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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 11 (7): 1051-1054, 2008
ISSN 1028-8880

Introducing the *Karayaka* Sheep Breed with its Traits and Influencing Factors

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Abstract: This study was planned to express the detailed traits of Karayaka sheep reared in Tokat province, also influencing factors on the traits were evaluated. While year effect was significant on 8 weeks weight, scanning weight, fat depth and muscle area, all the evaluated traits including birth weight and muscle depth were significantly affected by season ($p<0.05$). Dam age was significant on birth weight ($p<0.05$). Birth weight and 8 week weight were significantly affected by sex and birth type. Sex effect has been appeared on muscle depth while birth type effect has been detected on scanning weight ($p<0.05$). While the strongest phenotypic correlation coefficient was detected between muscle depth and muscle area, the weakest ones were found between birth weight and scanning traits.

Key words: Karayaka sheep, phenotypic traits, scanning measurements

INTRODUCTION

Because of the adaptation ability, indigenous sheep breeds are valuable livestock sources for a specific geography. Many indigenous sheep breeds reared across wide range of Turkey and their importance is irrefutable for economy, rural employing and human food. Additionally sheep and their products occupy an irreplaceable position in the customs of Turkish daily life. Karayaka is one of the indigenous breed reared in the Middle and East Black Sea region. The breed is mainly kept for its delicious meat. Besides, its wool is widely used for weaving traditional quilt, mattress and carpet. Karayaka sheep, numbering about 1,300,000 are highly adapted to the harsh environment of the area. Being a non-fat tailed sheep in a harsh environment makes the breed more interesting, this special character also brings a positive advantage for carcass grading system in terms of dressing percentage. All these traits give an important role to the breed to survive in harsh environment and produce meat for the sector.

Although there were not intensive studies, limited researches existed on Karayaka sheep. Liveweights of Karayaka for yearlings and breeding ewes were reported as 48.4 and 51.1 kg by (Atasoy *et al*., 2003). While birth rate, birth weight and weaning weight of the breed were determined as 92.3%, 3.1 and 19.5 kg by Ünal *et al*. (2003) and Balci and Karakaş (2007) were suggested the optimum slaughter weight as 40 kg for male Karayaka lambs.

Carcass traits and their determination before slaughtering are very important for meat type sheep. Therefore determining the muscle and fat depth in live animals with ultrasound technique is a useful application. Many researchers employed this technique on sheep, especially to produce leaner meat (Young and Deaker, 1994; Stanford *et al*., 1995; Simm *et al*., 2002; Kvame and Vangen, 2007). Existence of portable ultrasound imaging technology for live animals has made it feasible to collect carcass composition data without the time and expense of post-slaughter tests (Cross and Longnecker, 1989).

Karayaka breed do not have the fame it deserves, therefore to perform the specific studies on the breed are essential. Determining the phenotypic characters is crucial for a breed to make it known by public but it is quite difficult to perform this kind of study at village level, therefore this study was planned to express the detailed traits of Karayaka sheep reared in college farm of Gaziosmanpaşa University, in Tokat province.

MATERIALS AND METHODS

Data were collected from an experimental nucleus flock of Karayaka sheep at the college farm of Gaziosmanpasa University between the years of 2005 and 2007. The flock was managed according to basic rules of sheep keeping and local necessities. Animals were weighed at birth (BW) and 8 week of age (8 WW) and at ultrasonic scanning (SW) at approximately 150 days of

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age. At scanning, muscle depth (MD), fat depth (FD) and muscle area (MA) at the third lumbar were recorded. In the analyses, as shown in Table 1, both MD and FD traits were also phenotypically adjusted to correct for body weight.

Table 1: Descriptive values of evaluated traits

Traits	N	Mean±SE	Std. Dev.	Min.	Max.	CV (%)
Birth weight (kg)	352	3.68±0.04	0.68	1.90	6.00	18.5
Ewe weight after birth (kg)	350	49.38±0.30	5.61	35.25	66.85	11.3
Suckling length (day)	343	57.48±0.22	4.05	45.00	84.00	7.0
8 weeks weight (kg)	337	14.93±0.19	3.46	6.05	26.95	23.2
Scanning age (day)	337	147.44±0.72	13.29	112.00	196.00	9.0
Scanning weight (kg)	280	25.46±0.31	5.17	10.90	42.80	20.0
Muscle depth (cm)	280	1.85±0.02	0.32	0.95	2.68	17.3
Fat depth (cm)	280	0.26±0.01	0.08	0.10	0.56	30.0
Muscle area (cm^2)	175	5.98±0.11	1.51	2.04	9.52	25.0

