0.511 ^a	9	10.81 \pm 0.952 ^a	9	15.96 \pm 1.352	6	21.97 \pm 1.563
<i>P-Value</i>		0.000		0.000		0.059		0.309		0.581
<i>Sex</i>										
Female	77	3.29 \pm 0.104	76	7.83 \pm 0.257	75	12.40 \pm 0.460	72	17.50 \pm 0.660	46	21.23 \pm 0.760
Male	102	3.51 \pm 0.088	97	7.94 \pm 0.222	96	12.33 \pm 0.418	90	17.95 \pm 0.611	42	22.87 \pm 0.790
<i>P-Value</i>		0.100		0.737		0.912		0.616		0.196
Means	179	3.58 \pm 0.541	173	8.10 \pm 0.127	171	12.71 \pm 0.223	162	18.08 \pm 0.326	88	22.07 \pm 0.548

The average birth weight (3.58 kg) of the lambs in the present study was slightly lower than birth weight reported in the two studies conducted at Gökhöyük SF (3.9 and 3.7 kg) (Ünal et al., 2003; Akçapınar et al., 2005), and slightly higher than those reported in the studies at Kazım Karabekir SF (3.2 kg) (Işık & Aksoy, 2015a), the Lalahan Livestock Research Institute in Ankara province (3.3 kg) (Akçapınar et al., 2002), the Çubuk district of Ankara province (3.2 kg) (Güngör & Akçapınar, 2013) and the village of Elmalı in Niğde province (3.2 kg) (Yerlikaya & Ulutaş, 2019).

The effect of birth type on the birth weight of the lambs was found to be highly significant ($P= 0.000$), while the effect of sex on birth weight was found to be statistically insignificant, although male lambs had higher birth weights than female lambs. This was an expected result and concurred with the results of other studies of the Bafra lambs.

The effect of birth weight on live weight until day 60 was highly significant ($P= 0.000$), while the level of significance decreased on day 60 ($P= 0.059$) and the effect of birth type on live weight became insignificant on day 90. Milking began in the enterprise

approximately 45 days after birth, and at this time the lambs were introduced to the pasture with their mothers after milking. It can be said that this has a greater impact on the single-born lambs, in that a

higher mortality was recorded between days 30 and 90 in single-born lambs when the survival rates on days 30 and 90 were assessed according to birth type.

