Research Article

Investigation on Sakiz Ewes (Chios) from Different Age Groups in Aegean Region, Turkey

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ABSTRACT

Background and Aim: The present study was carried out to establish relationships among traits and the effect of body condition score on body weight and some body measurements of 109 Sakiz ewes from different aged groups raised at a private farm in Aegean Region, Turkey.

Material and Method: The animals were enrolled in four age groups as Group 1 (06-12 months, n: 42), Group 2 (13-18 months, n: 18), Group 3 (19-24 months, n: 25) and Group 4 (25 months and above, n: 24). The animal material in the study was released grazing at 9.00 and 16.30 at pasturage. Potable water was obtained as ad libitum. Body Length (BL), Wither Height (WH), Chest Depth (CD), Chest Girth (CG) and Shinbone Circumference (SC) were considered as some body measurements of ewes in study. WH and CD were measured by a measuring cane. BL, CG and SC were measured by using a measuring tape. Individual body weights were determined by a weighing scale in wee hours of the morning before grazing. In this study, assessment of body condition score (BCS) of sheep was performed within five-rank system by Russel, 1984. Sheep were enrolled in 4 groups (2.0, 2.5, 3.0, 3.5≤) according to BCS.

Results and Conclusion: Overall means of body weight (BW) 37.02 kg, BL 85.01 cm, WH 69.27 cm, CD 52.11 cm, CG 93.44 cm and SC 9.16 cm were found for Sakiz ewes. The means of BW, BL, WH, CD, CG and SC were increased as BCS. The highest means of BW, BL, WH, CD, CG and SC were determined by the group with score of 3.5≤ and the lowest means were found by the group with score of 2. The effect of age on BW, BL, WH, CG and SC were found statistically significant (P<0.01), while the effect of age on CD was found non-significant (P>0.05). In study, the effect of BCS on BW, BL, WH, CD, CG and SC were found significant (P<0.01). The positive and significant correlations were among WH, BL and BW (respectively, 0.659 and 0.741) (P<0.01). Besides, the correlations among CG and WH, SC and WH, CD and BL were deemed statistically significant (P<0.01). These correlations showed that BW could be estimated relatively rightly from WH and BL than other body measurements in Sakiz ewes. The results of this study showed that it should be improved necessary of technigues as BCS due to the important effects of BCS on body development and growth of ewes.

Keywords: Sakiz, body condition score, body weigt, body measurements

Türkiye, Ege Bölgesi'nde Farklı Yaş Gruplarındaki Sakız Koyunları (Chios) Üzerine Araştırma

ÖZET

Özbilgi/Amaç: Bu çalışma Türkiye, Ege Bölgesi'nde özel bir işletmede yetiştirilen farklı yaş gruplarındaki 109 baş Sakız koyunun canlı ağırlığı ve bazı vücut ölçüleri üzerine vücut kondisyon skorunun etkileri ile özellikler arasındaki ilişkilerin belirlenmesi için yürütülmüştür.

Materyal ve Metot: Hayvanlar Grup 1 (6-12 ay; n:42), Grup 2 (13-18 ay, n: 18), Grup 3 (19-24 ay, n:25) ve Grup 4 (25 ay ve yukarısı, n:24) olarak 4 yaş grubuna ayrılmıştır. Çalışmadaki hayvan materyali 09.00 ile 16.30 saatleri arasında mer'a da otlatılmaktadır. İçme suyu ad-libitum olarak sağlanmaktadır. Çalışmada vücut ölçüleri olarak Vücut Uzunluğu (VU), Cidago Yüksekliği (CY), Göğüs Derinliği (GD), Göğüs Çevresi (GÇ) ve İncik Çevresi (İÇ) dikkate alınmıştır. CY ve GD bir ölçü bastonu vasıtasıyla ölçülmüştür. VL, GÇ ve İÇ ise bir ölçü şeridi kullanılarak ölçülmüştür. Bireysel canlı ağırlıklar otlatma öncesi sabahın erken saatlerinde bir baskül yardımıyla belirlenmiştir. Bu çalışmada, koyunların vücut kondisyon skorunun (VKS) değerlendirilmesinde Russel (1984) tarafından tanımlanan beş-derecelendirme sistemine göre yapılmıştır. Koyunlar VKS'na göre 4 gruba (2.0, 2.5, 3.0, 3.5≤) ayrılmıştır.