Table 2: Effects included in the models for the evaluated traits

Traits	Year	Season	Dam age	Sex	Birth type	Covariates
Birth weight (BW)	✔	✔	✔	✔	✔	Ewe weight after birth
8 week weight	✔	✔	✔	✔	✔	
Scanning weight	✔	✔		✔	✔	
Muscle depth	✔	✔		✔	✔	Scanning weight
Fat depth	✔	✔		✔	✔	Scanning weight
Muscle area (cm^2)	✔	✔		✔	✔	Scanning weight

Additionally suckling length and scanning age were considered as covariates for 8 weeks weight and scanning weight but, because of their non-significant effects on the mentioned traits they were not included in the certain models (Table 2). General Linear Models were used for the analyses of the traits; included fixed effects in the models were shown in Table 2. Significance level between the subgroups of fixed effects was determined by Tukey test. Minitab statistical package was employed for the analyses.

RESULTS

Results from the applied statistical model for each evaluated trait were shown in Table 3. While year effect was significant on 8 WW, SW, FD and MA, all the evaluated traits were significantly affected by season ($p<0.05$). Higher mean values generally accumulated in year 2005 but similar gathering was not observed in the seasons. Dam age was significant on birth weight ($p<0.05$) but this significance was not observed on 8 WW ($p>0.05$). Therefore dam age has not been included in the models for successive analyses. Birth weight and 8 WW were significantly affected by sex and birth type, later on sex effect has been appeared on muscle depth while birth type effect has been detected on scanning weight ($p<0.05$). Other traits were not affected by any of sex and birth type ($p>0.05$). In general, measurements of singles and males were higher than twins and females.

Relationship among the scanning measurements was tested with correlation analyses and demonstrated in Table 4.

Table 3: Means with SE for evaluated traits according to effects included the models

	BW	8 WW	SW	MD	FD	MA
Years	-	***	***	-	*	***
2005	3.45±0.22	17.15±0.10^a	24.22±1.59^a	1.78±0.08	0.20±0.03^b	6.61±0.40^a
2006	3.42±0.13	16.86±0.65^a	23.31±1.21^a	1.75±0.06	0.25±0.02^a	6.13±0.29^a
2007	3.33±0.12	13.71±0.64^b	20.98±1.17^b	1.78±0.06	0.26±0.02^a	4.79±0.31^b
Season	**	**	***	***	**	***
Spring	3.79±0.11^a	16.41±0.51^a	23.42±0.65^a	1.74±0.03^a	0.21±0.01^a	5.81±0.19^a
Summer	3.07±0.39^{bc}	18.91±1.96^{ab}	18.65±4.44^{ab}	1.46±0.23^{ab}	0.22±0.07^{ab}	5.26±1.07^{ab}
Autumn	3.15±0.18^b	12.82±0.90^b	24.55±0.71^b	2.03±0.04^c	0.27±0.01^b	5.72±0.18^b
Winter	3.55±0.10^{ac}	15.48±0.48^b	26.06±0.55^b	1.85±0.03^b	0.24±0.01^b	6.59±0.16^b
Dam age	**	-	( )	( )	( )	( )
3	3.30±0.21^{ab}	15.92±1.00				
4	3.25±0.13^a	15.48±0.63				
5	3.40±0.13^{ab}	15.81±0.65				
6	3.64±0.14^b	16.41±0.71				
Sex	**	**	-	**	-	-
Male	3.51±0.13	16.55±0.64	23.26±1.22	1.73±0.06	0.24±0.02	5.69±0.30
Female	3.28±0.14	15.25±0.67	23.08±1.21	1.81±0.06	0.24±0.02	5.99±0.30
Birth type	***	***	***	-	-	-
1	3.77±0.13	17.80±0.62	25.50±1.17	1.76±0.05	0.24±0.02	5.74±0.28
2	3.03±0.14	14.00±0.70	20.84±1.28	1.77±0.06	0.23±0.02	5.94±0.33

( ): Not included the model, -: ($p>0.05$), *$p<0.05$, **$p<0.01$, ***$p<0.001$, (a,b,c) Differences between the groups having same superscripts in columns are not significant ($p>0.05$)

