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ARAŞTIRMA MAKALESİ

Growth Performance from Birth to 24 Months of Age in Calves of Three Breeds Raised at Lalahan Livestock Research Institute

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Abstract

In this study, it was aimed to determine some growth traits from birth to 24 months of age in Holstein Friesian (HF), Simmental (SIM) and Brown-Swiss (BS) calves raised in Lalahan Livestock Research Institute. For this purpose, live weights (LW) and chest girth (CG) measurements of 88 calves born between 2018 and 2020 were regularly measured at 3-month intervals. Birth weight (BW) and CG general mean values were found to be 40.43 kg and 75.05 cm, the effect of birth year and dam weight were significant (P<0.05). While the BW of the calves was generally found as 6.31% of the LW of dam, the effect of sex and dam weight was significant (P<0.05). In the analysis of growth traits after birth, the effect of breed was examined in all periods, the effect of sex in the period between 3-12 months and the pregnant status of the animal between 18-24 months. The LW in these periods were 101.3, 169.6, 264.3, 347.1, 408.5, 478.3, 547.5 and 629.8 kg, respectively, the effect of breed was significant in all periods, and the effect of sex was significant at 9 and 12 months. The CG values were determined as 104.8, 128.3, 145.2, 161.7, 173.6, 186.2, 196.6 and 207.5 cm, respectively, breed differences were significant in all periods and sex differences were insignificant in all periods. The effect of whether the animal is pregnant or not at 18, 21 and 24 months was found to be insignificant in growth characteristics examined. As a result, the growth traits obtained in this study with culture breeds were found to be higher than the literature, and it was concluded that body weights could be estimated high rate with chest girth measurements.

Lalahan Hayvancılık Araştırma Enstitüsünde Yetiştirilen Üç Farklı Irk Buzağılarda Doğumdan 24 Aylık Yaşa Kadar Büyüme Performansı

Özet

Bu çalışmada, Lalahan Hayvancılık Araştırma Enstitüsü'nde yetiştirilen Siyah Alaca (SA), Simental (SİM) ve Esmer (Esm) ırkı buzağılarda doğumdan 24 aylık yaşa kadar bazı büyüme değerlerinin belirlenmesi amaçlanmıştır. Bu amaçla 2018–2020 yılları arasında doğan 88 buzağının 3'er aylık periyotlarla canlı ağırlıkları (CA) ve göğüs çevresi (GÇ) ölçümleri düzenli olarak yapılmıştır. Doğum ağırlığı (DA) ve GÇ değerleri genel olarak 40.43 kg ve 75.05 cm olarak bulunmuş olup, bu değerlere yılın ve ana ağırlığının etkisi önemli (P<0.05) bulunmuştur. Buzağıların DA'sı analarının canlı ağırlıklarının % 6.31'i olarak bulunurken, bu değer üzerinde cinsiyetin ve ana ağırlığının etkisi önemli (P<0.05) bulunmuştur. Doğumdan sonraki büyüme özelliklerinin incelenmesinde ırkın etkisi tüm dönemlerde, cinsiyetin etkisi 3-12 ay arası dönemde ve hayvanın gebelik durumu 18-24 ay arası dönemde incelenmiştir. Bu dönemlerde CA'lar sırasıyla 101.3, 169.6, 264.3, 347.1, 408.5, 478.3, 547.5 ve 629.8 kg olarak bulunurken, ırkın etkisi tüm dönemlerde önemli, cinsiyetin etkisi 9 ve 12 ayda önemli bulunmuştur. GÇ değerleri, sırasıyla 104.8, 128.3, 145.2, 161.7, 173.6, 186.2, 196.6 ve 207.5 cm olarak belirlenirken, ırk farklılıkları tüm dönemlerde önemli, cinsiyet farklılıkları tüm dönemlerde önemsiz bulunmuştur. 18, 21 ve 24 ay dönemlerinde hayvanın gebe olup olmamasının etkisi, incelenen büyüme özelliklerinde önemsiz olarak bulunmuştur. Sonuç olarak, kültür ırkları ile yapılan bu çalışmada elde edilen büyüme değerleri literatüre göre daha yüksek bulunmuş olup, göğüs çevresi ölçüleri ile canlı ağırlıkların yüksek oranda tahmin edilebileceği sonucuna varılmıştır.

