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Research Article ***Araştırma Makalesi***

Loin Eye Muscle Ultrasonic Measurements, Live Weight and Some Body Measurements in Yalova Kıvırcık Lambs

Yalova Kıvırcık Kuzularında Bel Göz Kası Ultrasonik Ölçümleri, Canlı Ağırlık ve Bazı Vücut Ölçüleri

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ABSTRACT

Objective: This study was carried out to determine ultrasonic measurement parameters of the loin eye muscle characteristics, live weight and some body measurements in the marketing period of Yalova Kıvırcık lambs, and the relationships between them.

Material and Methods: The research animal material consisted of 308 Yalova Kıvırcık lambs in 9 different farms under extensive conditions in Yalova province of Türkiye.

Results: Least square means for backfat thickness (BFT), skin thickness, muscle depth (MD), body length (BL), chest girth (CG), and live weight (LW) at the mean age of 112 days were 0.20 cm, 0.15 cm, 1.94 cm, 60.50 cm, 73.82 cm, and 29.26 kg, respectively. Results of statistical analysis indicated that there was a significant difference between flocks in terms of MD, BFT, skin, BL, CG, and LW ($P<0.001$). The effect of gender was statistically significant on MD ($P<0.05$), BL ($P<0.01$), CG and LW ($P<0.001$).

Conclusion: As a result, it was found that the MLD measurements, the live weight, and some body measurements in Yalova Kıvırcık lambs were similar to those in Kıvırcık breed and in some indigenous sheep breeds in Türkiye.

Keywords: Loin eye muscle, carcass, backfat thickness, ultrasonic measurement, Yalova Kıvırcık

ÖZET

Amaç: Bu çalışma, Yalova Kıvırcık ırkına ait kuzularda pazarlama döneminde, ultrasonik yöntemle bel kası özellikleri, canlı ağırlık ile bazı vücut ölçülerini belirlemek ve aralarındaki ilişkilerin tespiti amacıyla yapılmıştır.

Materyal ve Metot: Araştırmanın hayvan materyalini Yalova'da ekstansif koşullarda yetiştirilen 9 farklı işletmede bulunan 308 adet Yalova Kıvırcık kuzusu oluşturmuştur.

Bulgular: Sırt yağı kalınlığı (BFT), deri kalınlığı, kas derinliği (MD), vücut uzunluğu (BL), göğüs çevresi (CG) ve canlı ağırlık (LW) için en küçük kareler ortalaması 112 günlük yaşta sırasıyla 0.20 cm, 0.15 cm, 1.94 cm, 60.50 cm, 73.82 cm ve 29.26 kg olarak bulunmuştur. Sürüler arasında MD, BFT, deri, BL, CG ve LW açısından istatistiksel olarak önemli fark olduğu bulunmuştur ($P<0.001$). Cinsiyetin etkisi ise MD ($P<0.05$), BL ($P<0.01$), CG ve LW ($P<0.001$) üzerinde istatistiksel olarak önemli bulunmuştur.

Sonuç: Sonuç olarak Yalova Kıvırcık kuzularında MLD ölçümleri, canlı ağırlık ve bazı vücut ölçülerinin Kıvırcık ırkı ve Türkiye'deki bazı yerli koyun ırkları ile benzerlik gösterdiği tespit edilmiştir.

Anahtar Kelimeler: Bel gözü kası, karkas, sırt yağı kalınlığı, ultrasonik ölçüm, Yalova Kıvırcık

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INTRODUCTION

Türkiye hosts a wide range of biodiversity due to its biogeographic location and there are many indigenous sheep breeds. Kıvırcık sheep breed is the best breed in terms of palatability of meat among the thin-tailed indigenous breeds, which are bred in Western Anatolia, especially in the Aegean and Marmara regions, constituting 6-7% of the total sheep population in the country. Kıvırcık sheep husbandry is carried out for lamb meat production, especially (Ekiz et al., 2009; Kaymakçı, 2010; Alarslan and Aygün, 2019). Yalova Kıvırcık is a sub-variety of the Kıvırcık breed and was registered in 2022 by being published in the Official Gazette of Türkiye (Date: 25.10.2022, Number: 31994).

