

Some Morphological Traits of Mules Raised in East Region of Turkey

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ABSTRACT: This is the first document in the world either on Turkish mules or foreign mules related with phenotypic traits. The aim of this study is to determine mules morphologically. This study was realized to define morphological dimensions by analyzing sex, regions, coat colour, and age for Turkish mules. Data were analyzed for ANOVA and Student's T-Test using the Minitab statistical programme. In this study in a three age group (4-6, 7-9 and 10-16 years) a total of 89 (45 male and 44 female) mules was used. Descriptive statistics of morphologic traits for withers height were 130.4±0.71 cm, height at rump 130.5±0.73 cm, body length 134.6±0.74 cm, heart girth circumference 148.6±0.73 cm, chest depth 60.2±0.44 cm, cannon circumference 16.2±0.13 cm, and head length 54.7±0.45 cm. In this study the distributions of bay colour were 61.8%, mouse gray 23.6%, black 9.0%, chestnut 3.4%, and isabelline 2.2%.

Keywords: Mule, morphologic traits, body measurement, coat colour

Türkiye'nin Doğusunda Yetiştirilen Katırların Bazı Morfolojik Özellikleri

ÖZET: Bu çalışma, Türkiye veya dünyada katırlara ait ilk morfolojik çalışma özelliğini taşımaktadır. Çalışmanın amacı katırların morfolojik özelliklerini belirlemektir. Gerçekleştirilen bu çalışmada cinsiyet, yetiştirme bölgesi, vücut rengi ve yaş faktörlerine bağlı olarak Van ve Hakkari vilayetlerinde yetiştirilen katırlarının morfolojik özellikleri analiz edilmiştir. Veriler ANOVA ve Student T-Test kullanılarak Minitab istatistik programında hesaplanmıştır. Çalışmada 4-6, 7-9 ve 10-16 olmak üzere üç farklı yaş gurubundaki, 45 erkek ve 44 dişi olmak üzere 89 adet katır kullanılmıştır. Morfolojik özelliklere ait tanımlayıcı istatistik değerler cidago yüksekliği 130.4±0.71, sağrı yüksekliği 130.5±0.73, vücut uzunluğu 134.6±0.74, göğüs çevresi 148.6±0.73, göğüs derinliği 60.2±0.44, ön incik çevresi 16.2±0.13 ve baş uzunluğu 54.7±0.45 cm olarak bulunmuştur. Çalışmada vücut renklerine ait oranlar doru renk % 61.8, fare bozu % 23.6, siyah % 9.0, al % 3.4 ve izabel % 2.2 olarak hesaplanmıştır.

Anahtar Kelimeler: Katır, morfolojik özellik, vücut ölçüsü, vücut rengi

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INTRODUCTION

A mule (Figure 1) is a crossbred hybrid of the species of donkey and horse. In the world mules are known as patient and sure-footed animals. They are also sturdy, long-lived, stubborn animals (Yarkın, 1962; Anonymous, 2011b) even though the diploid chromosome number is 64 for horse and 62 for donkey, mule have 63 chromosomes (Trujillo, 1991). Hence both male and female mules are sterile and cannot reproduce, although they have all genitals. There were only few evidence that mule reproduced (Anderson, 1939; Jones, 1985; Anonymous, 2011a; Anonymous, 2011b).

About 100 years ago in Turkey mules used to be raised in mountainous areas of Karadeniz, and Marmara Regions, and Toros mountain range (Yarkın, 1962). Nowadays mules are mainly raised in provinces of Ordu, Van, Hakkari, Şırnak, Mardin, İçel, and Balıkesir which have mountainous areas. At the present time mules are used either as a pack animal (Figure 2) or for smuggling (Figure 3 and 4) Either in Turkish or in world literature there were none of scientific contributions on mules related with body sizes. The only Yarkın (1962) reported some information on mules but did not give measurements. There were also none of data on body sizes of mules, but some data were got via personal communi-



Figure 1. A mule in a very rare Akkanat sorrel colour in Hakkari (Photo by Dr. O. Yılmaz).



Figure 3. A fleet of mules resting belonging to one person engaged in fuel smuggling across the Iran border in Başkale County of Van Province (Photo by Dr. O. Yılmaz).



Figure 2. A saddled gray mule used to carry belongings of a shepherd in rural area of Çukurca County of Hakkari Province (Photo by Dr. O. Yılmaz).



Figure 4. Two mules grazing used for smuggling across the Iraq border in Çukurca County of Hakkari Province (Photo by Dr. O. Yılmaz).

