

Characteristics of the main body measurements of male and female donkeys in Bulgaria

Характеристики на основните телесни измерения при мъжки и женски магарета в България

Radka VLAEVA (✉)

Department of Animal husbandry - Nonruminants and other Animals, Faculty of Agriculture, Trakia University, 6000 Stara Zagora, Bulgaria

✉ Corresponding author: rvlaeva@gmail.com

Received: January 16, 2021; accepted: March 29, 2021

ABSTRACT

The donkeys, together with other labour animals (mules and hinnies) are domestic animals that are losing their popularity continually among the rural population in Bulgaria. For the last decades, the population of donkeys in Bulgaria decreased nearly 10 times, from 328 587 donkey registered in 1990 to 35 000 in 2013. For some obvious reasons they were pushed aside, as in recent times it is much easier for a smallholder farmer to cultivate the land with modern machinery than with animal power. The objective of the experiment was to estimate and compare the body measurements of male and female donkeys reared in Bulgaria. The coat colour of the animals was also recorded to estimate the variation of it inside the groups. A total number of 198 donkeys (74 males and 124 females) were included in the study. The animals were located in different regions of Bulgaria. From each individual these main four body measurements were taken: height at the withers, body length, chest circumference and cannon bone circumference. The average height at the withers for male donkeys was 120.40 ± 7.13 cm as for the females it was 119.75 ± 6.83 cm. Body length for males and females was 124.47 ± 7.62 and 123.71 ± 8.01 cm on average, respectively. Mean values for the chest, and cannon bone circumferences for male individuals were 137.08 ± 9.64 and 16.15 ± 1.21 cm, the same traits on female donkeys were on average 134.16 ± 8.11 and 15.65 ± 1.27 cm.

Keywords: donkeys, body dimensions, gender, Bulgaria

РЕЗЮМЕ

Магаретата, заедно с другите работни еднокопитни (мулета и катъри) са домашните животни, които губят последователно, своята популярност сред селското население в България. За последните десетилетия, популацията на магарета в страната е намаляла почти 10 пъти, от 328 587 регистрирани магарета през 1990 г. до 35 000 през 2013 г. Поради някои очевидни причини, те са изместени в страни, тъй като в днешно време е много по-лесно за малките стопанства да обработват земята с малогобаритна техника, отколкото с животинска сила. Целта на настоящото изследване беше, да проучи и сравни телесните измерения при мъжки и женски магарета отглеждани в България. Цвета на космената покривка също беше регистриран с цел да се установи варирането му в отделните групи. Общият брой на животните включени в изследването е 198 (74 мъжки и 124 женски) от различни райони на страната. От всеки индивид бяха свалени основните четири телесни измерения: височина при холката, коса дължина на тялото, обхват на гърди и обхват на свирка. Установената средна стойност за височина при холката при мъжките магарета беше 120.40 ± 7.13 cm, а при женските 119.75 ± 6.83 cm. Косата дължина при мъжките и женските магарета беше със средни стойности, съответно: 124.47 ± 7.62 и 123.71 ± 8.01 cm. Средно за признаците обхват на гърди и обхват на свирка при групата на мъжките магарета стойностите

BULGARIA...

бяха 137.08 ± 9.64 и 16.15 ± 1.21 cm, а за същите признаци при женските животни бяха установени съответно средни стойности от 134.16 ± 8.11 и 15.65 ± 1.27 cm.

Ключови думи: магарета, телесни измерения, пол, България

INTRODUCTION

Donkeys, together with other labour animals (mules and hinnies) are domestic animals that are losing their popularity continually among the rural population in Bulgaria. For the last decades, the population of donkeys in Bulgaria decreased nearly 10 times (DAD IS/FAO, 2015), from 328 587 donkeys registered in 1990 to 35 000 in 2013. For some obvious reasons they were pushed aside, as in recent times it is much easier for a smallholder farming to cultivate the land with modern machinery than with animal power. Nevertheless, in the last few years many organizations in Europe and even in Bulgaria recall their attention to donkeys as an important genetic resource, an animal that needs to be protected and revived into modern times.

Even so, in Bulgaria, there is still no breeding organization responsible for the identification, classification and control of the breeding process of the donkey population. In previous study, Vlaeva et al. (2016), examined the morphological and phenotypic characteristics of donkeys in Bulgaria overall for the population, but no exhaustive studies were made in accordance with the gender of the animals. Ebagi and Vall (2005) studied the effect of the dry season on live weight and some body dimensions of donkeys in Cameroon, as they separated the animals by gender. Kostukova et al. (2015) conducted a comprehensive examination on 23 body dimensions on donkeys divided in groups by gender. Nininahazwe et al. (2017) presented measurement values by sex for donkeys in West Africa. Yilmaz and Ertugrul (2011) also compared body measurement values for male and female donkeys in Turkey. In East and Southeast Turkey, Yilmaz and Ertugrul (2012) studied the male and female donkey body dimensions, together with the distribution of the body coat colour. Nengomasha et al. (1999) studied the Zimbabwean donkey, as they recorded some body measurements and the coat colour of the

animals. The coat colour of donkeys was researched by Beretti et al. (2005) and Sargentini et al. (2009) in Italy.