Introduction

The cattle presence in Turkey has been on the rise in recent years, and this figure has reached 18 million by 2022 (TUIK, 2022). While nearly half of Turkey's cattle population consists of culture breeds, nearly half of the others are culture crossbreeds. It is important to know the growth traits in order to increase the yields per animal in Turkey, which is in good condition in terms of cattle. In order to prevent calf losses in farming, calves must show growth and development in accordance with their breed (Bayrıl and Yılmaz, 2010). In addition, animals that do not reach the breeding age in the herd, do not become pregnant or calve, cause significant economic losses in the farms (Sakar et al., 2022). The general growth and development of animals can be followed, and conditions such as sexual maturity age, reproductive age and appropriate slaughter age can be easily estimated. Especially, breeders interested in Estimated Breeding Values of live weight for the sustainability of the farm, should keep records of the birth and other weights (Aytekin et al., 2019).

Various studies were conducted to determine the birth weight and some growth traits of Holstein-Friesian, Simmental and Brown-Swiss breeds bred in various regions in Turkey (Akbulut et al., 1998; Yanar et al., 2004; Koçak and Güneş, 2005; Koçak et al., 2008; Bayrıl and Yılmaz, 2010; Hızlı et al., 2017; Aytekin et al., 2019). Aytekin et al. (2019) found the birth weight (BW) and weaning weight (WW) of the Holstein Friesian (HF) breed to be 34.99 kg and 74.25 kg, respectively. In that study they reported significant the effect of calving season, birth type, sex and age of dam on BW, and the effect of calving year, birth type and sex on WW ($P<0.05$). Hızlı et al. (2017) found the BW, WW (75 days) and 6-months weight in HF as 42.24 kg, 79.10 kg and 145.90 kg, respectively. They determined the effect of sex in the first 2 periods, the effect of the season in the last 2 periods, and the effect of birth year and dam age in 3 periods as significant ($P<0.01$). Koçak et al. (2008) found the BW value in HF, Brown-Swiss (BS) and Simmental (SIM) calves as 38.75 kg, 39.30 kg and 39.54 kg, respectively, and found the effect of year, sex and dam age on BW values as significant ($P<0.01$). Yanar et al. (2004) found the BW and 6-months weight in BS as 38.4 kg and 139.4 kg, respectively, they found the effect of sex to be significant ($P<0.05$) in BW and insignificant in the other periods. It is important to carry out up-to-date studies that reveal the growth, development and characteristic features of these culture breeds, which are very common in Turkey. Thus, an idea about the genetic and environmental characterization of animals over the years can be obtained and contribution to the development of selection indexes can be made.

This study was conducted to determine some growth traits between birth and 24 months of age by examining the effects of environmental factors in Holstein Friesian, Simmental and Brown-Swiss calves born at Lalahan Livestock Research Institute between 2018 and 2020.

Material and Methods

Animal material

The research was conducted at "International Center for Livestock Research and Training" (39°97′ N, 33°10′ E; elevation 826 m) located in Ankara Province of Turkey. The study was carried out on 88 calves from HF, SIM and BS born between 2018 and 2020. Figure 1 shows the compartments in which calves are housed from birth to 24 months of age.