Bulgular ve Sonuç: Sakız koyunları için canlı ağırlık (CA), VU, CY, GD, GÇ ve İÇ'ne ait tüm ortalamalar sırasıyla 37.02 kg, 85.01 cm, 69.27 cm, 52.11 cm, 93.44 cm ve 9.16 cm olarak bulunmuştur. VKS'na göre CA, VU, CY, GD, GÇ ve İÇ'ne ait ortalamalarda artış söz konusudur. CA, VU, CY, GD, GÇ ve İÇ'ne ait en yüksek ortalamalar 3.5≤ VKS grubunda, en düşük ortalamalar ise 2 VKS grubunda tespit edilmiştir. CA, VU, CY, GÇ ve İÇ üzerine yaşın etkisi istatistik bakımdan önemli bulunurken (P<0.01), GD üzerine etkisi önemsiz bulunmuştur (P>0.05). Çalışmada, CA, VU, CY, GD, GÇ ve İÇ üzerine VKS'nun etkisi önemli bulunmuştur (P<0.01). CY, VU ve CA arasında önemli ve pozitif korelasyonlar (sırasıyla 0.659 ve 0.741) bulunmuştur (P<0.01). Bunun yanında, GÇ ile CY, İÇ ile CY ve GD ile VU arasındaki korelasyonlar da istatistik bakımdan önemli bulunmuştur (P<0.01). Buradaki korelasyonlar, Sakız koyunlarında CA'nın diğer vücut ölçülerine göre CY ile VU'dan nispeten daha doğru tahmin edilebileceğini göstermektedir. Bu çalışmanın sonuçları, koyunların büyüme ve vücut gelişimi üzerine VKS'nun önemli etkilerinden ötürü VKS'na yönelik tekniklerin geliştirilmesi gerekliliğini ortaya koymaktadır.

Anahtar kelimeler:Sakız, vücut kondisyon skoru, canlı ağırlık, vücut ölçüleri

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Table 1. Least square means and standard errors of body weight and some body measurements of Sakız ewes by age and body condition score

Tablo 1. Yaş ve vücut kondisyon skoruna göre Sakız koyunlarının canlı ağırlığı ve bazı vücut ölçülerinin en küçük kareler ortalamaları ve standart hataları

Factors	N	BW (kg) $\bar{X} \pm S_{\bar{X}}$	BL (cm) $\bar{X} \pm S_{\bar{X}}$	WH (cm) $\bar{X} \pm S_{\bar{X}}$	CD (cm) $\bar{X} \pm S_{\bar{X}}$	CG (cm) $\bar{X} \pm S_{\bar{X}}$	SC (cm) $\bar{X} \pm S_{\bar{X}}$
Age		**	**	**	NS	**	**
Group 1 (06-12 months)	42	27.67[a]±1.160	78.81[a]±1.326	64.68[a]±0.860	48.99±1.870	86.23[a]±2.076	8.52[a]±0.222
Group 2 (13-18 months)	18	35.68[b]±0.799	79.22[a]±2.364	70.13[b]±1.075	52.14±4.141	83.37[a]±3.234	8.76[ab]±0.286
Group 3 (19-24 months)	25	45.07[c]±1.363	95.54[b]±1.543	72.97[b]±0.960	52.58±0.624	103.19[b]±1.459	9.84[b]±0.325
Group 4 (25 months and above)	24	46.01[c]±1.221	89.24[b]±1.459	72.80[b]±1.423	57.05±2.374	103.45[b]±3.220	9.86[b]±0.280
Body Condition Score		**	**	**	**	**	**
2.0	23	22.20[a]±0.657	74.15[a]±1.077	62.16[a]±0.837	43.44[a]±0.628	81.90[a]±1.240	7.97[a]±0.200
2.5	12	30.27[b]±0.677	81.22[ab]±2.113	65.40[a]±1.465	52.46[ab]±4.195	87.08[a]±4.724	9.10[ab]±0.452
3.0	29	36.47[c]±0.474	83.24[b]±1.868	70.58[b]±0.828	53.16[ab]±3.017	88.58[a]±2.807	8.86[ab]±0.214
3.5≤	45	46.76[d]±0.834	92.72[c]±1.251	73.08[b]±0.898	55.76[b]±1.297	104.16[b]±1.863	9.98[b]±0.237
Overall	109	37.02±0.997	85.01±1.041	69.27±0.641	52.11±1.151	93.44±1.497	9.16±0.148