MATERIAL AND METHODS

The objective of the experiment was to estimate and compare the body measurements of male and female donkeys reared in Bulgaria. The coat colour of the animals was also recorded to estimate the variation of it inside the groups (males and females). A total number of 198 donkeys (74 males and 124 females) were included in the study. The age of the animals was between 3 and 25 years according to the owners records. The animals were located in different regions of Bulgaria (Kardzhali, Stara Zagora, Sofia, and Sliven). To ensure that all measurements are accurate the animals were placed on levelled ground surface, with all four legs stepped on the ground. To measure the different body parameters Lydtin stick and measuring tape were used. From each individual the main four body measurements were taken: 1) height at the withers – from ground level to the highest point of the withers, 2) body length – from the point of shoulder to tuber icshii, diagonally, 3) chest circumference – circumference of the chest right behind the elbow, 4) cannon bone circumference – circumference of the cannon bone in the upper third. Coat colour of the animals was recorded at the time the measurements were taken, for 73 male and 113 female donkeys. The statistical analysis was performed with the statistical package STATISTICA, version. 6.1. (StatSoft, Inc. 2002).

RESULTS AND DISCUSSION

The results estimated for male and female donkeys are presented in Tables 1 and 2. For the male donkeys group, the mean value for the height at the withers was 120.40 ± 7.13 cm, with minimal and maximal values of 105.0 cm and 148.0 cm.

BULGARIA...

Table 1. Estimated values for male donkeys (in centimeters)

Trait	No	Mean	SD	Min	Max	CV
Height at the withers	74	120.40	7.13	105.0	148.0	5.92
Body length	74	124.47	7.62	105.0	149.0	6.12
Chest circumference	73	137.08	9.64	115.0	160.0	7.03
Cannon bone circumference	74	16.15	1.21	13.0	20.0	7.49

Table 2. Estimated values for female donkeys (in centimeters)

Trait	No	Mean	SD	Min	Max	CV
Height at the withers	124	119.75	6.83	99.0	139.0	5.70
Body length	124	123.71	8.01	102.0	154.0	6.48
Chest circumference	124	134.16	8.11	115.0	158.0	6.04
Cannon bone circumference	124	15.65	1.27	13.0	19.0	8.15

For the body length, the average was 124.47 ± 7.62 cm, with variation from 105.0 cm to 149.0 cm. Estimated minimal and maximal values for the chest circumference were accordingly 115.0 cm and 160.0 cm, with mean of 137.08 ± 9.64 cm. Cannon bone circumference was with mean of 16.15 ± 1.21 cm and variation between 13.0 and 20.0 cm.

For the female donkeys group estimated average for the height at the withers was 119.75 ± 6.83 cm, with variation between 99.0 and 139.0 cm. For the body length, the minimal value was 102.0 cm and the maximal was 154.0 cm with mean value of 123.71 ± 8.01 cm. Chest circumference varied between 115.0 and 158 cm, and the estimated average was 134.16 ± 8.11 cm. The mean value for cannon bone circumference was 15.65 ± 1.27 cm, with minimal and maximal figures of 13.0 and 19.0 cm.

Donkeys in Bulgaria are referred as a population of "local donkey" and they do not represent any specific breed. There is no breeding goal, set for the development of the population and this might be the reason for the wide variation of minimal and maximal values of the studied traits inside groups.

In all cases, with two exceptions, values estimated for male donkeys overtop the values estimated for the female donkeys. For the body and cannon bone circumferences the minimal values for male animals equal minimal values for female animals, accordingly 115.0 and 13.0 cm. Although body measurements of male donkeys exceed the figures of the body measurement of female donkeys, the difference between traits varied from 0.5 cm to 2.92 cm, which is insignificant.

Comparing the results of the recent study with the outcomes of others, the donkeys in Bulgaria, both males and females come on second place right after Romagnolo donkeys (Beretti et al., 2005), which surpass all other studied groups, presented in Table 3. In West Africa, Nininahazwe et al. (2017) also report that male donkeys have a slightly bigger size than female donkeys, as the difference between traits vary from 1.6 cm to 2.2 cm. Kostukova et al. (2015) estimate slightly bigger difference between male and female donkeys with variation from 1.4 cm for the cannon bone circumference to 5.7 cm for the chest circumference. A similar report comes from Gichure et al. (2020), where the variation of the studied body measurement is from 4.22 to 5.0 cm, all in favour of male donkeys.