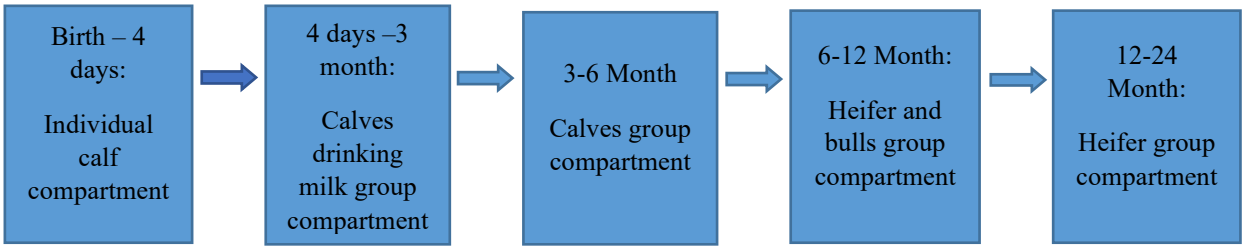

Figure 1. Animals compartments according to age

Data set

In the study, live weights (LW) and chest girths (CG) measurements of calves were taken at birth, 3, 6, 9, 12, 15, 18, 21 and 24 months. Birth period measurements were measured within the first 24 hours, while other measurements were measured within ±3 days. Later, these measurements were corrected by the interpolation method. LW values were determined by weighing them with precision scales up to 200 g (YH-T7+E weighing). CG values were taken by tape measure. Data set of calves are presented in Table 1. LW and CG values at birth and at 3, 6, 9, 12, 15, 18, 21 and 24 months were shown as BW, MW3, MW6, MW9, MW12, MW15, MW18, MW21 and MW24 with BCG, CG3, CG6, CG9, CG12, CG15, CG18, CG21 and CG24 respectively. Then, between the specified periods, average daily weight gain (ADG) values were determined by means of linear statistics. ADG values are shown as ADG3 (birth-3 month), ADG6 (3-6 month), ADG9 (6-9 month), ADG12 (9-12 month), ADG15 (12-15 month), ADG18 (15-18 month), ADG21 (18-21 month) and ADG24 (21-24 month).

Statistical analyses

First, the distributions of the traits were examined, and outliers were excluded from the study. Then, the data were analysed using the Linear Model procedures of the Minitab statistical package program (Minitab, 2016). Breed, sex, year of birth, season of birth, parity, gestation length, dam weight and pregnancy status were added to the model as environmental factors which affect the values of the animals in the periods examined. Differences between more than two subgroups that were found to be statistically significant were analysed with the "Tukey Multiple Comparison" test. The Correlation coefficients between traits, for all periods were determined with using “Minitab - Basic Statistics” section. Linear regression model was used to estimate of LW from CG values.

Table 1. Descriptive statistics of body weight in different ages in cattle

Statistics	BW	MW3	MW6	MW9	MW12	MW15	MW18	MW21	MW24
N	88	75	58	49	46	38	38	38	35
N – Female	42	40	39	38	38	38	38	38	35
N - Male	46	35	19	11	8	0	0	0	0
N – Holstein Friesian	32	31	23	20	18	15	15	15	14
N - Simmental	28	22	16	12	11	8	8	8	8
N – Brown-Swiss	28	22	19	17	17	15	15	15	13
Minimum (kg)	25.0	62.0	96.0	150.0	190.0	281.0	342.0	366.0	455.0
Maximum (kg)	52.0	125.0	231.0	360.0	447.0	509.0	598.0	680.0	758.0
CV (%)	13.62	12.50	17.97	19.17	15.82	14.28	14.12	14.23	10.99

Notes: BW=birth weight, MW3=3 months weight, ….. MW24=24 months weight, CV: Coefficient of variation

The statistical model used in the BW, BCG, Dam Weight at Birth and Birth Weight - Dam Weight (%) values of calves is given below:

$Y_{ijklmnop}= \mu + a_i + b_j + c_k + d_l + f_m + g_n + h_o + e_{ijklmnop}$

The symbols in the formula;

μ: overall mean,

a_i: i. the effect of the breed (1=BS, 2=HF, 3=SIM);

b_j: j. the effect of the sex (1=female, 2= male);

c_k: k. the effect of the birth year (1=2018, 2=2019, 3=2020);

d_l: l. the effect of the birth season (1=spring, 2= summer, 3=autumn, 4=winter);

f_m: m. the effect of parity (1, 2, 3, 4, 5);

g_n: n. the effect of gestation length (1=less than 275 days, 2=276-284 days, 3=more than 285 days);

h_o: o. the effect of dam weight (1=less than 599 kg, 2=600-699 kg, 3=more than 700); (This factor was removed from the model in the calculation of Dam Weight at Birth and Birth Weight - Dam Weight (%) values.)

