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Full Length Article

Phenotypic Characteristics of Turkish Mules

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ABSTRACT

This study was realized to define some phenotypic characteristics of Turkish mules raised in Balikesir, Hakkari, Icel, Mardin, Ordu, Sirnak and Van provinces of Turkey. A total of 236 (121 males & 115 females) mules in four age groups (3-5, 6-7, 8-9 & 10-30 years) were included in the study. Measurements of different morphological traits of mules were: withers height (130.6 cm), height at rump (130.7 cm), body length (133.9 cm), heart girth circumference (149.6 cm), chest depth (59.7 cm), cannon circumference (16.5 cm) and head length (55.6 cm).The distributions of color were: bay 42.8%, white 23.7%, black 16.5%, chestnut 7.6%, mouse gray 7.6%, buckskin 0.8% and isabelline 0.8%. There was no significant difference for morphological dimensions except the traits of cannon circumference and head length being higher ((P<0.05, (P<0.01) in males than in the females. There was no difference in the body sizes among different age groups of mules. After two years of age, however, there was minor growth in the Turkish mules.

Key Words: *Equus mulus;* Mule; Phenotypic trait; Genetic resource; Turkey

INTRODUCTION

Turkey is not like a geographic bridge, but also it is a cultural bridge. Turkey has been a passageway, so it carries lot of fingerprints belonging to various civilizations. Because of this side, Turkey has a rich array of farm animal genetic resource. It is possible to find various animal species in a narrow piece of land (Wilson *et al.*, 2011; Yilmaz & Ertugrul, 2011; Yilmaz *et al*., 2011a-c; Yilmaz *et al*., 2012).

A mule is not a genus, species or breed, but a hybrid offspring of a donkey (*Equus asinus*)and ahorse (*E. caballus*). Mules are sure-footed and sturdy animals. They can live longer than horses. They are generally known as less stubborn, faster and smarter than donkeys (Yarkin, 1962; Sonmez, 1973). Although the diploid chromosome numbers are 64 for horses and 62 for donkeys, it is 63 for the mule. Hence, mule is a sterile animal (Anderson, 1939; Jones, 1985; Trujillo *et al*., 1991).

About 100 years ago in Turkey, mules used to be raised in mountainous areas of Black Sea, Marmara Regions, and Taurus mountain range (Yarkin, 1962). Nowadays mules are raised in provinces of Ordu, Van, Hakkari, Sirnak, Mardin, Icel and Balikesir, which have mountainous areas. In provinces of Van, Hakkari, Sirnak, Mardin mules are used for fuel-oil and cigarette smuggling between Turkey and Iran and Turkey and Iraq. They are used by small scale farmers to carry wood material or some belongings of them in provinces of Ordu, Icel and Balikesir (personal communication).

There is dearth of literature on the morphological characteristics of Turkish mules except that of Yilmaz *et al.* (2011).This paper describes phenotypic characteristics of Turkish mules having different origins within Turkey.

MATERIALS AND METHODS

Experimental animals: In this study a total 236mules, 121 males and 115 females, were examined in Balikesir (39° 39'N; 27° 53'E), Hakkari (37° 34'N; 43° 44'E), Icel (36° 48'N; 34° 38'E), Mardin(38°19'N; 40°44'E), Ordu (40° 59'N; 37° 53'E), Sirnak (37° 31'N; 47° 27'E), and Van (38° 29'N; 43° 21'E) (Anonymous, 2011a). The mules were grouped into four age groups of 3-5, 6-7, 8-9 and 10-30 years. Ages were determined from the information given by owner of mules.

Measurements: The study was carried out from November 2010 to November 2011. Withers height (WH), height at rump (HR), body length (BL), and chest depth (CD) were measured using a measuring stick. Heart girth circumference (HGC), cannon circumference (CC), and head length (HL) were measured with a specially graduated metal measuring tape (Yildirim, 2007).

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Statistical analysis: Data were analyzed using the Minitab 15 statistical software program. Descriptive statistics for body dimensions were analyzed using the ANOVA and Student's T-Test that also determined the impact of sex, region, body coat color and age group on the response variables of WH, HR, BL, HGC, CD, CC and HL (Anonymous, 2011b).