[*]: P<0.05; [**]: P<0.01; NS: Non significant; a, b, c, d: Means with different superscripts in each column are different; BW: Body Weight; BL: Body Length; WH: Wither Height, CD: Chest Depth, CG: Chest Girth; SC: Shinbone Circumference

Introduction

The Turkey's sheep population was reached 29 million 284 thousand as statistical data in 2014 (Anonymous, 2014). A great number of indigenous sheep breeds adaptation to different climatic zones because of Turkey's complex topography (Ozcan, 1990). In Turkey, the whole of indigenous sheep breeds are raised for milk, mutton and wool yield (Sonmez, 1962).

Sakiz is remain one of the most substantial Turkish sheep for high milk yield and fertility (Kaymakci, 2006). This sheep is named from Chios island in the Aegean Sea. Sakiz (Turkish) and Chios (Greek) breeds are presumably similar breed. Sakiz is greatly situated through coastal towns (Cesme, Urla, Seferihisar and of Izmir county) in Turkey. However, the latter breed may be present dispersedly in other Aegean town and through Sea of Marmara (FAO, 1986).

Body condition scoring (BCS) may quickly be learnt as an ideal management practice (Kenyona et al., 2014). BCS is a substantially subjective procedure and used to predict the quantity of fat and muscle at various production phase of livestock (Phytian et al., 2011; Gaias, 2012; Jalilian an Moeini, 2013). Also, this method is used to part of routine animal health practice (Lovatt, 2010), health planning schedule for flock (Sargison and Scott, 2010) and animal welfare at farm (Phytian et al., 2012).

In different sheep breeds, relationships among body weight and body measurements were investigated from several authors (Afolayan et al., 2006; Otoikhian et al., 2008; Tadesse and Gebremarimam, 2010; Birteeb and Ozoje, 2012; Yildirir et al., 2011a; Yilmaz et al., 2011; Ravimurugan et al., 2013; Younas et al., 2013). Also, the effects of age and BCS on some traits in sheep were investigated in some studies (Abboud, 2007; Sezenler et al., 2007; Yildirir et al., 2011b; Aliyari et al., 2012; Aktas and Dogan, 2014; Jafari et al., 2014)

The objective of this study was to determine relationships among traits and the effect of body condition score on body weight and some body measurement of Sakiz ewes from different age groups raised at a private farm in Aegean Region, Turkey.

Material and Methods

The investigation was conducted at a private farm in Aegean Region, Turkey. Animals enrolled consisted of 109 Sakiz ewes from different age groups. The animals were distributed in four age groups as Group 1 (06-12 months, N: 42), Group 2 (13-18 months, N: 18), Group 3 (19-24 months, N: 25) and Group 4 (25 months and above, N: 24).

The animal material in the study was released grazing at 9.00 and 16.30 at pasturage. Potable water was obtained as ad libitum. Body Length (BL), Wither Height (WH), Chest Depth (CD), Chest Girth (CG) and Shinbone Circumference (SC) were considered as some body measurements of ewes in study. WH and CD were measured by a measuring cane. BL, CG and SC were measured by using a measuring tape. Individual body weights were determined by a weighing scale in wee hours of the morning before grazing. Assessment of BCS of sheep was used to five-rank system by (Russel, 1984). Sheep for BCS were divided into 4 groups (2.0, 2.5, 3.0, 3.5≤).

Data were analyzed by ANOVA using the General Linear Model (GLM) procedure of (SPSS, 2009). The model was used to determine the effects of age and BCS on BW and other measurements. This model was as follows:

$$Y_{ijk}: \mu + a_i + b_j + e_{ijk}$$

where: Y_{ijk}, Body weight and other body measurements of ewes; μ, overall mean, a_i, effect of age (i = Group 1, Group 2, Group 3 and Group4), b_j, effect of body condition score (2.0, 2.5, 3.0, 3.5≤) and e_{ijk}, random error.

The differences between subclass means were determined by Duncan's multiple range tests (Steel and Torrie, 1984). The correlations among BCS, body weight and other body measurement were calculated by using Pearson's correlation analyses (SPSS, 2009).