In recent years, due to consumer habits preferring low-fat or lean meat, the tendency to eat lamb has increased in Türkiye as well as in the world. High yield and carcass quality are desirable features in the meat industry. Therefore, many methods have been developed to determine the composition and quality of lamb carcasses supplied to the market. Determining the carcass quality before slaughter is essential especially for businesses that carry out breeding work. One of the methods that provides fast, noninvasive, economical and more objective estimation of carcass characteristics in live animals is the ultrasonic measurement method and it is widely used (Kor ve Ertuğrul, 2000; Yılmaz et al., 2011; Fan et al., 2022). Also, the genetic evaluation for carcass characteristic in farm animal species is commonly based on measurements of the loin eye muscle, because this anatomic region represents the whole carcass (Meirelles et al., 2010). Ultrasonic measurements of the loin eye muscle in animals are of practical importance in terms of enabling selection considering measurement criteria for the improvement of some carcass characteristics and estimating the most appropriate slaughter or marketing age (Yılmaz et al., 2011).

It has been reported that there is a high level of correlation between body weight and eye muscle characteristics, and the effect of lamb body weight on muscle depth, muscle width and eye muscle area is important. (Esen ve Yıldız, 2000; Stanford et al., 2001; Cemal et al, 2007; Cemal et al, 2009). When the high-level relationships between eye muscle and body weight obtained from these studies are examined, it came into light that it is possible to use ultrasonic measurements effectively in selection programs for carcass quality (Yılmaz et al., 2011). In addition, there are studies reporting a high correlation between ultrasonic measurements and Musculus longissmus dorsi thoracis et lumborum (MLD) and fat thickness measurements and post-slaughter measurements in live animals (Fernandez et al., 1997; Gökdal et al., 2004; Cemal et al., 2007; Şahin et al., 2008).

The aim of this study was to determine ultrasonic measurement parameters of the loin eye muscle characteristics of Yalova Kıvırcık lambs and to determine live weight in the marketing period, some body measurements, and the relationships between them.

MATERIAL AND METHOD

Animal Material

The research animal material consisted of the 308 lambs of Yalova Kıvırcık sheep breed extensively raised on 9 different farms in Yalova province of Türkiye.

Method

The study was carried out in May and June 2021. The routine maintenance and feeding program of the breeders have not been interfered with. The birth weights of the lambs were determined with an electronic scale within the first 24 hours after birth and recorded with the birth data. The lambs recorded were followed until they reached their marketing weight, and the live weights of the lambs during the average weaning period (3.5-4 months) were determined with an electronic scale sensitive to 10 g. At the same time, on the day of weighing, the characteristics of the loin eye muscle (musculus longissimus thoracis et lumborum) in the region between the 12^{th} and 13^{th} ribs were determined with a linear probe (8 MHz) of an ultrasound device (Mindray DP-20Vet). Muscle depth, fat thickness, and skin thickness of the loin eye muscle were determined.

Data Analyses

Statistical analysis of the data was made using the least squares analysis method in the SPSS 22 (SPSS, 2015) package program. Duncan multiple comparison test was used to compare the subgroup means. Furthermore, correlation analysis was performed in order to determine the phenotypic correlation among the traits.

RESULTS AND DISCUSSION

Basic statistics for ultrasound measurements of musculus longissimus thoracis et lumborum (MLD), live weight, and some body measurements of Yalova Kıvırcık lambs are shown in Table 1. Also, the least squares mean for ultrasound measurements of MLD, live weight, and body measurements and factors are shown in Table 2.

Table 1. Descriptive statistics for ultrasound measurements of MLD, live weight and some body measurements

Çizelge 1. *MLD ultrason ölçümleri, canlı ağırlık ve bazı vücut ölçülerine ilişkin tanımlayıcı istatistikler*

Variable	n	X ± Sx	Min	Max	CV (%)
Live weight (kg)	308	29.26±0.409	13.24	47.80	24.51*
Muscle depth (cm)	308	1.94±0.017	0.92	2.86	15.67
Backfat thickness (cm)	308	0.20±0.003	0.10	0.41	24.23*
Skin thickness (cm)	308	0.15±0.002	0.03	0.30	22.39*
Body length (cm)	308	60.50±0.250	46	76	7.36
Chest girth (cm)	308	73.82±0.403	52	93	9.57
Age (day)	308	112.84±1.043	70	153	16.21