Table 1. Body sizes of mules which are under protection of the Donkey Sanctuary of UK*

Name	Age	WH**	HR	BL	HGC	CC	HL	EL
Gretel King	25	152	155	139	182	17	63	23
Jethro King	28	131	132	133	156	17	67	22
Henry Blease	7	118	118	115	149	15	52	19
Chad	9	104	105	120	128	13	50	16
Ronnie Leone	5	97	99	106	120	12	44	15
\bar{X}	14.8	120.4	121.8	122.6	147	14.8	55.2	19

* The data of mules belonged to Liz Hazell-Smith (Senior Research Assistant, www.thedonkeysanctuary.org.uk, UK) and data was sent via Dr. Faith Burden (Head of Research, www.thedonkeysanctuary.org.uk, UK) (Anonymous, 2011^c)

** WH= Withers height, HR=Height at rump, BL=Body length, Heart Girth Circumference, CC=Cannon Circumference, HL= Head length, and EL, Ear length.

cation from the Donkey Sanctuary of UK (Table 1). The data were on five mules.

The aim of this study which is the first in Turkish literature on mule phenotypic traits is to determine phenotypic traits including body measurements and coat colour of mules which raised in East of Turkey.

MATERIALS AND METHODS

Experimental animals: In this study a total of 89

mules, 45 males and 44 females, was analyzed in Van (38° 29'N; 43° 21'E), and Hakkari (37° 34'N; 43°44'E) in East of Turkey (Anonymous, 2011d). The mules were aged from four to 16 years. They are grouped into three age groups of 4-6, 7-9 and 10-16 years.

Measurements: The study was carried out between November 2010 and January 2011. Withers height (WH), height at rump (HR), body length (BL), and chest depth (CD) were measured using a measuring

Table 2. Distributions of body coat colour of mules

	Bay	Mouse Gray	Black	Chestnut	Isabelline	Overall
n	55	21	8	3	2	89
%	61.8	23.6	9.0	3.4	2.2	100.0

stick. Heart girth circumference (HGC), cannon circumference (CC), and head length (HL) were measured with a specially graduated metal measuring tape (Sönmez, 1973). Ages were determined from the information given by owner of mules.

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

RESULTS

The distributions of bay colour were 61.8%, mouse gray 23.6%, black 9.0%, chestnut 3.4%, and isabelline 2.2% as given in Table 2. It is clearly defined that about 62% of mules had bay coloured and about 24% of mules had mouse gray colour. The other three colours of black, chestnut and isabelline were about 14%.

As seen in Table 3, between male and females mules there was not a significant difference for morphological dimensions except the BL, HGC and CC. For the traits of BL, and HGC male mules had lower values than female mules had but for CC male mules had higher values than female mules had.

The impacts of region and age did not affect morphological dimensions and there were no significant differences as given in Table 3. For body coat colour there was no significant difference among mules except the trait of BL. Mules in isabelline colour yielded the lowest and mules in black colour yielded the highest values.

Phenotypical correlation coefficients (r) among morphologic traits were given in Table 4. The highest value was found between WH and HR (r = 0.93) (P<0.01). Other high values were found between WH and BL (r = 0.63), WH and HGC (r = 0.62), WH and CD (r = 0.65), HR and BL (r = 0.65) those of higher than r = 0.60 (P<0.01). The correlation values of WH-HL, HR-HGC, HR-CD, HR-HL, BL-HGC, BL-CD, BL-HL, HGC-CD, CD-HL and CC-HL also had high

Table 3. Descriptive statistics and comparison results of the phenotypic traits in different sex, regions, ages and body coat colours in mules