Table 2. The Correlations between measurements
Tablo 2. Ölçümler arasındaki korelasyonlar

Measurements	BW	WH	BL	CD	CG
BW					
WH	0.659[**]				
BL	0.741[**]	0.593[**]			
CD	0.425[**]	0.190[*]	0.305[**]		
CG	0.561[**]	0.528[**]	0.564[**]	-0.260[**]	
SC	0.513[**]	0.567[**]	0.346[**]	0.129	0.492[**]

[*]: P<0.05; [**]: P<0.01; BW: Body Weight; BL: Body Length; WH: Wither Height, CD: Chest Depth, CG: Chest Girth; SC: Shinbone Circumference

Results

Least square means and standard errors of body weight and some body measurements of Sakiz ewes by age and body condition score were given in Table 1. Least squares mean of BW in the present study was found as 37.02 ± 0.997 kg. It was seen that BW increased with age in Table 1. In fact, the highest values were reached at Group 3 and Group 4 of age. Least square means of BL changed between 78.81 cm and 95.54 cm as age of ewes.

The overall mean of WH were found as 69.27 ± 0.641 cm and were showed similarity with Group 3 and Group 4. The mean of CD was determined to be about 52.11 cm and this measurement was resembled to Group 2 and Group 3 of ages. Similarly, means of CG changed between 83.37 and 103.45 am and were showed similarity with Group 3 and Group 4 of ages. The overall mean value of SC was found 9.16±0.148 cm and means of SC were increased with age.

According to Table 1, It was observed that the means of BW, BL, WH, CD, CG and SC were increased as BCS. Such that, the highest means of BW, BL, WH, CD, CG and SC were determined by the group with score of 3.5≤ and the lowest means were found by the group with score of 2.

The influence of age on BW, BL, WH, CG and SC were found significant (P<0.01), when the effect of age on BW and some body measurements were analyzed. The effect of age on CD was found non-significant (P>0.05). The effect of BCS on BW, BL, WH, CD, CG and SC were found significant (P<0.01).

The relationships among measurements were summarized in Table 2. The highest correlations were found among WH, BL and BW(respectively, 0.659 and 0.741) and were significant (P<0.01). In general, the moderate, below average and positive correlations between some measurements (such as, CG and WH, SC and WH, CD and BL) were determined statistically significant (P<0.01), but the correlations between CG and CD was found negative and significant (P<0.01).

Discussion

The primary objective of the present study was to determine the relationships between traits and the effect of body condition score on body weight and some body measurements of Sakiz ewes from different age groups.

The means of BW increased with age in the present study. Similar results were reported to Hissardale sheep by (Younas et al., 2013). The present results on the overall mean of body weight (37.02 kg) were found lower than mean values of Sakiz ewes in some studies (Yildirir et al., 2011b, Ceyhan et al., 2007; Anonymous, 2009; Sezenler et al., 2011) and similar to findings of Çine Çapari, Güney Karaman and Karagül sheep reported by

Anonymous (2009) and Kilis sheep reported by Alizadehasl and Unal(2011). In comparison to other Turkey indigenous sheep breeds, the mean value of BW for Sakiz ewes was found lower than findings of Karakas sheep (Gokdal et al., 2000) and Kangal type Akkaraman sheep (Yilmaz et al., 2011).

Similarly, this value was lower than overall means of BW of Karya, Pırlak, Ramliç, Anatolian Merino, Karacabey Merino, Gokceada Merino, Karayaka, Kıvırcık, Acıpayam, Malya, Hemşin, Herik, Akkaraman, Morkaraman, Dağlıç, Awassi and Tuş ewes (Anoymous, 2009), Honamli ewes (Alizadehasl and Unal, 2011) and Zom ewes (Koncagul et al., 2012). However, this value was higher than BW of Norduz ewes reported by Alizadehasl and Unal (2011).

Overall mean of BL in the current study was found as 85.01±1.041 cm. This value was higher than those reported for Sakiz ewes (Anoymous, 2009) and (Yildirir et al., 2011b). This value was higher than findings reported for Kangal type Akkaraman ewes (Yilmaz et al., 2011); Karakas sheep (Gokdal et al., 2000); Akkaraman, Kangal type Akkaraman, Morkaraman, Daglıç, Awassi, Çine Çapari, Güney Karaman, Anadolu Merino, Karacabey Merino, Karagül, Tuj, Gökçeada, Karayaka, Karya, Hemşin, Herik, Pırlak, Kıvırcık, Acıpayam, Ramliç, Malya, Acıpayam ewes (Anoymous, 2009); Kilis, Norduz and Honamlı ewes (Alizadehasl and Unal, 2011); Zom ewes (Koncagul et al., 2012).