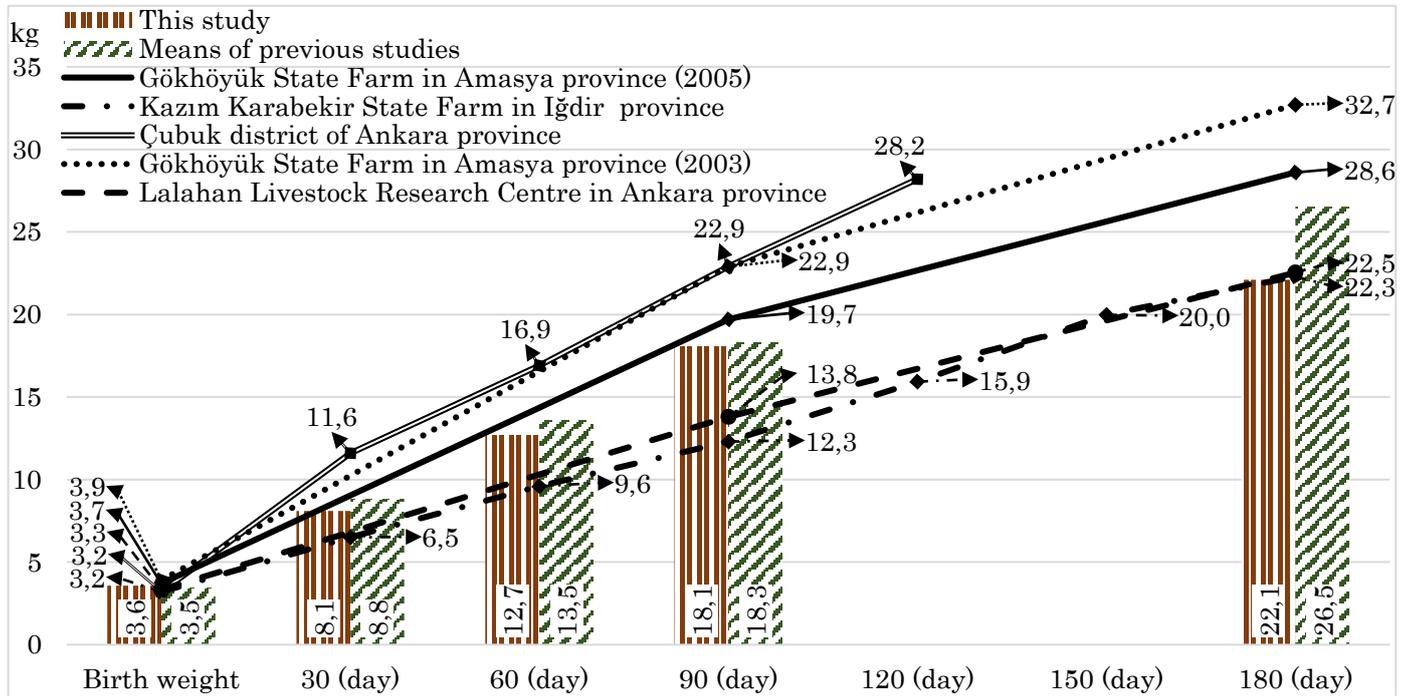


Figure 2. Comparison of the growth traits found in this study with previous studies (Akçapınar et al., 2002; Ünal et al., 2003; Akçapınar et al., 2005; Güngör & Akçapınar, 2013; Işık & Aksoy, 2015a)

Şekil 2. Bu çalışmada elde edilen büyüme özelliklerinin daha önce yapılmış çalışmalarda elde edilen sonuçlarla karşılaştırılması (Akçapınar ve ark., 2002; Ünal ve ark., 2003; Akçapınar ve ark., 2005; Güngör & Akçapınar, 2013; Işık & Aksoy, 2015a).

The average live weights (18.71 kg) on the weaning (day 90) of the lambs in the present study was slightly lower than those reported in the two studies conducted at Gökhöyük SF, and in the study in the Çubuk district of Ankara province (22.9, 19.7 and 22.9 kg, respectively) (Akçapınar et al., 2002; Ünal et al., 2003; Güngör & Akçapınar, 2013), and higher than the results recorded in the studies at the Kazım Karabekir SF (12.3 kg) and the Lalahan Livestock Research Institute (13.8 kg) (Akçapınar et al., 2002; Işık & Aksoy, 2015a).

When the average live weights of the lambs was assessed on day 180, 22.07 kg recorded in the present study was lower than that found during the same period in the two studies conducted at Gökhöyük SF (32.7 and 28.6 kg) (Ünal et al., 2003; Akçapınar et al., 2005) and the value recorded on day 150 of the study in the Çubuk district of Ankara (28.2) (Güngör & Akçapınar, 2013), but similar to the values recorded in the studies at Kazım Karabekir SF (22.3 kg) (Işık, 2015) and the Lalahan Livestock Research Institute in Ankara province (22.5 kg) (Akçapınar et al., 2002). Lamb growth up to day 90 was slightly lower than, or similar to the results of the two studies at Gökhöyük SF (Ünal et al., 2003; Akçapınar et al., 2005), but

lower on day 180, which could be attributed to the fact that the pastures of the farm were not as high quality as those of the Gökhöyük SF.

Body Measurements of Lambs

The mean values of various body measurements determined in different growth periods according to birth type and sex are presented in Table 3. The effects of birth type and sex on body measurements were not found to be significant.

On around day 71, the wither heights and body lengths of the lambs were 47.86 and 45.68 cm. The Bafra lambs' values on 90 days in the studies of the Lalahan Livestock Central Research Institute in Ankara province (48.90 and 49.52 cm) (Akçapınar et al., 2002) and in the Kazım Karabekir SF (46.61 and 48.44 cm) (Işık & Aksoy 2015a) were similar to those in the present study, but lower than the values found in the study conducted in the Çubuk district of Ankara province (55.08 and 56.68 cm) (Güngör & Akçapınar, 2013). This was anticipated taking into consideration the age when the body lengths were determined and the live weights reported in the studies, as the results in the present study were recorded on around 71 days ages.

Table 3. The least square means (\pm SE) of the lamb body measurements at different ages (cm)
Çizelge 3. Kuzu vücut ölçülerinin farklı yaşlardaki en küçük kareler ortalamaları (\pm SE), (cm)