RESULTS

The distributions of color were: bay 42.8%, white 23.7%, black 16.5%, chestnut 7.6%, mouse gray 7.6%, buckskin 0.8% and isabelline 0.8% as given in Table I. So, majority of the animals had bay color. There was no difference in the morphological traits between males and females except for CC and HL. The observed values were higher in males than females for CC (P<0.05) and HL (P<0.01). The considered age groups and coat color were not significantly different in morphological dimensions of mules. On an overall basis, mules of Icel, Sirnak and Madin origin had superior morphological dimensions compared with other origins (Table I). The phenotypic correlation coefficient values (r) are shown in Table II. All of the observed traits were affected by selected factors (P<0.01, P<0.05). The other high values were observed between WH-CD (r = 0.78), HR-CD (r = 0.72), HR-BL (r = 0.70), and WH-BL (r = 0.67) those higher values than r = 0.50 (P<0.01). The lowest correlation values were between CD and CC (r = 0.16) (P<0.01). The other low values were CD-HL (r = 0.20), HGC-HL (r = 0.27), BL-CC (r = 0.33), HR-CC (r = 0.33), BL-HL (r = 0.33), HGC-CD (r = 0.34), WH-CC (r = 0.35), and HGC-CC (r = 0.39) those lower values than r = 0.40 (P<0.01). There were no negative correlations among all traits as seen in Table II.

DISCUSSION

Descriptive statistics of morphologic traits revealed that male and female mules were similar in size for all traits except the traits of CC and HL.

In age groups, there were no significant differences in four age groups shown in Table I. It showed that after 2 years

Table I: Descriptive statistics and comparison results of the phenotypic traits in different sex, regions, ages and body coat colours in Turkish mules

Trait		WH (cm)	HR (cm)	BL (cm)	HGC (cm)	CD (cm)	CC (cm)	HL (cm)
		$\bar{X} \pm S_{\bar{X}}$	$\bar{X} \pm S_{\bar{X}}$	$\bar{X} \pm S_{\bar{X}}$	$\bar{X} \pm S_{\bar{X}}$	$\bar{X} \pm S_{\bar{X}}$	$\bar{X} \pm S_{\bar{X}}$	$\bar{X} \pm S_{\bar{X}}$
Sex	Overall(n=236)	130.5 ± 0.49	130.7 ± 0.50	133.9 ± 0.49	149.6 ± 0.46	59.7 ± 0.34	16.5 ± 0.07	55.6 ± 0.26
	Male(n=121)	131.2 ± 0.72	131.0 ± 0.74	133.8 ± 0.65	149.3 ± 0.67	60.1 ± 0.51	16.7B ± 0.11	56.3b ± 0.38
	Female(n=115)	129.9 ± 0.64	130.3 ± 0.68	134.0 ± 0.74	149.8 ± 0.63	59.2 ± 0.45	16.3A ± 0.09	54.9a ± 0.34
Region	Balıkesir(19)	130.7b ± 1.75	132.1bc ± 1.54	133.8ab ± 1.88	147.2a ± 1.69	59.7b ± 1.38	16.4 ± 0.24	55.3ab ± 0.96
	Hakkari(29)	131.5b ± 1.13	131.9bc ± 1.17	135.6b ± 1.45	148.6ab ± 1.34	61.0b ± 0.75	16.2 ± 0.20	54.6a ± 0.81
	Mardin(21)	134.7c ± 1.73	134.1bc ± 1.63	135.8b ± 1.79	150.9ab ± 2.15	61.6b ± 1.18	16.7 ± 0.35	55.0ab ± 0.96
	Icel(14)	137.0c ± 2.53	138.3c ± 2.58	136.0b ± 2.65	148.3ab ± 1.59	63.7b ± 2.92	17.1 ± 0.22	58.4b ± 0.97
	Ordu(54)	125.5a ± 0.67	124.4a ± 0.73	130.1a ± 0.84	152.3b ± 0.76	56.2a ± 0.34	16.6 ± 0.16	55.8ab ± 0.26
	Sirnak(37)	133.4bc ± 1.15	134.5c ± 1.05	136.0b ± 1.21	148.9ab ± 1.18	60.7b ± 0.80	16.7 ± 0.18	56.6ab ± 0.77
	Van(62)	139.9b ± 0.87	129.9b ± 0.89	134.2b ± 0.83	148.5a ± 0.84	59.8b ± 0.53	16.3 ± 0.11	54.9a ± 0.53
Age	3-5 years(n=60)	130.1 ± 0.94	130.0 ± 1.00	134.7 ± 1.01	150.3 ± 0.75	59.0 ± 0.56	16.5 ± 0.13	55.9 ± 0.47
	6-7 years(n=52)	130.2 ± 0.94	129.9 ± 0.92	133.1 ± 0.90	150.2 ± 0.83	59.4 ± 0.73	16.5 ± 0.15	55.8 ± 0.62
	8-9 years (n=67)	130.8 ± 0.96	130.9 ± 0.99	133.6 ± 0.96	148.8 ± 1.11	59.7 ± 0.63	16.5 ± 0.15	55.1 ± 0.49
	10-30 years (n=57)	131.1 ± 1.04	131.7 ± 1.09	134.2 ± 1.04	149.1 ± 0.87	60.6 ± 0.83	16.7 ± 0.14	55.7 ± 0.49
Coat Colour	Chestnut (n=18)	130.6 ± 1.41	131.2 ± 1.29	135.2 ± 1.57	150.1 ± 1.18	59.3 ± 1.09	16.3 ± 0.18	56.5 ± 0.81
	Bay (n=101)	131.4 ± 0.82	131.5 ± 0.85	134.5 ± 0.77	150.0 ± 0.78	60.4 ± 0.58	16.6 ± 0.12	55.7 ± 0.42
	Mouse Gray (n=18)	131.9 ± 1.34	132.1 ± 1.15	136.3 ± 1.51	148.9 ± 1.45	60.3 ± 1.14	16.3 ± 0.28	54.0 ± 1.01
	Isabelline (n=2)	126.5 ± 4.50	126.5 ± 6.50	123.5 ± 6.50	137.5 ± 8.50	56.0 ± 6.00	15.0 ± 0.50	52.5 ± 2.50
	White (n=56)	130.3 ± 0.97	130.4 ± 0.98	133.0 ± 0.93	148.2 ± 0.91	59.5 ± 0.65	16.4 ± 0.13	55.1 ± 0.52
	Buckskin (n=2)	119.0 ± 1.00	116.5 ± 0.50	123.0 ± 0.00	143.5 ± 1.50	54.6 ± 0.50	16.0 ± 0.50	54.5 ± 0.50
	Black (n=39)	128.9 ± 1.07	128.7 ± 1.21	133.2 ± 1.28	151.2 ± 0.94	58.3 ± 0.73	16.9 ± 0.17	56.4 ± 0.53