Least square mean of the WH was found as 69.27±0.641 cm. This result was lower than findings of Sakiz ewes (Anoymous, 2009) and (Yildirir, 2011b), whereas was higher than those reported (Akkaraman, Dağlıç, Awassi, Çine Çapari, Güney Karaman, Tuj, Herik, Gökçeada, Anadolu Merino, Pırlak, Karayaka, Karya) by Anoymous (2009). However, this value was consistent with the finding of some authors (Gokdal et al., 2000; Anoymous, 2009; Koncagul et al., 2012).

The mean of CD (52.11±1.151 cm) was determined in this study was higher than those findings of some researchers (Gokdal et al., 2000;Yilmaz et al., 2011; Yildirir et al., 2011b; Alizadehasl and Unal, 2011; Koncagul et al., 2012). The mean value of CG (93.44±1.497 cm) was found in the present study was similar to the results of some researchers (Gokdal et al., 2000; Yilmaz et al., 2011; Yildirir et al., 2011b; Koncagul et al., 2012), whereas was higher than those reported by Alizadehasl and Unal (2011). The overall mean of SC was identified as 9.16±0.148 cm. This result was consistent with the finding of Alizadehasl and Unal (2011) and higher than results of Koncagul et al., (2012).

In this study, a great majority of ewes were described within 3.0 and 3.5≤ BCS. (6) suggested BCS varying among 2.5 and 3.0. (Sezenler et al., 2011) were reported that the BCS of Sakiz ewes were found 3.509, 2.260 and 1.851 for breeding, lambing and weaning periods, respectively.Many sheep were defined within

2-3 BCS (mid-range) by Phytian et al. (2011).

According to analyses, the effect of age on BW, BL, WH, CG and SC was found significant (P<0.01). The effect of age on CD was found non-significant (P>0.05). Abboud (2007) reported the effect of age on body measurements (BW; BL and CG) of Awassis sheep. Yildirir et al. (2011b) reported that significantly effect of age on live weight, BL, CD and CG (apart from WH) (P<0.001). Accordingly, the effect of age on BW were found significant (P<0.01) for Karakaş sheep by Gokdal et al., (2000), Ouda sheep by Otoikhian et al., (2008) and Sakiz sheep by Sezenler et al., (2011) and. The effect of age on CD and CG was found statisticall significant by Koncagul et al., (2012).

The effect of BCS on BW, BL, WH, CD, CG and SC were found statistically significant in this study (P<0.01). Sezenler et al., (2011) reported that the every BCS unity was equal to the BW alterations in sheep management practices (such as breeding, lambing and weaning) and these alterations were significant (P<0.01). Kenyona et al., (2014) informed that the alterations of BW discrepancy for unit BCS differs among sheep breeds. The latter author reported that the bigger total BW gain necessitate for a supplement BCS in a weighty animal might partially clarified discrepancy declared among sheep breeds (Kenyona et al., 2014).

In the present study, significant positive correlations among BW and body measurements were generally found and the high correlations between BW with WH and BL (respectively, 0.659 and 0.741) were found statistically significant (P<0.01). In accordance with the report of Afolayan et al., (2006) for Yankasa Sheep, correlation between BW-BL (0.76) and BW-CG (0.94) was significant (P<0.01). Accordingly, the findings of this study were similar to results that were obtained for Highland sheep breed (Tadesse and Gebremariam, 2010), Kangal type Akkaraman (Yilmaz et al., 2011), Awassi sheep breed (Abboud, 2007), Hissardale sheep breed (Younas et al., 2013) and Merinolandschaf sheep breed (Petrović et al., 2012).

Conclusion

In generally, the effect of BCS on BW and some body measurement of Sakiz ewes was determined in this study. However, the relationships between BW and body measurements were evaluated in the present study. As is known, the BCS procedure has been widely used in sheep raising, due to its advantages such as BW for definition the body condition and animal welfare. Likewise, BCS technique was used to assessment of sheep in this study and it was determined within 2.0–3.5≤ of BCS.