$e_{ijklmnop}$: random error.

The statistical model used in the LW, CG and ADG values of calves between 3-24 animals is given below. Sex was removed from the model after 15 months, while pregnancy status was added to the model from 18 months.

$Y_{ijkl}= \mu + a_i + b_j + c_k + e_{ijkl}$

The symbols in the formula;

μ: overall mean,

a_i: i. the effect of the breed (1= BS, 2=HF, 3=SIM);

b_j: j. the effect of the sex (1=female, 2= male);

c_k: k. the effect of pregnancy status (1=not pregnant, 2=1-3 months pregnant, 3=4-6 months pregnant, 4=7-9 months pregnant); (The effect: 1 and 2 at 18 months; 1, 2 and 3 at 21 months; 1, 2, 3 and 4 at 24 months);

e_{ijkl}: random error.

Results and Discussion

Values at birth period

In the study, the change of BW and CG values of calves according to environmental factors is presented in Table 2. While the birth weight and chest girth mean were found to be 40.43 kg and 75.05 cm, the effect of year and dam weight on these values was significant ($P<0.05$).

In various studies, while calf birth weight was between 38-46 kg in HF breed (Hızlı et al., 2017; Bayrıl and Yılmaz, 2010), it was found between 36-41 kg in BS breed (Yanar et al., 2004; Akbulut et al., 1998). Koçak et al. (2008) these values found between 38-39 kg in HF, SIM and BS. The calf birth weight values found in the study were generally compatible with the literature reports.

In the study, it was determined that the birth weight of the calves generally corresponded to 6.34% of the live weight of their mothers (Table 2). In the research, although the mothers of male calves have a lower in “Dam Weight at Birth” than females, “Dam Weight - Birth Weight Percentage” was found to be higher in male calves as 6.63% than in females ($P=0.010$). This difference may be due to the higher birth weight of male calves. As the parity (age) of the cows increased, in “Dam Weight at Birth” was determined to be higher, while “Dam Weight - Birth Weight Percentage” was found the opposite relationship, and these rates were found to be higher in the 1st and 2nd parity cows than the others ($P=0.010$). This may be due to the fact that young dams have not yet completed their development and have a lower body weight than older dams. The effects of breed, year, season and gestation on Dam Weight - Birth Weight Percentage (%) values were found to be also insignificant. Generally, as the percentage

rate decreases in these values, it can be said that the mother cannot provide the necessary care and feeding to the calf before birth.

Growth traits between 3-24 months

In the study, the overall mean of LW, CG and ADG values according to breed, sex and pregnancy status between 3-24 months are presented in Table 3. Insemination of the heifers in the farm started at the age of about 15 months. For this reason, in addition to the breed, the pregnancy status of the animal was added to the calculation of the 18, 21 and 24 month values. In these periods, in the examinations made, whether there was pregnancy in animals or not had an insignificant effect on all values.

