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Original Contribution

MORPHOLOGICAL AND PHENOTYPIC CHARACTERISTICS OF DONKEYS IN SOME REGIONS OF BULGARIA

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ABSTRACT

The aim of the recent study was to determine the morphological characteristics of the donkey population in some areas of Bulgaria. The number of donkeys included in the research was 96, bred in three regions of Bulgaria – Kardzhali, Stara Zagora and Sofia. Four exterior measurements were taken from each donkey as follow: height at withers, body length, chest circumference and cannon bone circumference. Height at withers and body length were measured with measuring stick the two circumferences were taken with measuring tape. The main coat color of the donkeys was determent as part of the study. The estimated mean value for height at withers was 119.8 cm with variation within the range of 99 cm to 148 cm; the mean body length value was 124 cm ranging from 102 cm to 154 cm. Chest circumference ranged from 115 cm to 160 cm, average 136 cm and cannon bone circumference is with mean value of 16 cm varying from 13 cm to 20 cm. More common coat colors of the examined donkeys were brown and grey with the typical dark cross on the back.

Key words: donkey, body measurements, coat color,

INTRODICTION

The coexistence of man and donkey dates back to ancient times. Known for their durability and unpretentiousness to the conditions in which they are raised the donkey population in Bulgaria reaches its largest number during the second half of the 20th century. Nowadays their population is highly reduced and this trend spread all over Europe. This defines the donkeys as a suitable subject of many scientific studies and projects for their preservation. The most common topics of discussion are the morphological and phenotypic characteristics of donkeys. In regard of this the body condition, live weight and body dimensions of 516 working donkeys in Morocco are examined (1). In Cameroon the effect of "dry season" on live weight and some body measurements of donkeys used for work are studied (2). The study includes a total number of 135 donkeys between 2 and 15 years of age. Height at withers varies from 90 to 110 cm and body length range widely from 115 to 173 cm. Other authors investigate the body development of two donkey breeds (Poitevian and Catalan) and their crosses. The results show little difference in body measurements among individuals of the two breeds (3). In Banat great variety of body measures, colors and hues is reported on 94 donkeys (4). In Turkey the morphological characteristics of 94 donkeys (56 male and 38 female) are examined (5). The authors also examine the morphological characteristics of donkeys in Eastern and Southeastern Turkey and compare them with other breeds of donkeys worldwide (6). The results of their studies show that donkeys grown in Turkey have relatively low values for height at withers - from 98.6 cm to 102.3 cm. In Czech Republic is reported a relatively low value for height at withers - 104 cm, as the authors study the factors influencing body dimensions and some hipometric indices of 15 jacks and 35 jennets (7).

Having in mind the wide variation in morphological characteristics found in donkeys by many authors, the aim of this study was to determine the morphological characteristics of the donkey population in some areas of Bulgaria.

MATERIAL AND METHODS

The study includes total number of 96 donkeys reared in the regions of Kardzali, Stara Zagora and Sofia. Four exterior measurements were

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collected from each donkey as follow: height at withers, body length, chest circumference and cannon bone circumference. The main coat color was determent using the routine zootechnical methods. The exterior measurements data was analyzed using the STATISTICA software, version 6.1 (8) for the whole studied population and divided by regions.

RESULTS AND DISCUSSION

The results of statistical processing for the examined four body measurements are presented in **Table 1**. Height at withers is with estimated mean value of 119.8 cm with variation within the range of 99 cm to 148 cm, the mean body length value is 124 cm ranging from 102 cm to 154 cm. Chest circumference range from 115 cm to 160 cm, average 136 cm and cannon bone circumference is with mean value of 16 cm varying from 13 cm to 20 cm. When compared by regions the greatest height at withers were measured on donkeys raised in Stara Zagora region - 126.09 cm, while the lowest value is taken of the donkeys in Sofia region. The highest value for body length - 133.09 cm was estimated also on donkeys from Stara Zagora district, followed by donkeys from Kardzhali district - 125.16 cm. Regarding the chest circumference and cannon bone circumference again the highest values are obtained from donkeys in Stara Zagora region, 143.18 cm and 17.04 cm respectively, followed by donkeys in the region of Kardzhali.

Based on the assessment of the exterior measurement of the donkeys included in the study we can conclude that the donkeys raised in the plane areas of the country have greater height at withers and elongated body compared to the donkeys bred in the mountain areas. The examined individuals in the plane areas show significant varying in minimal and maximal values of height at withers – 20 cm, and body length - 29 cm. Similar trend is observed and for the other two measurements.

The greatest value for height at withers (148 cm) was measured on donkey in the Kardzali region, where we came across of just one jennet, all others were mainly geldings, which means that in this area there is no breeding process and the animals are brought there from other regions of the country.