Trait	WH (cm)	HR (cm)	BL (cm)	HGC(cm)	CD (cm)	CC (cm)	HL (cm)
	$\bar{X} \pm S_x$	$\bar{X} \pm S_x$	$\bar{X} \pm S_x$	$\bar{X} \pm S_x$	$\bar{X} \pm S_x$	$\bar{X} \pm S_x$	$\bar{X} \pm S_x$
Overall (n=89)	130.4 ± 0.71	130.5 ± 0.73	134.6 ± 0.74	148.6 ± 0.73	60.2 ± 0.44	16.2 ± 0.13	54.7 ± 0.45
Sex							
Male (n=45)	129.7 ± 1.10	129.6 ± 1.10	133 ± 0.97a	146.8 ± 1.10a	59.8 ± 0.69	16.5 ± 0.14a	55.2 ± 0.64
Female (n=44)	131.1 ± 0.81	131.5 ± 0.93	136.2 ± 1.09b	150.4 ± 0.87b	60.6 ± 0.55	15.9 ± 0.21b	54.2 ± 0.61
Region							
Hakkari (28)	131.3 ± 1.15	131.7 ± 1.20	135.5 ± 1.49	148.6 ± 1.39	60.8 ± 0.76	16.2 ± 0.21	54.4 ± 0.81
Van (61)	130.0 ± 0.88	130.0 ± 0.90	134.2 ± 0.84	148.6 ± 0.85	59.9 ± 0.54	16.2 ± 0.16	54.8 ± 0.53
Age							
4-6 years (n=32)	129.4 ± 1.61	131.3 ± 1.47	129.5 ± 2.63	145.0 ± 2.70	57.2 ± 1.18	16.6 ± 0.28	52.9 ± 0.80
7-9 years (n=41)	137.7 ± 0.73	137.6 ± 0.54	143.6 ± 1.36	158.1 ± 1.30	63.8 ± 0.64	18.2 ± 0.19	55.4 ± 0.46
10-16 years (n=16)	138.8 ± 1.12	138.8 ± 0.74	145.5 ± 2.351	158.3 ± 2.03	63.8 ± 1.10	18.6 ± 0.24	55.7 ± 0.66
Coat Colour							
Bay (n=55)	130.2 ± 0.82	130.1 ± 0.86	134.8 ± 0.92b	149.2 ± 0.92	60.2 ± 0.47	16.1 ± 0.18	54.6 ± 0.58
Mouse Gray (n=21)	130.8 ± 1.52	130.9 ± 1.52	133.3 ± 1.25ab	148.3 ± 1.36	60.9 ± 1.05	16.1 ± 0.15	53.6 ± 0.77
Black (n=8)	133.8 ± 3.19	135.3 ± 2.95	140.5 ± 2.88c	148.8 ± 2.67	60.9 ± 1.60	17.1 ± 0.45	57.9 ± 1.61
Chestnut (n=3)	125.7 ± 4.63	125.7 ± 3.48	132.7 ± 2.60abc	147.3 ± 1.45	56.3 ± 3.84	16.3 ± 0.33	58 ± 1
Isabelline (n=2)	126.5 ± 4.50	126.5 ± 6.50	123.5 ± 6.50a	137.5 ± 8.50	56.0 ± 6	16.1 ± 0.15	53.6 ± 0.77

a, b; P<0.05, c; P<0.01.

* There were no significant differences between means showed by the same letters of alphabet in the same column and factor group.

Table 4. Phenotypical correlation coefficients (r) between body measurements in mules

Traits	WH	HR	BL	HGC	CD	CC
HR	0.93**					
BL	0.63**	0.66**				
HGC	0.62**	0.58**	0.60**			
CD	0.65**	0.57**	0.38**	0.46**		
CC	0.21	0.19	0.12	0.06	0.11	
HL	0.48**	0.51**	0.41**	0.22*	0.28**	0.33**

*P<0.05, **P<0.01

values (P<0.01). The lowest value was found between HGC and HL (r = 0.22) (P<0.05). There were no negative correlations between all other traits, as seen in Table 4.

DISCUSSION

In this study bay colour is the most frequent colour. Thiruvenkadan (2008) reported that among the basic colours of horse, bay is the most frequent colour and it is present in all the breeds except Friesian, Fjord, Percheron, Haflinger and Suffolk Punch. Mule is an offspring of a male donkey and a female horse. Hence it can be concluded that as a most frequent mule colour the presence of bay colour in Turkish mule is seemingly quite normal. In this study the second most frequent colour is mouse gray. Mouse gray is not a frequent colour in horses (Thiruvenkadan, 2008) but it is quite common among mules and donkeys.

Sample mules were raised in two adjacent provinces. There were no significant differences in mules raised in provinces of Hakkari and Van. According to mule owners none of mules were produced in Turkey and all mules come from north of Iraq. Mules are produced by using huge Iraq donkeys as sire line. Hence, Iraq mules are larger than other mules and are preferred by Turkish farmers. Hakkari and Van mules come from same source and they resemble each other, therefore there were no significant difference statistically.

In this study mules which were younger than 4 year-old were not used. All mules were 4 years old age and more. After 3 years of age there was no significant difference among 4-6, 7-9 and 10-16 years groups (Table 2). It showed that growing nearly completed until 4 years of age and then there was a small difference.

Related with coat colour there was no significant difference among five coat colour all traits except the trait of BL (P<0.05). For the trait of BL two isabelline colour mules were the lowest value and eight black colour mules were the highest value. Colours of bay, mouse gray and chestnut were grouped in the middle.

As seen in Table 4, between all traits there were

significant correlation (P<0.01 and P<0.05) except the trait of CC. The trait of CC had not any significant correlation to traits of WH, HR, BL, HGC, CD and HL.

The present data demonstrated that Turkish mules raised in provinces of Hakkari and Van are almost similar in body sizes. They are larger than mules raised in UK, although the number of examples is only five

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