Age (day)		Mean: 71.24 \pm 1.117		Minimum: 56		Maximum: 82		Range: 26	
		Wither height		Chest depth		Body length		Chest girth	
Item	n	$\bar{X}\pm S\bar{x}$	$\bar{X}\pm S\bar{x}$	$\bar{X}\pm S\bar{x}$	$\bar{X}\pm S\bar{x}$	$\bar{X}\pm S\bar{x}$	$\bar{X}\pm S\bar{x}$	Cannon bone circumference	The widest circumference of tail
<i>Birth type</i>									
Single	11	48.63 \pm 1.248	18.00 \pm 0.499	46.00 \pm 1.706	55.46 \pm 1.787	6.46 \pm 0.152	12.18 \pm 1.020		
Twin	17	47.59 \pm 0.936	18.77 \pm 0.374	45.18 \pm 1.279	56.21 \pm 1.340	6.56 \pm 0.114	11.59 \pm 0.764		
Triplet+	14	46.43 \pm 0.986	18.36 \pm 0.394	43.64 \pm 1.347	55.50 \pm 1.411	6.43 \pm 0.120	11.36 \pm 0.805		
<i>P-Value</i>		0.222	0.711	0.163	0.626	0.768	0.461		
<i>Sex</i>									
Female	21	47.05 \pm 0.926	18.62 \pm 0.370	45.14 \pm 1.265	56.98 \pm 1.325	6.62 \pm 0.113	12.00 \pm 0.756		
Male	21	47.91 \pm 0.810	18.24 \pm 0.324	44.62 \pm 1.107	54.57 \pm 1.160	6.36 \pm 0.099	11.33 \pm 0.662		
<i>P-Value</i>		0.861	0.385	0.281	0.057	0.079	0.215		
Means	42	47.86 \pm 0.615	18.52 \pm 0.246	45.68 \pm 0.840	56.47 \pm 0.881	6.50 \pm 0.075	12.01 \pm 0.502		
<hr/>									
Age (day)		Mean: 206.45 \pm 1.737		Minimum: 177		Maximum: 219		Range: 42	
		Wither height		Chest depth		Body length		Chest girth	
Item	n	$\bar{X}\pm S\bar{x}$	$\bar{X}\pm S\bar{x}$	$\bar{X}\pm S\bar{x}$	$\bar{X}\pm S\bar{x}$	$\bar{X}\pm S\bar{x}$	$\bar{X}\pm S\bar{x}$	Cannon bone circumference	The widest circumference of tail
<i>Birth type</i>									
Single	9	52.89 \pm 1.124	23.22 \pm 0.473	56.00 \pm 1.457	68.56 \pm 1.665	6.61 \pm 0.144	13.06 \pm 0.942		
Twin	11	51.73 \pm 1.309	22.18 \pm 0.551	53.27 \pm 1.697	68.64 \pm 1.941	6.73 \pm 0.168	12.82 \pm 1.098		
Triplet+	9	51.56 \pm 1.124	22.89 \pm 0.473	54.67 \pm 1.457	68.22 \pm 1.665	6.44 \pm 0.144	12.33 \pm 0.942		
<i>P-Value</i>		0.701	0.424	0.723	0.900	0.265	0.599		
<i>Sex</i>									
Female	18	51.83 \pm 0.836	22.72 \pm 0.352	54.17 \pm 1.084	69.00 \pm 1.240	6.58 \pm 0.107	12.86 \pm 0.701		
Male	11	52.36 \pm 1.088	22.73 \pm 0.458	55.18 \pm 1.411	67.64 \pm 1.613	6.64 \pm 0.139	12.55 \pm 0.913		
<i>P-Value</i>		0.763	0.644	0.733	0.580	0.447	0.930		
Means	29	52.24 \pm 0.686	22.82 \pm 0.289	55.06 \pm 0.890	68.80 \pm 1.017	6.64 \pm 0.088	13.00 \pm 0.575		

The mean wither height and body length of the lambs at around 206 days were 52.24 and 55.06 cm, respectively, which are lower than those of found at the Lalahan Livestock Central Research Institute in Ankara province (Akçapınar et al., 2002) (56.21 and 58.06 cm) and the Kazım Karabekir SF (Işık & Aksoy, 2015a) (54.04 cm and 57.89 cm) on day 180. The chest depth (18.52 cm and 22.82 cm) and chest girth (56.47 cm and 68.80 cm) measurements recorded on around days 71 and 206 of the study were in line with the chest depths (19.11 cm and 23.45 cm) and chest girths (55.28 cm and 68.75 cm) recorded on days 90 and 180 of the study conducted at the Kazım Karabekir SF (Işık & Aksoy, 2015a).

CONCLUSION

It can be concluded that the survival characteristics of Bafra lambs residing in steppe conditions are at an acceptable level, while their growth characteristics are at a satisfactory level. However, growth and development characteristics of lambs of Bafra

crossbred genotype should be investigated under different farm conditions and with different breeds.

ACKNOWLEDGMENTS

The authors wish to thank the General Directorate of Agricultural Enterprises, Republic of Turkey Ministry of Agriculture and Forestry, and Yüksel Akçay, the manager of the Gozlu Agricultural Enterprise.

Author's contributions

The contributions of the authors are equal.

Conflict of interest

The authors declare no conflict of interest.

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