Table 2. The least squares mean and standard errors of LW, CG, dam's weight values and percentage of dam-calf weight at birth

Character	Group	Birth Weight	Chest Girth	Dam Weight	Dam Weight - Birth Weight Percentage (%)
Overall mean		40.43±0.715	75.05±0.566	657.6±9.592	6.34±0.126
Breed	BS	39.90±1.165	74.40±0.920	621.7±16.39^{b}	6.45±0.206
	HF	41.31±1.283	76.05±1.026	680.9±17.89^{a}	6.33±0.232
	SIM	40.09±1.201	74.71±0.968	670.2±16.41^{a}	6.24±0.213
	P Value	*NS*	*NS*	***0.031***	*NS*
Sex	Female	39.30±1.009	74.72±0.806	670.7±14.00	6.04±0.182^{b}
	Male	41.56±0.885	75.38±0.707	644.4±12.03	6.63±0.152^{a}
	P Value	*NS*	*NS*	*NS*	***0.010***
Year	2018	40.53±0.998^{ab}	75.74±0.798^{a}	652.5±13.44	6.41±0.172
	2019	38.33±1.200^{b}	72.03±0.952^{b}	643.6±16.50	6.14±0.212
	2020	42.43±1.068^{a}	77.39±0.866^{a}	676.6±15.30	6.47±0.198
	P Value	***0.029***	***0.001***	*NS*	*NS*
Season	Spring	40.72±1.549	76.81±1.240	666.1±22.49	6.36±0.281
	Summer	41.01±1.981	74.30±0.795	660.4±13.92	6.36±0.178
	Autumn	39.81±1.317	74.80±1.043	656.0±18.24	6.22±0.240
	Winter	40.18±1.102	74.31±0.886	647.8±15.63	6.41±0.198
	P Value	*NS*	*NS*	*NS*	*NS*
Parity	1	41.58±1.107	75.77±0.893	602.1±15.28^{c}	6.95±0.184^{a}
	2	41.02±1.217	76.76±0.985	652.8±17.73^{b}	6.52±0.224^{ab}
	3	38.94±1.361	73.72±1.097	673.1±18.71^{ab}	5.91±0.244^{c}
	4	40.85±1.854	75.83±1.476	672.3±25.95^{ab}	6.25±0.341^{b}
	5	39.77±1.812	74.19±1.459	687.4±24.59^{a}	6.07±0.328^{b}
	P Value	*NS*	*NS*	***0.011***	***0.010***
Gestation	≤275	38.43±1.546	73.29±1.224	622.8±21.05	6.28±0.267
	276-284	41.63±0.861	76.16±0.691	676.1±12.55	6.34±0.161
	285≤	41.24±1.262	75.71±1.010	673.8±17.50	6.39±0.224
	P Value	*NS*	*NS*	*NS*	*NS*
Dam Weight Group	Less	37.64±1.283^{b}	73.37±1.005^{b}	-	-
	600-699	41.54±0.900^{a}	76.56±0.724^{a}	-	-
	More	42.11±1.193^{a}	75.23±0.959^{ab}	-	-
	P Value	***0.018***	***0.031***	-	-
R^2		13.64	25.23	17.18	7.43

NS: nonsignificant.

Table 3. The overall mean of LW, CG and ADG values in period between 3-24 months and their P values

Character	Factor	3MW	6MW	9MW	12MW	15MW	18MW	21MW	24MW
LW	Overall	101.3± 1.19	169.6± 3.52	264.3± 6.21	347.1± 8.412	408.5± 6.81	478.3± 9.17	547.5± 10.97	629.8± 10.25
	Breed	*0.001*	*0.001*	*0.001*	*0.020*	*0.001*	*0.001*	*0.001*	*0.001*
	Sex	*NS*	*NS*	*0.002*	*0.013*	-	-	-	-
	Pregn.	-	-	-	-	-	*NS*	*NS*	*NS*
CG	Overall	104.8± 0.62	128.3± 1.46	145.2± 1.66	161.7± 1.53	173.6± 1.24	186.2± 2.06	196.6± 1.81	207.5± 1.86
	Breed	*0.001*	*0.011*	*0.004*	*0.001*	*0.001*	*0.002*	*0.001*	*0.001*
	Sex	*NS*	*NS*	*NS*	*NS*	-	-	-	-
	Pregn.	-	-	-	-	-	*NS*	*NS*	*NS*
ADG	Overall	662.6± 10.21	792.0± 28.85	1072.6± 41.32	1026.8± 56.07	995.0± 39.92	833.2± 43.14	770.8± 46.27	847.3± 59.86
	Breed	*0.001*	*0.028*	*NS*	*NS*	*0.001*	*0.037*	*NS*	*NS*
	Sex	*NS*	*NS*	*0.001*	*NS*	-	-	-	-
	Pregn.	-	-	-	-	-	*NS*	*NS*	*NS*

NS: nonsignificant.

