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Some Morphologic Characteristics of Central Anatolian Merino Sheep

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ABSTRACT

This study aimed to investigate the body weight and some body measurements in Central Anatolian Merino sheep regarding ages and to carry out a comparative analysis between them. The study included a total of 60 animals aged 2, 3 and 4 years old. The sheep were fed daily with hay, vetch, alfalfa and limited amount of concentrated feed (400 g/head) until the pasture period, and pasture grass and mixed grass-clover hay during the pasture period. The live weights of the sheep of different ages in the farms were measured with a digital scale, and some body sizes were measured using a measuring tape and a measuring stick. When the live weight and chest circumference values of the 4-year-old sheep were compared with the data obtained in the other age groups (2 and 3 years old), and it was statistically significant, chest width and rump height values were found to be similar to those in the 3-age group. There were significant correlations between live weight and chest circumference, between withers height and rump height and significant correlations between live weight and chest width, body length with rump height, chest width with chest depth. In addition, significant correlations were found between live weight and chest depth, and between withers height, body length, and chest depth. Present findings revealed that the Central Anatolian Merino sheep can be beneficial in the development of meat-type sheep breeding.

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Introduction

The sheep (*Ovis aries*) is one of the important livestock animals where the ability to utilize even poor-quality pastures at maximum level for the sustainability of safe and reliable food (i.e., meat, milk) supply (Günaydın 2009). Considering its socio-economic structure, ecotype variety, wide pasture areas and geographical structure, Türkiye has favourable conditions for multi-purpose sheep breeds (Ceyhan et al., 2009). Although the quality of pastures in Türkiye is relatively inadequate, pasture-based livestock is very important in sheep breeding as it creates low-cost feed material input (Güngör and Akçapınar, 2013). Due to the low and irregular precipitation regime in the Central Anatolian Region, such pasture areas cover a very large area. However, indigenous breeds and their crosses, which are well adapted to the region, utilize these dry pastures quite effectively compared to other species (Yılmaz et al., 2011).

In many studies, it has been shown that there is a consistent relationship between body weights and body measurements in sheep (Çelik, 2006; Cam et al., 2010). Measurements on the sheep body such as chest depth, body length etc., are highly correlated with the conformation and growth of animals and are used as indicator phenotypes. For example, high correlation between body size and meat yield were reported (Gürcan and Akçapınar, 2006). The age of the animal is one of the important factors affecting the body conformation, moreover, the live weight changes in different age periods cause certain changes in body sizes (Kumlu, 2000; Koç and Akman, 2007). Therefore, in order to obtain high meat yield in sheep breeding, it is important to identify animals with high breeding value by using efficient methods and to use them in breeding selection (Gürcan and Akçapınar, 2006).

Crossbreeding studies have been carried out for many years in order to get cross-breed sheep with high production for various traits (i.e., meat, milk, wool). One of these studies was the Central Anatolian Merino (CAM) sheep as a result of crossing Merino with Akkaraman (75-

80% German Mutton Merino and 20-25% Akkaraman) in Türkiye (Çolakoğlu and Özbeyaz 1999; Sönmez et al. 2009). CAM is generally rearing in the Central Anatolia Region, especially in Eskişehir, Ankara, Konya and Karaman. Merino sheep, which is the world-wide sheep breed, meat yield-oriented characteristics have started to gain more importance in some countries, including Türkiye. In recent years, the instability in wool prices has led to the prominence of meat traits in the breeding program of many countries including Türkiye (Aktaş et al., 2016). There are approximately 42.2 million sheep in total in Türkiye and Merino sheep constitute 8.5% of this number. When the distribution of the total sheep population in terms of age is examined, a significant proportion (59%) consists of female sheep aged 2 and over (TUIK, 2020).

In this study, it was aimed to compare body weight and some body measurements (body length, height at withers, chest width, rump height, chest circumference and chest depth) of CAM regarding different age groups and additionally, the correlation between the relevant traits were analysed.

Material and Methods

The animal material of the research consisted of 60 CAM sheep from different age groups (2, 3 and 4 years old) raised in a farm in Polatlı district. Each age group consists of an equal number of animals.

Sheep are kept indoors in winter (April to November) and fed with straw, vetch, alfalfa and limited concentrate feed (400 g/head) daily, while in summer (November to April) they graze on pasture and additionally alfalfa-dry meadow mixture grass is given.

