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Araştırma Makalesi/*Research Article (Original Paper)*

Some Morphological Characteristics of Mules Raised in Van Province in Turkey

Orhan YILMAZ[1*], Füsun COŞKUN[2], Mehmet ERTUĞRUL[3]

[1] Çanakkale University, Faculty of Agriculture, Department of Animal Science. 17100. Çanakkale.
[2]Ahi Evran University, Vocational High School, Department of Plant and Livestock Production, 40100, Kırşehir
[3]Ankara University, Faculty of Agriculture, Department of Animal Science, 06110, Ankara.
*Corresponding author: zileliorhan@gmail.com

Abstract: The aim of this research study is to define some morphological characteristics of mules raised in Van province. A total of 62 mules, 35 males and 27 females, in three age groups (3-6, 7-8 and 9-15 years) were examined. Descriptive statistics of morphologic traits were as follow: Withers height 129.9±0.87 cm; height at rump 128.3±1.64 cm; body length 134.2±0.83 cm; heart girth circumference 148.5±0.84 cm; chest depth 59.8±0.54 cm; cannon circumference 16.2±0.16 cm; and head length 54.9±0.53 cm. In this study the distributions of coat colour were 54.8% for bay colour, 24.3% for white, 4.8% for black, 4.8% for brown, 8.1% for mouse gray, and 3.2% for chestnut. It can be concluded that body development continues until 3 years of age and thereafter only slight increases can be seeen in this trait. The present data also showed that mules raised in province of Van were slightly larger in body sizes than UK and Ordu Province of Turkey mules but nearly similar in body sizes with Eastern Anatolian and Turkish mules.

Key words: Genetic resource, Morphologic trait, Body measurement, Coat color.

Van İli'nde Yetiştirilen Katırların Bazı Morfolojik Özellikleri

Özet: Bu araştırma çalışması, Van İli'nde yetiştirilen katırların morfolojik özelliklerini belirlemek amacıyla gerçekleştirilmiştir. Çalışmada kullanılan katırlar cinsiyet ve yaş faktörleri bakımından incelenmiş, ayrıca Ordu İli, Doğu Anadolu Bölgesi, Türkiye ortalaması ve İngiltere'de yetiştirilen bazı katırlar ile karşılaştırılmıştır. Veriler, Minitab İstatistik Programı kullanılarak ANOVA ve Student's T-Test analizleri ile incelenmiştir. Çalışmada 3-6, 7-8 ve 9-15 olmak üzere 3 farklı yaş grubu altında, 18 erkek ve 20 dişi olmak üzere 38 katır kullanılmıştır. Morfolojik özelliklere ait tanımlayıcı istatistik değerler cidago yüksekliği 129.9±0.87 cm, sağrı yüksekliği 128.3±1.64 cm, vücut uzunluğu 134.2±0.83 cm, göğüs çevresi 148.5±0.84 cm, göğüs derinliği 59.8±0.54 cm, ön incik çevresi 16.2±0.16 cm, ve baş uzunluğu 54.9±0.53 cm olarak bulunmuştur. Bu çalışmada vücut renginin dağılımında doru don % 44.7, siyah % 7.9, fare bozu % 5.3, kır 31.6 ve al % 3.7 olarak bulunmuştur. Vücut gelişiminin 3 yaşa kadar sürdüğü ve ondan sonra çok küçük değişiklikler olduğu söylenebilir. Bu veriler ayrıca Van katırlarının vücut ölçüleri bakımından İngiltere'deki bazı ve Ordu İli'nde yetiştirilen katırlardan daha iri, Doğu Anadolu Bölgesi ve Türkiye katırları ile neredeyse aynı oldukları söylenebilir.

Anahtar kelimeler: Gen kaynağı, Morfolojik özellik, Vücut ölçüsü, Vücut rengi.

Introduction

Turkey is like a bridge between continentals of Asia and Europe. Many civilizations either lived or passed through Turkey during history. Therefore it has a wide array of livestock and other species. Mule is not a genus, species or breed but a hybrid offspring of male donkey and female horse. An offspring of female donkey and male horse is also called as hinny (Yarkin 1962; Anonymous 2011a,b). The diploid chromosome numbers for horse are 64, for donkey 62 and for the mule 63 (Trujillo et all. 1991; Bennett and Hoffman 1999). Even though both male and female mules have all genitals, they are sterile and cannot give birth. There are only few evidence that mule reproduced (Anderson 1939, Jones 1985).