Table 1. *Estimated values of the studied exterior measurements in donkeys distributed by regions.*

	n	Mean ± Std. Dev	Min.	Max.
height at withers (h) in см.				
Kardzhali region	67	120,61±7,35	105,0	148,0
Stara Zagora region	11	126,09±6,73	119,0	139,0
Sofia region	18	112,94±7,21	99,0	123,0
TOTAL	**96**	**119,80±8,09**	**99,0**	**148,0**
body length (см.)				
Kardzhali region	67	125,16±7,73	105,0	149,0
Stara Zagora region	11	133,09±9,55	125,0	154,0
Sofia region	18	117,06±8,83	102,0	136,0
TOTAL	**96**	**124,64±9,28**	**102,0**	**154,0**
chest circumference (см.)				
Kardzhali region	66	138,31±8,84	116,0	160,0
Stara Zagora region	11	143,18±8,85	128,0	158,0
Sofia region	18	126,78±7,81	115,0	139,0
TOTAL	**95**	**136,69±9,94**	**115,0**	**160,0**
cannon bone circumference (см.)				
Kardzhali region	67	16,18±0,14	13,0	20,0
Stara Zagora region	11	17,04±1,23	15,0	19,0
Sofia region	18	14,75±1,09	13,0	17,0
TOTAL	**96**	**16,01±1,35**	**13,0**	**20,0**

The morphological characteristics of the donkeys are subject to many other studies. In **Table 2** are presented the results of some authors compared with the results from recent research. The comparative analysis shows that with highest mean value for height at withers (139, 5 cm) are donkeys in Morocco followed by 119,8 cm measured on donkeys in the recent study. For the other three exterior measurements (body length, chest circumference and cannon bone circumference) again the greatest mean values are reported for the donkeys in Marocco.

For the donkey population examined in the recent study mean values for chest circumference and cannon bone circumference take second place with values of 136,69 cm

and 16,01 cm respectively. Regarding the body length the greatest values are observed on donkeys in Marocco – 139,8 cm and Cameroon – 137,3 cm the studied population in Bulgaria comes on third place with mean of 124,6 cm. Results reported for donkey population in Turkey show that despite the close geographical location donkeys in Bulgaria differ significantly from those in Turkey in height and massiveness.

Table 2. *Comparative analysis of the exterior measurements with the results of other authors.*

exterior trait / Authors	height at withers (cm)	body length (cm)	chest circumference (cm)	cannon bone circumference (cm)
recent study	***119,80***	***124,64***	***136,69***	***16,01***
Ebangi & Vall (2005)	98,05	137,26	107,53	- - -
Boujenane & Machmoum (2008)	139,50	139,80	151,00	19,60
Yilmaz & Ertuğrul (2011)	99,10	103,00	111,50	13,40
Matiuti et al. (2011)	105,00	121,00	- - -	- - -

The coat color of the examined donkeys varies, as more common were brown and grey with the typical dark cross on the back. Those two colors also occur in the lighter and darker shades. Black and roan coat colors were observed on few individuals.

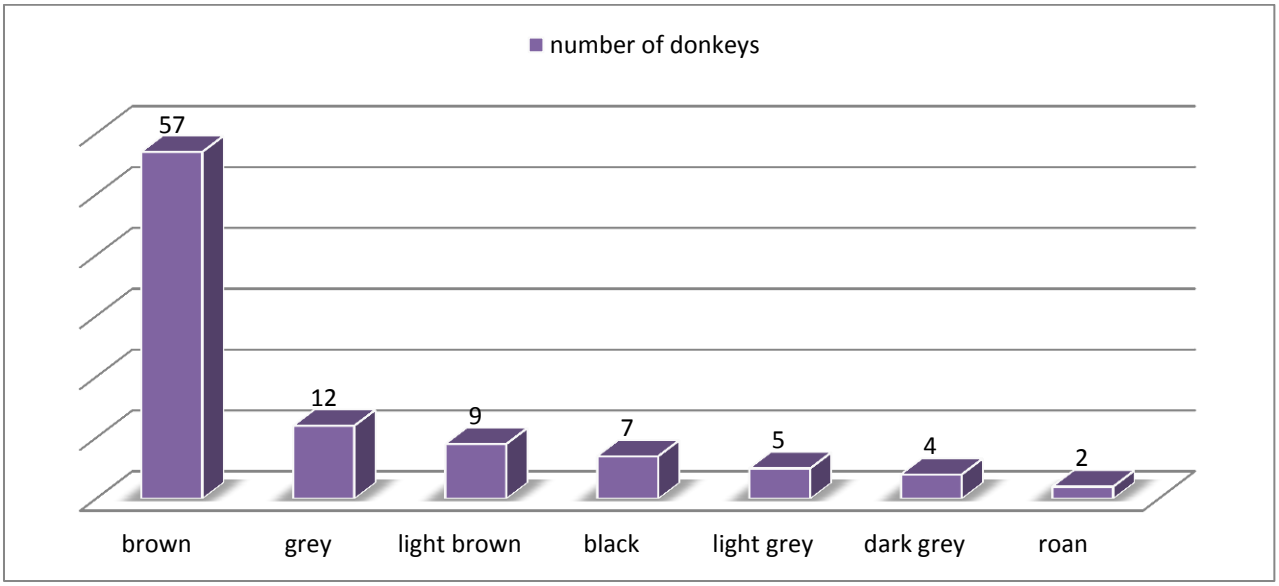

Figure 1. Number of donkeys divided by coat color

CONCLUSION

The donkeys raised in the plane areas of the country have greater height at withers and elongated body compared to the donkeys bred in the mountain areas. Greatest mean values for all of the examined exterior measurements are observed in donkeys raised in the region of Stara Zagora. Comparatively high values of the body measurements obtained from donkeys bred in Kardzali area are due to the fact that most or the animals in the area are bought from other regions of the country. Most common coat color is brown identified on 57 donkeys followed by gray and light grey coat color.

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