The other results of this study showed that, the BCS and age had significant effects on BW and some body measurements. The correlations between BW and body measurements were generally high and positive. These correlations showed that BW could be estimated relatively rightly from WH and BL than other body measurements in Sakiz ewes.

The findings of present study are consistent with the findings of some literature, whereas showed disperancy to some authors. The observed differences in body weight, body measurements and other findings could have association with environmental conditions, inaccurate management and feeding practice in a farm. According to results of the present study for well being of animals at this farm in Aydin, management and environmental conditions must be developed. However, development of technigue as BCS is necessary for evaluation of sheep (yield, health and well being) in further studies.

References

Abboud MG (2007). Effect of different body condition score on the reproductive performance of Awassi Sheep. PhD Thesis, Landwirtschaftlich- Gärtnerischen Fakultät der Humboldt-Universität zu Berlin. http://edoc.hu-berlin.de/dissertationen / georges-abboud-mona-2007-07-04/PDF/georges-abboud.pdf.

Afolayan RA, Adeyinka IA, Lakpini CAM (2006). The estimation of live weight from body measurements in Yankasa sheep. Czech Journal of Anim Science, 51, 8, 343–348.

Aktas AH, Dogan S (2014). Effect of live weight and age of Akkaraman ewes at mating on multiple birth rate, growth traits, and survival rate of lambs. Turkish Journal of Veterinary Animal Science, 38, 176-182.

Alizadehasl M, Unal N (2011). Some morphological traits of Kilis, Norduz and Honamli indigenous breeds. Journal of Lalahan Livestock Research Institute, 51, 2, 81-92.

Aliyari D, Moeini MM, Shahir MH, Sirjani SA (2012). Effect of body condition score, live weight and age on reproductive performance of Afshari Ewes. Asian Journal of Animal and Veterinary Advances, 7, 9, 904-909.

Anonymous (2009). Turkiye Evcil Hayvan Genetik Kaynaklari Tanitim Katalogu 2009; 26-72.

Anonymous (2014). Agricultural Holding Structure Statistics 2014. http://www.turkstat.gov.tr/VeriBilgi.do?alt_id= 1003.

Birteeb PT, Ozoje MO (2012). Prediction of live body weight from linear body measurements of West African Long-Legged and West African Dwarf sheep in Northern Ghana. Online Journal of Animal and Feed Research, 427-434.

Ceyhan A, Erdogan I, Sezenler T (2007). Some production characteristics of Kivircik, Gokceada and Sakiz breeds of sheep conserved as gene resources. Journak of Tekirdağ Agriculture Faculty, 4, 2, 211-218.

FAO (1986). Sheep and Goats in Turkey. FAO Animal Production and Health Paper, p. 97, Rome.

Gaias G (2012). Body condition score and body composition of Sarda dairy ewes. Università Degli Studi Di Sassari Scuola Di Dottorato Di Ricerca, Scienze dei Sistemi Agrari e Forestali e delle Produzioni Alimentari, PhD Thesis, p. 138. http://eprints.uniss.it/8252/1/ Gaias_G_Body_condition_score_body.pdf

Gokdal O, Ulker H, Oto M, Temur C, Budag C (2000). Different production traits and body measurements of Karakas sheep in rural farm conditions. Yuzuncu Yil University Journal ofAgricultural Sciences, 10, 1, 103-111.

Jafari S, Hashemi A, Darvishzadeh R, Manafiazar G (2014). Genetic parameters of live body weight, body measurements, greasy fleece weight, and reproduction traits in Makuie sheep breed. Spanish Journal of Agricultural Research, 12, 3, 653-663.

Jalilian MT, Moeini MM (2013). The effect of body condition score and body weight of sanjabi ewes on immune system, productive and reproductive performance. Acta Argiculturae Slovenica, 102, 2, 99–106.

Kaymakci M (2006). Advanced Sheep Breeding. Sheep and Goat Breeders Association Publication Number:1, Izmir, Turkey.

Koncagul S, Akca N, Vural ME, Karatas A, Bingol M (2012). Morphological characteristics of Zom sheep. Kafkas Universitesi Veteriner Fakultesi Dergisi, 18, 5, 829-837.

Kenyona PR, Maloneyb SK, Blachec D (2014). Review of sheep body condition score in relation to production characteristics. New Zealand Journal of Agricultural Research, 57, 1, 38–64.