Live weight values

In the study, the growth traits of the animals between 0-24 months according to breeds and sex are presented in Figures 2 and 3. When Figure 2 is examined, it is seen that HFs have the highest weight up to the age of 9 months, while the SIM breed has the highest values from the age of 9 months. The BS breed was found to be the lowest in all periods. Differences in LW values between breeds were found to be significant in all periods (Table 3). These values have been reported between in 3rd and 6th 84-95 kg and 160-175 kg (Koçak and Güneş, 2005); 65.2 - 176.4 kg at the age of 2-6 months (Bayrıl and Yılmaz, 2010) and 79.10 - 145.90 kg at the age of 2.5-6 months (Hızlı et al., 2017), in the HF breed. In another study conducted with the HF breed, LW values between 3-24 months were reported as 96.52, 113.68, 142.28, 165.16, 247.0, 232.7, 226.98 and 287.04 kg in 3-month periods, respectively (Mekparyup et al., 2013). While LW values were reported as 110, 203 and 296 kg at the ages of 6-12-18 months in the BS breed (Akbulut et al., 1998), in another study it was reported between 136-143 kg at the age of 6 months (Yanar et al., 2004).

LW values were generally found to be higher than the literature data, and these findings are thought to be an indication of better care and feeding for calves and breeding candidate heifers.

When Figure 3 is examined, while the LW values of male and female animals were close to each other until 6 months of age, the values of male animals began to increase considerable from 6 months of age. These differences were found to be insignificant at 3 and 6 months and significant at 9 and 12 months (Table 3). When the literature data were examined, the differences between the sexes were found to be insignificant in the HF and BS breeds at weaning and 6 months of age (Hızlı et al., 2017; Bayrıl and Yılmaz, 2010; Yanar et al., 2004). The sex differences in the study were found to be compatible with the literature data.