* = indicates a significant variance of >20%

Table 2. Least squares mean and standard error (SE) for ultrasound measurements of MLD, live weight and body measurements

Çizelge 2. *MLD ultrason ölçümleri, canlı ağırlık ve vücut ölçülerine ilişkin en küçük kareler ortalamaları ve standart hataları*

Factors	N	MD	BFT	Skin	BL	CG	LW
Herds		***	***	***	***	***	***
1	42	2.20±0.041^{a}	0.25±0.007^{a}	0.17±0.006^{a}	61.95±0.606^{ab}	77.62±0.830^{bc}	33.21±0.971^{b}
2	48	1.75±0.035^{d}	0.17±0.057^{de}	0.14±0.003^{cd}	59.40±0.658^{cd}	70.43±0.962^{d}	26.48±0.871^{de}
3	18	2.05±0.101^{bc}	0.22±0.004^{b}	0.14±0.008^{cd}	63.38±0.662^{a}	78.50±0.912^{ab}	35.80±1.166^{ab}
4	31	1.81±0.062^{d}	0.22±0.008^{b}	0.17±0.006^{ab}	58.16±0.846^{de}	68.65±1.042^{d}	24.90±1.052^{ef}
5	46	1.97±0.038^{c}	0.19±0.004^{cd}	0.16±0.004^{bc}	61.23±0.540^{bc}	77.15±0.797^{bc}	30.07±0.839^{c}
6	20	1.94±0.049^{c}	0.18±0.005^{de}	0.13±0.006^{d}	62.00±0.672^{ab}	74.60±1.177^{c}	29.28±1.025^{cd}
7	38	2.14±0.027^{ab}	0.20±0.006^{bc}	0.14±0.005^{d}	64.05±0.543^{a}	80.60±0.802^{a}	36.48±0.973^{a}
8	21	1.80±0.032^{d}	0.16±0.004^{e}	0.15±0.007^{cd}	59.04±0.803^{de}	69.00±1.100^{d}	23.08±1.094^{e}
9	44	1.78±0.030^{d}	0.18±0.005^{de}	0.14±0.003^{cd}	57.00±0.571^{e}	68.60±0.825^{d}	24.80±0.811^{ef}
Type of birth							
1	163	1.95±0.024	0.21±0.003	0.16±0.003	60.88±0.36	74.14±0.55	29.82±0.580
2	145	1.93±0.025	0.20±0.004	0.15±0.003	60.08±0.36	73.50±0.60	28.63±0.572
Gender		*			**	**	***
Male	142	1.97±0.260	0.20±0.04	0.15±0.002	61.30±0.410	74.93±0.630	31.35±0.675
Female	166	1.90±0.230	0.20±0.04	0.16±0.002	59.82±0.310	72.86±0.510	27.48±0.450
Reg. lin. LW		0.505±0.002***	0.103±0.000***	0.020±0.000*	0.635±0.021***	0.762±0.027***	

***P<0.001, **P<0.01, *P<0.05, MD: Muscle depth, BFT: Backfat thickness, BL: Body length, CG: Chest girth, LW: Live weight

Table 3. Phenotypic correlation coefficients between live weight, ultrasonic measurements of MLD and body measurements

Çizelge 3. *Canlı ağırlık, MLD ultrason ölçümleri ve vücut ölçüleri arasındaki fenotipik korelasyon katsayıları*

	LW	MD	BFT	Skin	BL
MD	0.711**				
BFT	0.320**	0.383**			
Skin	0.143*	0.182**	0.312**		
BL	0.797**	0.610**	0.210**	0.156**	
CG	0.873**	0.703**	0.306**	0.200**	0.779**