Body weight (with a digital scale with 100 g sensitivity) and body measurements were taken in sheep at birth. In sheep, body length, height at withers, chest width, rump height and chest depth were determined with the help of a measuring stick, and chest circumference was determined using a measuring tape as follows (Gürcan et al., 2011). Phenotypes and definitions which were used in the study were;

Live Weight (LW): Live weight of animals when the measurement taken.

Body Length (BL): The length from the anterior end of the shoulder (articulus humeri) to the seat bump (tuber ichii),

Wither Height (WH): The height from the top of the withers to the ground,

Chest Width (CW): The distance between the heads of the shoulders (caput humeri),

Rump Height (RH): The height from the highest point of the rump bone (sacrum) to the ground,

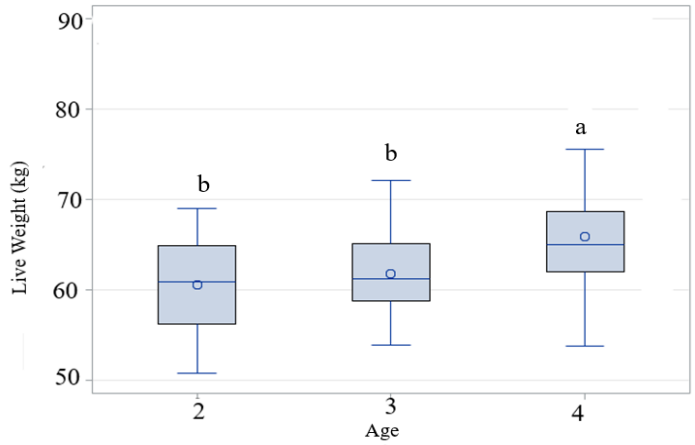
Heart Girth (HG): The circumference measurement taken around the body just behind the shoulder blades (scapula),

Chest Depth (CD): The vertical distance between the highest point of the withers and the sternum.

The results obtained in the study were presented as mean and standard error (Mean ± SE). Significance test of age groups was performed with one-way ANOVA and multiple comparison of the difference between each group was tested according to Duncan test. In addition, the mean value of body measurements by age are presented with various graphics. Pearson's correlation analysis was performed to determine the relationships between traits. SAS statistics software program was used in all statistical analyses in the study (SAS, 2017).

Results

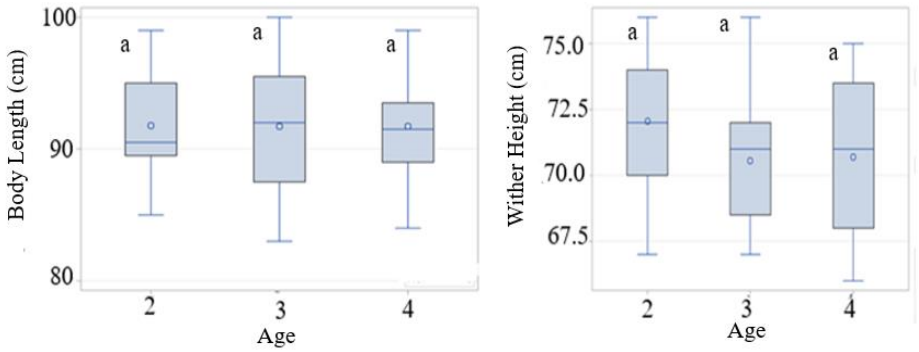
The distribution of body measurements in separate groups according to age, as box plots, is shown in Figures 1, 2, 3 and 4. In the comparison of the phenotypes in different age groups, the LW and HG values of the sheep in the 4-age group were found to be higher ($P<0.01$ and $P<0.001$) compared to the other age groups (2 and 3 years, respectively). In terms of CAM sheep CW trait, while the animals in the 3-age group were higher than the 2-age group and lower than the 4-age group, a significant difference was found between the 2 and 4 age groups. Additionally, for RH trait, animals in the 2nd age group were found to be higher ($P<0.01$) than the animals in the 3rd and 4th age groups. On the other hand, any significant differences between age group were found for BL, WH and CD.