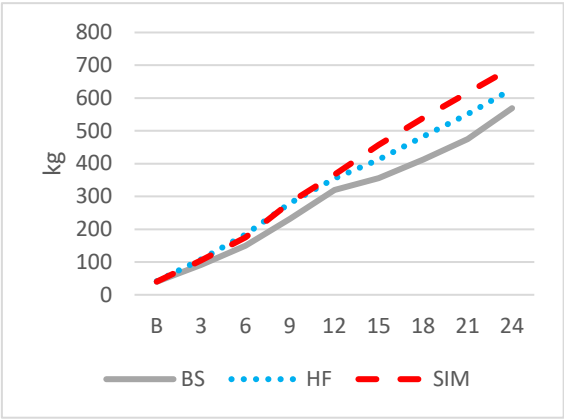

Figure 2. According to breed LW values

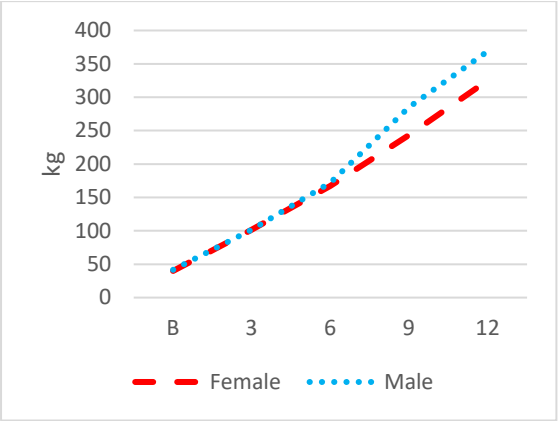

Figure 3. According to sex LW values

Chest girth values

In the study, CG values were found to be close to each other in the HF and SIM breeds in the first 12 months, and higher in the SIM breed between 12 and 24 months, while it was observed to be the lowest in the BS breed in all periods (Figure 4). These values were found to be significant between breeds in all periods (Table 3). As can be seen in Figure 5, CG values were found to be close to each other between the sexes in the 0–12-month period, and the differences were statistically insignificant. In the literature data, while these values were found to be 86, 106.2 and 132.9 cm at 2, 8, and 16 weeks of age in the HF breed (Wilson et al., 1997). In another study, it was found as 112, 118, 128 136, 150, 145, 143 and 164 cm in 3-month periods between 3-24 months, respectively (Mekparyup et al., 2013). The same values were reported as 107, 134 and 155 cm at the ages of 6-12-18 months in the BS breed (Akbulut et al., 1998). As with the LW values, the CG values were also found to be higher than the literature reports

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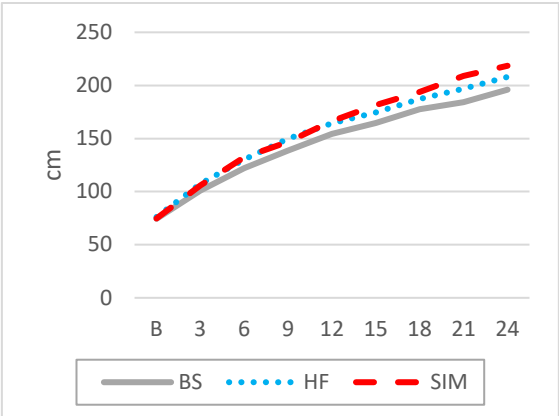

Figure 4. According to breed CG values

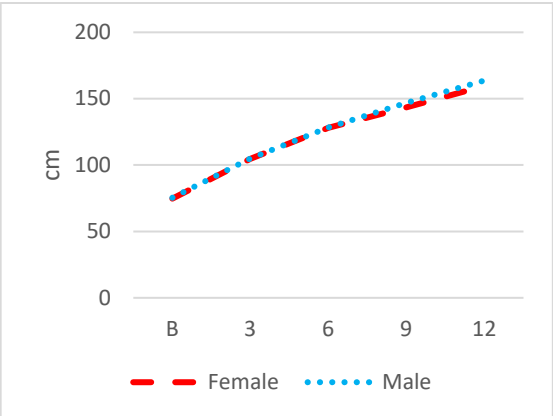

Figure 5. According to sex CG values

Average daily weight gain values

In the study, ADG values were found to be significant at 3, 6, 15 and 18 months and insignificant at 9, 12, 21 and 24 months between breed. Also, values were found to be significant at 9 month and insignificant at 3, 6 and 12 months between sexes (Table 3). While these values were highest in the SIM breed after 6 months of age, they were lowest in the BS breed in all periods except the 12-month period (Figure 6). Also, while values between males and females are close to each other at the age of 3 months, it is seen that males have higher values from the age of 6 months (Figure 7). In a study conducted with HF and Jersey breeds, ADG values were found to be statistically higher in females between birth-weaning and weaning-1 years of age (Abera et al., 2012). In a study conducted with Anatolian Black breeds, while male animals had higher ADG values at birth-3 months, 3-6 months and 6-12 months, the differences were found to be significant only between 6-12 months (Sakar and Zülkadir, 2022). The significant increase in differences between male and female animals from the age of 6 months in the study is proof that sex hormones begin to take effect from these months.