**P<0.01, *P<0.05, MD: Muscle depth, BFT: Backfat thickness, BL: Body length, CG: Chest girth, LW: Live weight

In this study least squares means for live weight, muscle depth, backfat thickness, skin, body length, and chest girth were found to be 29.26 kg, 1.94 cm, 0.20 cm, 0.15 cm, 60.50 cm, and 73.82 cm, respectively. These results are compared with similar studies; for live weight of Yalova Kıvırcık lambs (28.58 kg) (Alarslan ve Aygün, 2019), Kıvırcık lambs (28.87 kg) (Cemal et al., 2017), Sakız and Sönmez lambs (29.01 and 27.56) (Çörekçi and Evrim, 2001) similar results were reported with this study. This weight was determined to be higher than those reported by Altın et al. (2003) and Yılmaz et al. (2014) for Kıvırcık lambs (20.34 and 26.74 kg). Şireli and Ertuğrul's (2004) finding for Akkaraman lambs (31.55 kg) and that of Yılmaz et al. (2014) for Karacabey Merino (38.07 kg) lambs were heavier than our finding for Yalova Kıvırcık lambs. Compared to similar studies, the values of the body length and chest girth were determined to be higher than some studies, lower than some studies and similar to some studies (Aksakal et al., 2009; Yilmaz et al., 2016; Alarslan and Aygün, 2019).

Compared to similar studies, the muscle depth in this study was higher than those reported by Yılmaz et al (2014) in Karya lambs (1.77 cm), by Yılmaz et al (2016) in White Dorper lambs (1.67 cm), White Dorper x Merino lambs (1.81 cm), Black Dorper lambs (1.75 cm), and Black Dorper x Merino lambs (1.84 cm), and that reported by Duman and Ulutaş (2018) in Karayaka lambs (1.73 cm). However, the average MD of the Yalova Kıvırcık lambs was lower than those determined by Sahin et al (2008) in Akkaraman lambs (2.20 cm), by Yılmaz et al (2014) in Kıvırcık lambs (2.02 cm) and Karacabey Merino lambs (2.47 cm), by Yaralı and Yılmaz (2014) in Karya male (2.12 cm) and female lambs (2.24 cm). In addition, the MD of the Yalova Kıvırcık lambs was similar to that reported by Cemal et al (2007) for Kıvırcık sheep. Compared to similar studies, the backfat thickness and skin values determined were higher than those reported in some studies, lower than some studies and similar to those reported in some studies (Cemal et al., 2007; Yaralı and Yılmaz, 2014; Grill et al., 2015; Duman and Ulutaş, 2018).

The analysis results indicated that there was a significant difference between flocks in terms of MD, BFT, skin, BL, CG and LW ($P<0.001$) in the study (Table 2). Birth type showed no significance in MD, BFT, skin, LW and body measurement parameters. The effect of gender was statistically significant on MD ($P<0.05$), on BL ($P<0.01$) and CG, and on LW ($P<0.001$); in addition to this, male lambs were found to be heavier than female lambs. The coefficients for the regression of live weight on MD, BFT, BL and CG measurements were found to be highly significant ($P<0.001$) and found to be significant on skin ($P<0.05$). Similar results were obtained in other studies (Cemal et al., 2007; Yaralı and Yılmaz, 2014; Yılmaz et al., 2014; Orman et al., 2008; Akdag et al., 2015). Statistical differences in MD, BL, CG and LW were as expected for gender. The difference between the flocks was found to be statistically significant for all parameters examined. It can be said that the reason for this may be the care, feeding, and breeding conditions among the flocks.

Phenotypic correlation coefficients between live weight, ultrasonic measurements of MLD and body measurements of Yalova Kıvırcık lambs are given in Table 3. All phenotypic correlation coefficients were found positive and significant ($P<0.01$, $P<0.05$). The highest coefficient was found between body weight and chest girth ($r = 0.873$, $P<0.01$) and the lowest correlation coefficient was found between skin thickness and body weight ($r = 0.143$, $P<0.05$). A high correlation coefficient was determined between live weight and body measurements, and a high correlation was found between body weight and MLD parameters.

CONCLUSION

Kıvırcık sheep husbandry has been carried out especially for lamb meat production in Western Türkiye. Ultrasonic measurements of the lumbar eye muscle in animals are important both in terms of estimating the most appropriate slaughter or marketing age of lambs and in providing selection according to the measurement criteria for the purpose of breeding some carcass characteristics. Thus, looking at pre-slaughter ultrasonic measurements will both accelerate animal breeding in terms of meat production and increase operating profitability.

In this study, it was found that Yalova Kıvırcık lambs were similar to other indigenous sheep breeds for MLD measurements, live weight, and some body measurements in Türkiye.

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