	2 age (n=20)	3 age (n=20)	4 age (n=20)
Live Weight (kg)	60.60±1.19^{b}	61.80±1.08^{b}	65.90±1.81^{a*}

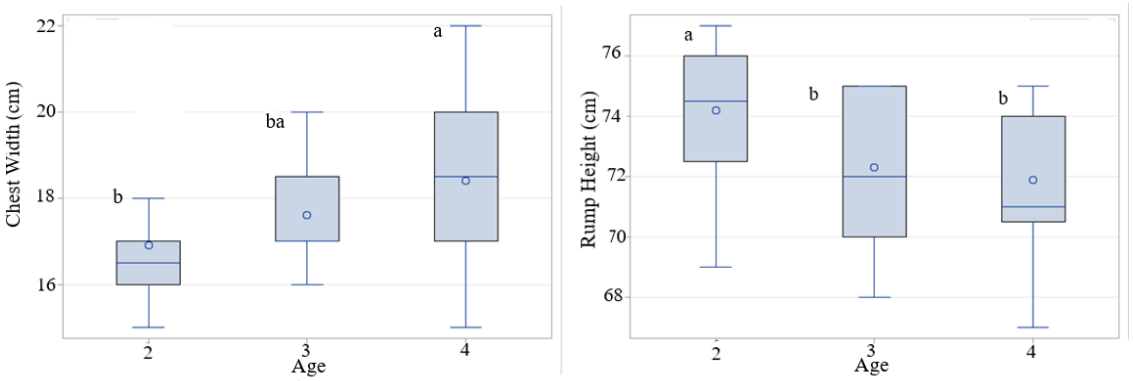
Different letters in the same line represent statistically significant differences (*: $P<0.05$).

Figure 1. Box plot of Live Weight.



	2 age (n=20)	3 age (n=20)	4 age (n=20)
Body Length (cm)	91.80±0.87^{a}	91.70±1.14^{a}	91.70±0.81^{a}
Wither Height (cm)	72.05±0.55^{a}	70.55±0.54^{a}	70.70±0.69^{a}

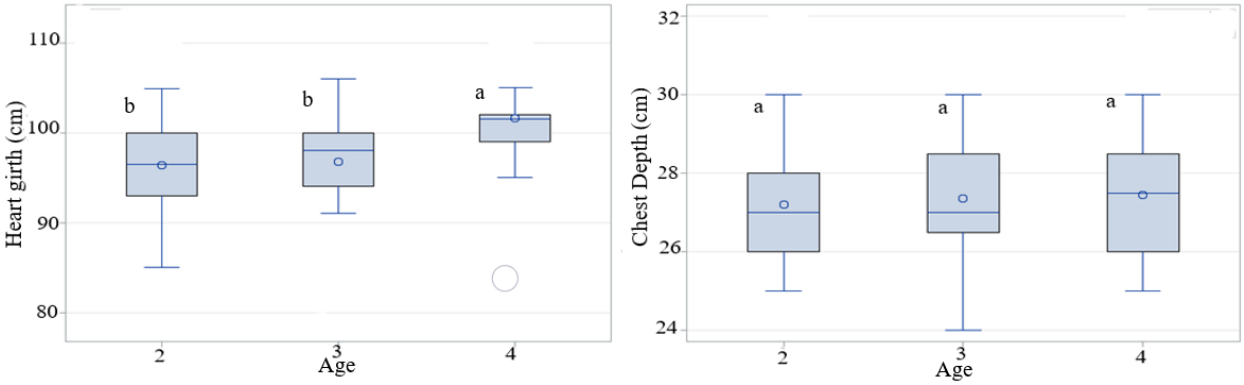
Figure 2. Box plot of Body Length and Wither Height.



	2 age (n=20)	3 age (n=20)	4 age (n=20)
Chest Width (cm)	16.90±0.31^{b}	17.60±0.28^{ba}	18.40±0.42^{a**}
Rump Height (cm)	74.20±0.50^{a}	72.30±0.52^{b}	71.90±0.58^{b***}

Different letters in the same line represent statistically significant differences (**: P<0.01; ***: P<0.001).

Figure 3. Box plot of Chest Width and Rumph Height.



	2 age (n=20)	3 age (n=20)	4 age (n=20)
Heart girth (cm)	96.40±1.11^{b}	96.75±1.29^{b}	101.60±0.92^{a***}
Chest Depth (cm)	27.20±0.40^{a}	27.35±0.36^{a}	27.45±0.30^{a}

Different letters in the same line represent statistically significant differences (***: P<0.001).

Figure 4. Box plot of Heart Girth and Chest Depth.