During 1900s mules were used to be raised in mountainous areas of Black Sea and Marmara Regions, and Taurus Mountain range in Turkey(Yarkin 1962; Yilmaz et al 2012a). Nowadays mules are mainly raised

in provinces of Adiyaman, Balikesir, Hakkari, Icel, Konya, Ordu, Van, Mardin and Sirnak which have mountainous areas (Yilmaz et al 2011; Yilmaz et al 2012a,b). The mules are generally used as load animal and by smugglers to carry some goods such as oil, sugar, rice in provinces of Hakkari, Mardin, and Sirnak between countries of Iraq and Turkey, and in province of Van between countries of Iran and Turkey illegally (Figure 1). In Adiyaman, Icel, Konya and Balikesir they are used by farmers to carry wood stuff and goods. Nowadays Ordu mules are used in hauling green tea leaf packs by tea producers (Yilmaz et al 2011).

Figure 1. A group of resting mules belonging to one person engaged in fuel smuggling across the Iran border in Baskale County of Van Province.

In Turkish literature there are a few scientific researches on mules. Yarkin (1962) reported some information on mules but did not give any measurements. On body size of mules there was only data reported by Yilmaz et al (2011; 2012a,b). Yilmaz compared mules to East Anatolian mules with UK mules using data sent by the Donkey Sanctuary of UK (Anonymous 2011c) (Table 1).

Table 1. Some data on body sizes of mules from UK and Turkey.

Trait Source	WH* ($\bar{X}$)	HR ($\bar{X}$)	BL ($\bar{X}$)	HGC ($\bar{X}$)	CD ($\bar{X}$)	CC ($\bar{X}$)	HL ($\bar{X}$)	EL ($\bar{X}$)
UK mule (Anon 2011c)	120.4	121.8	122.6	147	-	14.8	55.2	19
East Anatolia mule (Yilmaz et al 2011)	130.4	130.5	134.6	148.6	60.2	16.2	54.7	-
Turkish mule (Yilmaz et al 2012a)	130.6	130.7	133.9	149.6	59.7	16.5	55.6	-
Ordu mule (Yilmaz et al 2012b)	125.5	124.4	130.1	152.3	56.2	16.6	55.8	-
Van mule	129.9	128.3	134.2	148.5	59.8	16.2	54.9	-

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

The goal of this research study is to define some phenotypic characteristics including body sizes, sexes, and ages of mules raised in Province of Van, Turkey.

Materials And Methods

Animals

This study was carried out in December 2011. In this study data of 62 mules, 35 males and 27 females, raised in County of Baskale, (38° 29'N; 43° 21'E) province of Van (Anonymous 2011d) were analyzed. The mules were aged from 3 to 15 years old age. They were evaluated in three age groups as 3-6, 7-8 and 9-15 years old. The ages of mules were determined from the information given by their owners.

Measurements

The mules were provided to stand on their four legs properly on a flat surface. 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 (Sönmez 1975).

Statistical analysis

Data were analyzed using the Minitab 16 statistical software program. Descriptive statistics for body dimensions were analyzed using ANOVA and Student's T-Test (Minitab16 2011) that also determined the impact of sex, and age groups on the response variables of WH, HR, BL, HGC, CD, CC, and HL.

Table 2. Distribution of body coat colour of mules.

	Bay	White	Black	Brown	Mouse Gray	Chestnut	Overall
n	34	15	3	3	5	2	62
%	54.8	24.3	4.8	4.8	8.1	3.2	100.0

Results

The distributions of body coat colours were given in Table 2. It was determined that about more than half of mules were bay coloured. The least observed colours were black, brown, and chestnut (Figure 2) which were about one eighth.

Figure 2. A very rare chestnut coat colour in mules.

The mean values of CD, CC and HL were higher in males than females, however, the mean values of WH, HR, BL and HGC were higher in females than males. There were no significant differences among these except CC ($P<0.05$) between male and female mules (Table 3). Male mules had higher CC value than females.

The age did not affect on morphological dimensions and there were no significant differences among all traits as seen in Table 3. The mules in 3-5 years old age group mostly yielded lower values than the other two groups.

Table 3. Descriptive statistics and comparison results in different sex, and ages.