Table 4: Results from correlation analysis among the evaluated traits

Traits	Birth weight	8 week weight	Scanning weight	Muscle depth	Fat depth
8 week weight	0.55***				
Scanning weight	0.35***	0.60***			
Muscle depth	0.11 -	0.23***	0.64 ***		
Fat depth	0.06 -	0.17**	0.37***	0.45***	
Muscle area	0.14 -	0.33***	0.60***	0.74***	0.50***

-: ($p>0.05$), **$p<0.01$, ***$p<0.001$

As expected, all the correlation coefficients were positive among the evaluated traits ($p<0.01$-0.001). While the strongest correlation coefficient was detected between muscle depth and muscle area, the weakest ones were found between birth weight and scanning traits. Non-significant correlations were detected between the birth weight and scanning traits ($p>0.05$). Moderate correlations were defined among the scanning traits and between the 8 weeks weight and the weights of birth and scanning.

DISCUSSION

Making a study on a breed which is not known openly is important for its recognition by both breeders and scientist. Therefore obtained and presented data gave an opportunity to publicity of Karayaka sheep. Year affected 8 WW, SW and MA and there was a decreasing trend in these traits from year 2005 to 2007. The effect of years reflects the different environmental influences on phenotypic measurements. Therefore detected decreasing in weights and muscle area can be explained with the quite dry seasons at the last two years in the province. Similarly, Fogarty *et al.* (1994) and Nsoso *et al.* (1994) have noted liveweight and tissue depth differences according to years in various sheep breeds.

Season significantly affected all the traits ($p<0.01$-0.001) but there was not a constant trend on the traits. Higher and lower values of the traits were located in different seasons. Similar result about the significant but fluctuating effect of season on sheep weights were reported by the researchers Alamer and Al-Hozab (2004).

The effect of dam age was significant on birth weight ($p<0.01$), but this significance has not been noticed in 8 WW ($p>0.05$), so this effect was not investigated in following analyses. The highest birth weights were located in older aged dams like reported by Atkins *et al.* (1991) and Gilmour *et al.* (1994).

Birth weight, 8 weeks weight and muscle depth were affected by sex, while males were producing more weight in birth and 8 weeks, females muscle depth was deeper than males ($p<0.01$). While Bedhiaf and Djemali (2006) were reporting the higher muscle dept in male lambs, Barone *et al.* (2007), Kvame and Vangen (2007) and Maxa *et al.* (2007) showed the non-significant effect of sex on muscularity. Defined noteworthy deeper muscle depth in females might be a characteristic of Karayaka. The most dramatic difference was observed in 8 WW between two sexes; male lambs were on average 1.3 kg heavier than female lambs. Significant differences in weights between male and female sheep were reported by Iman and Slyter (1993) with males being heavier than females. Atasoy *et al.* (2003) also reported the significant effect of sex on Karayaka yearlings.

The effect of rearing type, single or twin, was significant for all weight traits, with single lambs having significantly larger values ($p<0.001$). Other scanning measurements were not affected by the birth type. Gilmour *et al.* (1994), Bishop (1993) and Brash *et al.* (1992) also reported the effect of rearing type both on weight and scanning traits.

In a comprehensive study reported by Unal *et al.* (2003), year, dam age, sex and birth type effects were significant on both birth and 90 day weights of Karayaka lambs. They also reported similar birth weight (3.8 kg) with the corresponding study (3.7 kg) for the breed.

Importance of scanning in live farm animals will be more important in following years for the early evaluation of carcass traits. Using this technique in Karayaka sheep gave opportunities in both demonstrating the application and arise the related traits in Karayaka.

CONCLUSION

A primarily phenotypic analysis was conducted on the production traits of Karayaka breed and the effective factors on the traits were evaluated. These presented data from the birth to the scanning were the first for Karayaka sheep; therefore the corresponding study is essential for the announcement of the breed for the scientific literature and livestock sector. With the base of this project, the breed can be studied in more detail. Employing the quantitative genetics analyses in first place for the successive studies can play vital role in characterisation of Karayaka.

ACKNOWLEDGMENTS

This research is a part of a comprehensive project which was financially supported by TÜBİTAK (The Scientific and Technical Research Council of Turkey) and authors gratefully acknowledge TÜBİTAK for the valuable helps in every stage of the study.

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