Table 1. The correlation among live weight and body measurement traits in CAM

Traits	LW	BL	WH	CW	RH	HG	CD
LW	1	0.42***	0.22	0.32**	0.24	0.43***	0.26*
BL		1	0.30*	0.02	0.33**	0.47***	0.03
WH			1	0.08	0.88***	0.10	0.29*
CW				1	0.01	0.19	0.32**
RH					1	0.10	0.33**
HG						1	0.06
CD							1

LW: live weight, BL: body length, WH: wither height, CW: chest width, RH: rump height, HG: heart girth, CD: chest depth. * P<0.05; ** P<0.01; *** P<0.001.

Table 2. Summary of the selected studies implemented on the live weight of different breeds in Türkiye

Breed	Reference	Mean live weight (kg)
Çine Çaparı	Altın et al., 1999	37.13 - 41.96
Karakaş	Gökdal et al., 2000	40.80 – 47.86
Karayaka	Atasoy et al., 2003	49.30 - 54.8
Bafra	Atasoy et al., 2003	58.1 - 66.30
Akkaraman	Elibol and Dağ, 2004	54.72
Awassi	Elibol and Dağ, 2004	52.85
Kıvırcık	Yılmaz and Altın, 2004	46.36 - 47.72
Lalahan	Erol et al., 2017	51.88 - 56.78
Dağlıç	Bağkesen and Koçak, 2018	42.33 – 49.43

The correlations between live weight (LW) and body measurements (i.e., BL, WH, CW, RH, HG and CD) and the correlation among the body measurements regarding different age groups were given in Table 1. When the table was examined, a high statistical significance (P<0.001) correlation was found to be between LW-BL, LW-HG, and WH-RH. In addition, there is a high statistical significance (P<0.01) correlation between LW-CW, BL-RH, and CW-CD. Finally, statistical significance (P<0.05) correlations were found between LW-CD, BL-WH, and WH-CD.

Discussion and Conclusion

In this study, it was determined that the mean of LW in the 4-age group showed significant (P<0.05) differences compared to the other age groups (Figure 1). In addition, the moderate (from 0.22 to 042) correlations were found to be between LW and other body measurements (Table 1). Previously, the significant correlations between LW and other body measurement (i.e., BL, HG, CW and CD) were reported (Şeker and Kul, 2000; Yılmaz et al., 2011) and the results were quite similar with the recent study.

Average live weights of different indigenous breeds from previous studies in Türkiye were presented in Table 2. When the average live weight values in previous studies were compared with the current study, the values in all three age groups in the current study were found to be relatively higher than other breed. However, it was found to be in a similar range with the mean body weight of Bafra sheep.

The changes in body measurements (i.e., BL, WH, CW, RH, HG and CD) of CAM sheep regarding the age groups are given in Figures 2, 3 and 4 in the study. CW in 2 and 3-year-old sheep lower than the 4-year-old sheep. In contrast, RH of 2 and 3-year-old sheep were statistically higher than 4-year-old sheep. It is clear that when animal getting older the height of rump is decreasing. Similar with CW, HG of 2 and 3-year-old sheep were significantly higher than 4-year-old sheep. On the other hand, there is no significant differences between age groups according to BL, WH and HG trait.

When compared with the results of the study conducted with Karakaş sheep (Gökdal et al., 2000), BL and WH values of CAM sheep were found higher, HG similar, CW and CD lower. Furthermore, Chios sheep (Kaymakçı et al., 2002) had higher BL and RH values, and similar WH, CW and HG traits. Additionally, compared to Karayaka sheep, BL, WH and HG values were higher, while CW and CD were lower than the result of the current study. It was determined that Bafra sheep had higher BL and WH values, and lower than CW, HG and CD values (Atasoy et al., 2003). Compared to Kangal Akkaraman ewes (Yılmaz et al., 2011), CAM ewes had a higher BL value, similar HG, and lower other body measurements.

Different levels of correlations were found between BW and body measurements in CAM sheep and were given in Table 1. The correlations were found to be consistent with the results reported in previous studies (Şeker and Kul, 2000; Yılmaz et al., 2011). The relationship between BW and BL, HG, CW and CD values was found to be significant. Furthermore, according to their statistical significance, BL-HG, BL-WH and BL-RH were high (P<0.00.1), the correlations were found to be moderate (P<0.01) between BL-RH, CW-CD, RH-CD, and the correlation were found to be significant (P<0.05) between BL-WH, WH-CD.

When the results obtained in the study were evaluated in general, it was determined that CAM sheep showed higher BW and BL values than our domestic sheep breeds, and similar, low or high values in terms of other body characteristics (WH, CW, RH and HG). This result suggests that CAM animals can be an important option to meet the need for sheep meat in case of need.

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