Lovatt FM (2010). Clinical examination of sheep. Small Ruminant Research 2010; 92: 77–79.

Otoikhian CSO, Otoikhian AM, Akporhuarho OP, Isidahomen C (2008).Correlation of body weight and some body measurement parameters in Ouda sheep under extensive management system. African Journal of General Agriculture, 4, 3, 129-133.

Ozcan L (1990). Koyunculuk. Republic of Turkey Ministry of Agriculture, Forestry and Rural Affairs, p. 117, Ankara, Turkey.

Phythian CJ, Michalopoulou E, Jones PH, Winter AC, Clarkson MJ, Stubbings LA, Grove-White D, Cripps PJ, Duncan JS (2011). Validating

indicators of sheep welfare through a consensus of expert opinion. Animal, 5, 943–952.

Phythian CJ, Hughes D, Michalopoulou E, Cripps PJ, Duncan JS (2012). Reliability of body condition scoring of sheep for cross-farm assessments. Small Ruminant Research, 104, 156-162.

Petrović MP, Caro Petrović V, Ružić Muslić D, Ilić Z, Spasić Z, Stojković J, Milenković M (2012). Genetic and phenotypic aspects of the body measured traits in Merinolandschaf breed of sheep. Biotechnology in Animal Husbandry, 28, 4, 733-741.

Ravimurugan T, Thiruvenkadan AK, Sudhakar K, Panneerselvam S, Elango A (2013). The estimation of body weight from body measurements in Kilakarsal Sheep of Tamil Nadu, India. Iranian Journal of Applied Animal Science, 3, 2, 357-360.

Russel A (1984). Body condition scoring of sheep. In Practice 1984; 6: 91–93.

Sargison ND, Scott PR (2010). The implementation and value of diagnostic procedures in sheep health management. Small Ruminant Research, 92, 2–9.

Sezenler T, Koycu E, Ozder M, Karadag O, Erdogan I (2007). The effects of body condition score and age on the some reproductive performances of Karacabey Merino Ewes. Journal of Tekırdag Agricultural Faculty, 4, 3, 277-281.

Sezenler T, Ozder M, Yildirir M, Ceyhan A, Yuksel MA (2011). The relationship between body weight and body condition score some indigenous sheep breeds in Turkey. The Journal of Animal & Plant Sciences, 21, 3, 443-447.

Sonmez R (1962) Breed Characters and Different Productions in the Sakiz Sheep (Chios Schafe) of Turkey, 78, 1-4, 281-286. http://www.onlinelibrary. wiley.com/doi/10.1111/j.1439-0388. 1962. tb01283.x/abstract

SPSS (2009). SPSS release 18.0.0, Standard version for windows.

Steel RDG, Torrie JH (1984). Principles and procedures of statistics. Mc-Graw Hill Book Co. Inc. New York, USA.

Tadesse A, Gebremariam T (2010). Application of linear body measurements for live body weight estimation of Highland Sheep in Tigray Region, North-Ethiopia. Journal of The Drylands, 3, 2, pp. 203-207.

Yildirir M, Sezenler T, Ceyhan A, Yuksel MA, Onal AR, Ozder M (2011a). The effect of breed, body condition score and age of ewe on the reproductive performance of ewes in breeding season. Vth Balkan Conference of Animal Science, http://balnimalcon.nku.edu.tr/romanya(2011)/3/Mesut. Yildirir.pdf.

Yildirir M, Erdogan I, Sezenler T, Yuksel MA (2011b). Body measurement and growth characteristics of Sakiz sheep raised in Bandirma Sheep Research Station. RBI 8th Global Conference on the Conservation of Animal Genetic Resources, Tekirdag, TURKIYE , 341-344.

Yilmaz A Tepeli C, Tekin ME, Akmaz A, Garip M, Polat ES, Coskun B, Caglayan T (2011). Determination of live weights and body measurements of Kangal Type Akkaraman sheep in producers conditions. Journal of Food, Agriculture and Environment 9, 2, 366-370.

Younas U, Abdullah M, Bhatti JA, Pasha TN, Ahmad N, Nasir M, Hussain A (2013). Inter-relationship of body weight with linear body measurements in Hissardale Sheep at different stages of life. The Journal of Animal & Plant Sciences, 23, 1, 40-44.