A, B: P<0.05, a, b: P<0.01;* There were no significant differences between means showed by the same letters of alphabet in the same column and factor group; WH= Withers height, HR= Height at rump, BL= Body length, HGC= Heart girth circumference, CD= Chest depth, CC= Cannon circumference, HL= Head length

Table II: Phenotypic correlation coefficient values (r) among body measurements in mules

Traits	WH	HR	BL	HGC	CD	CC
HR	0.94**					
BL	0.67**	0.70**				
HGC	0.48**	0.44**	0.57**			
CD	0.78**	0.72**	0.46**	0.34**		
CC	0.35**	0.33**	0.33**	0.39**	0.16*	
HL	0.40**	0.41**	0.33**	0.27**	0.20**	0.59**

*P<0.05, **P<0.01; WH= Withers height, HR= Height at rump, BL= Body length, HGC= Heart girth circumference, CD= Chest depth, CC= Cannon circumference, HL= Head length

of age there was no significant difference among all age groups. It can be said that growing nearly completed until 3 years of age and then there was a minor growth. Observed values also showed that coat color did not affect the body size and all mules are similar in size according to coat color.

Yilmaz *et al*. (2011) studied on mules which were raised in region of East Anatolia and reported that withers height was 130.4 cm, height at rump 130.5 cm, body length 134.6 cm, heart girth circumference 148.6 cm, chest depth 60.2 cm, cannon circumference 16.2 cm, and head length 54.7 cm. Results of the present study supported those of Yilmaz *et al*. (2011). Burden (2011) reported some measurements of animals in Donkey Sanctuary, UK as: withers height was 120.4 cm, height at rump 121.8 cm, body length 122.6 cm, heart girth circumference 147 cm, cannon circumference 14.8 cm, head length 55.2 cm, and ear length 19 cm. However, values for morphological traits in the current study were higher than those reported by Burden (2011). The values of Turkish mules were about 10% higher than UK mules for the traits of WH, HR and BL. The traits of HGC, CC and HL in this study were slightly higher than values of Burden (2011). Therefore, Turkish mules are larger than UK mules in body size. There were significant coefficient correlations ($P<0.01$, $P<0.05$) among all traits (Table II).

CONCLUSION

The present data demonstrated that Turkish mules are native farm animal source of Turkey and they were larger than UK mules. The factors of age and coat color did not affect body sizes and after 2 years of age there were minor growth in Turkish mules.

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