Correlation values

In the study, correlation values between LW, CG and ADG values from birth to 24 months of age are presented in Table 4. LW-CG values were found to be significant (P<0.001) with positive correlation in all periods. LW-ADG values were also found to be positively correlated in all periods. While CG-ADG values were positively correlated in all periods, they were negatively correlated only at the age of 24 months. The high correlation between LW-CG values in all periods shows that live weight can be estimated in these animals using CG values. When the literature data are examined, the correlations between LW-CG values were found as 0.921 (P<0.01) in HF breed (Koç and Akman, 2007); as 0.78 in HF and 0.95 in BS breed (Ozkaya and Bozkurt, 2009); as 0.956 (P<0.01) in HF cattle (Mekparyup et al., 2013); as 0.961 in HF crossbred cattle (Ashwini et al., 2019). In another study conducted with the BS breed, CG among body measurements gave the highest correlation coefficients with body weights at birth, 2, 6, 12 months, 2, and 3 years (Yanar et al., 1995). The correlations between LW-CG values found in this study were found to be compatible with the literature data.

In the study, correlation values between LW - dam weight at birth were found to be positive in all periods. These values have increased from the age of 12 months, which is proof that the animals are genetically similar to the live weights of their mothers upon completion of their development in size.

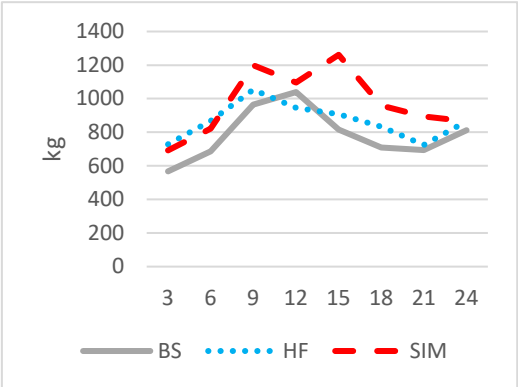

Figure 6. According to breed ADG values

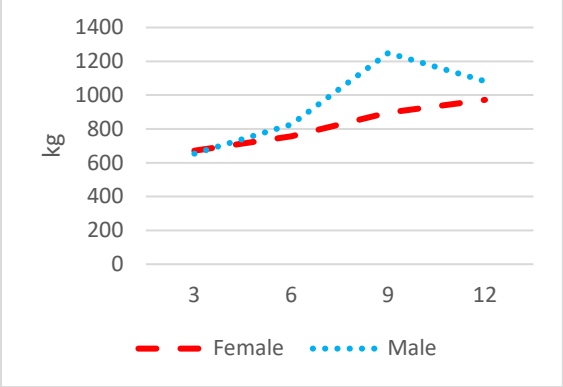

Figure 7. According to sex ADG values

Table 4. Correlation coefficients between growth traits and between live weight dam weight at birth in all periods

Period	Character	Dam Weight at Birth	CG	LW
Birth	BW	0.313**	0.816***	
3 Month	LW	0.297**	0.636***	
	ADG		0.578***	0.925***
6 Month	LW	0.221	0.635***	
	ADG		0.490***	0.909***
9 Month	LW	0.353*	0.687***	
	ADG		0.514***	0.777***
12 Month	LW	0.347*	**0.887***	
	ADG		0.322*	0.438**
15 Month	LW	0.480**	**0.883***	
	ADG		0.428**	0.606***
18 Month	LW	0.508***	0.846***	
	ADG		0.295	0.556***
21 Month	LW	0.466**	0.877***	
	ADG		0.290	0.555***
24 Month	LW	0.522***	0.844***	
	ADG		-0.044	0.066

Conclusions

It is possible to determine the growth rate of animals by different methods. Among these, the foremost measurement is weighing the weight gain in different periods. As a result, in this study, in which some growth traits from birth to 24 months of age were examined, especially from the age of 6 months, the SIM breed was found to have the highest values, while the BS breed was found to have the lowest values. Differences between sex values were found in favour of male animals from 6 months of age. The positive correlation of almost all of the growth traits examined indicates that one value affects the other positively. In addition, it can be said that the estimation of live weight can be determined with a high degree of accuracy by using chest girth in conditions where weighing facilities are not available. Thus, in rural areas where resources are insufficient for the producers, estimation of body weight with chest circumference measurements can be done in a practical, fast, easy and cheap way.

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