Trait		WH (cm) $\bar{X} \pm S_{\bar{x}}$	HR (cm) $\bar{X} \pm S_{\bar{x}}$	BL (cm) $\bar{X} \pm S_{\bar{x}}$	HGC (cm) $\bar{X} \pm S_{\bar{x}}$	CD (cm) $\bar{X} \pm S_{\bar{x}}$	CC (cm) $\bar{X} \pm S_{\bar{x}}$	HL (cm) $\bar{X} \pm S_{\bar{x}}$
Overall (n=62)		129.9±0.87	128.3±1.64	134.2±0.83	148.5±0.84	59.8±0.54	16.2±0.16	54.9±0.53
Sex	Male (n=35)	129.3±7.65	126.1±16.07	133.2±6.05	147.5±6.97	59.9±4.58	16.4±0.84[a]	55.7±4.18
	Female (n=27)	130.7±5.70	131.3±6.20	135.4±7.01	149.7±6.09	59.8±3.83	15.8±1.55[b]	53.9±4.01
Age	3-6 years (n=20)	128.6±7.04	128.8±6.66	135.6±8.49	148.2±6.98	58.6±4.26	16.2±0.66	55.6±3.68
	7-8 years (n=23)	130.7±7.84	125.8±19.73	133.0±5.69	148.4±6.70	60.6±4.65	16.2±0.92	54.7±5.04
	9-15 years (n=19)	130.5±5.37	130.9±5.32	134.2±4.97	148.9±6.54	60.2±3.37	16.1±1.91	54.5±3.60

a, b: $P<0.05$

Phenotypic correlation coefficient values (r) among morphologic traits were given in Table 4. There were significant differences among about half of the phenotypic traits ($P<0.01$ and $P<0.05$). There were no significant differences between traits of WH-HR, WH-CC, HR-HGC, HR-CD, HR-CC, HR-HL, BL-CC, HGC-CC, HGC-HL, CD-CC, AND CC-HL. The highest value was found between WH and CD ($r = 0.67$) ($P<0.01$). Other high values were found between WH-HGC ($r = 0.63$), WH-BL ($r = 0.59$), BL-HGC ($r = 0.55$), WH-HL ($r = 0.47$), HGC-CD ($r = 0.42$), HR-BL ($r = 0.38$), and BL-HL ($r = 0.38$) ($P<0.01$). The lowest result was found between HGC-CC ($r = 0.01$), and BL-CC ($r = 0.08$) those of lower than $r = 0.10$ and they were no significant differences among them. There was also negative correlations between traits of HR-CD ($R = -0.12$).

Table 4. Phenotypical correlation coefficient values (r) between body measurements in mules raised in Van.

Traits	WH	HR	BL	HGC	CD	CC
HR	0.21					
BL	0.59**	0.38**				
HGC	0.63**	0.22	0.55**			
CD	0.67**	-0.12	0.29*	0.42**		
CC	0.19	0.10	0.08	0.01	0.14	
HL	0.47**	0.13	0.38**	0.20	0.27*	0.20

*P<0.05, **P<0.01

Discussions and Conclusions

Thiruvenkadan et al (2008) reported that the most common horse coat colour was bay colour. Although horses and mules are different zoological systematic, report of Thiruvenkadan et al (2008) were nearly same with the results of this study.

Among mean values belonged to UK (Anonymous 2011c), East Anatolian (Yilmaz et al 2011), Turkish (Yilmaz et al 2012a), and Ordu mules (Yilmaz et al 2012b) Van mules nearly were nearly same with East Anatolian and Turkish mules but had higher values than UK and Ordu mules for the trait of WH. For the trait of HR mean of Van mules were lower than that of East Anatolian and Turkish mules but had higher

value than UK and Ordu mules. Related with BL the mean value of Van mules were nearly same with East Anatolian mules but it was higher than UK, Turkish and Ordu mules. For the trait of HGC Van mules were nearly same with East Anatolian mules but lower than Turkish mules and higher than UK and Ordu mules. The observed result of CD was nearly same with Turkish mules but lower than East Anatolian mules and higher than Ordu mules. There was no available result to compare UK mules with Van mules for the trait of CD. For the trait of CC Van mules had the same value with East Anatolian mules but lower than Turkish and Ordu mules and higher than UK mules. The mean value of Van mules nearly was nearly same with East Anatolian mules but lower than UK, Turkish and Ordu mules.

In this study older than 3 year-old mules were used and there were no significant differences in body measurements among all age groups (Table 3). It was concluded that growth was completed before 3 years of age in these mules.

The present data demonstrated that mules raised in province of Van were slightly larger in body sizes than UK and Ordu mules but nearly similar in body sizes with East Anatolian and Turkish mules.

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