BULGARIA...

Table 3. Comparison of the morphometric measurements of male and female donkeys in Bulgaria with the results from other studies

Authors	Height at the withers (cm)		Body length (cm)		Chest circumference (cm)		Cannon bone circumference (cm)	
	Male	Female	Male	Female	Male	Female	Male	Female
Recent study	120.40	119.75	124.47	123.71	137.08	134.16	16.15	15.65
Beretti et al. (2005)	137.0	131.6	--	--	155.6	151.3	18.4	16.7
Nininahazwe et al. (2017)	98.9	96.9	103.1	100.9	106.9	105.3	--	--
Nengomasha et al. (1999)	105.0	105.0	89.0	90.0	115.0	115.0	--	--
Kostukova et al. (2015)	109.9	106.0	--	--	132.9	127.2	14.7	13.3
Gichure et al. (2020)	100.5	96.28	114.4	109.4	114.6	110.2	--	--
Yilmaz & Ertuğrul (2011)	99.7	98.6	103.4	102.3	112.8	111.6	13.5	13.1
Yilmaz & Ertuğrul (2012)	102.7	99.7	105.2	103.1	113.3	111.7	13.6	13.3

In Turkey, Yilmaz and Ertuğrul (2011), when studying donkeys raised in Iğdır, report difference between male and female donkeys from 0.4 cm for the cannon bone girth to 1.2 cm for chest girth. For donkeys raised in East and Southeast Turkey, the variation of examined traits was from 0.3 cm for cannon bone circumference to 3.0 cm for the height at the withers (Yilmaz and Ertuğrul, 2012). Intriguing is the outcome of Nengomasha et al. (1999), as they report nearly no difference between male and female donkeys in Zimbabwe.

Concerning the distribution of the coat colour among male and female groups in Bulgaria, the bay (brown) colour predominates with nearly 59% among males and

53% among females. Second most common coat colour among male donkeys is black – nearly 22%, and among female donkeys is grey-dun – 34%. Yilmaz and Ertuğrul (2012) also report the distribution of the coat colour for donkeys raised in East and Southeast Turkey, as they state that the most common colour was mouse grey – 31.4%, followed by white coat colour – 24.7%, the difference here is that donkeys were not separated by gender. In Nigeria, Khaleel et al. (2020) recorded the coat colour of 144 donkeys and reported that predominantly donkeys are of light-grey colour (30.6%), followed by light-brown (16.7%), and white coat colour, representing just 5.5%.

Table 4. Distribution of coat colour among groups of male and female donkeys

	Male group (n=73)		Female group (n=113)		Total sample n=186	
	Frequency (No)	Percentage (%)	Frequency (No)	Percentage (%)	Frequency (No)	Percentage (%)
Bay (brown)	43	58.90	60	53.09	103	55.37
Dun	7	9.58	9	7.96	16	8.60
Grey-dun	7	9.58	35	34.07	42	22.58
Black	16	21.91	9	7.96	25	13.44

BULGARIA...

CONCLUSIONS

Male donkeys are larger than female donkeys although the difference between traits is insignificant with variation from 0.5 cm to 2.92 cm.

Donkeys reared in Bulgaria (males and females) have higher average values for the studied body dimensions when compared with donkeys of the same gender in other countries. Since there is no specific donkey breed in Bulgaria and no active breeding program, owners tend to breed donkeys, according to their personal preferences often based only on the exterior of animals.

The coat colour in male and female donkey groups is predominantly bay (brown), over 50%, second most common coat colour for the male group is black (22%), and for the female group is grey-dun (34%).

REFERENCES

- Beretti, V., Zanon, A., Soffiantini, C. S., Sabbioni, A. (2005) Preliminary results about morphological and demographic traits of Romagnolo donkey. *Annali della Facoltà di Medicina Veterinaria - Università di Parma (Italy)*, 25, 131-144.
- Domestic Animal Diversity Information System (DAD-IS) [Online] Available at: www.fao.org/dad-is/en/
- Ebangi A.L., Vall, E. (2005) Dry season effect on live weight and some body dimensions of working donkeys in the Sudano-sahel region of Cameroon. *Tropicicultura*, 23 (1), 48-53.
- Gichure, M., Onono, J., Wahome, R., Gathura, P. (2020) Assessment of phenotypic characteristics and work suitability for working donkeys in the Central Highlands in Kenya. *Veterinary Medicine International*, 2020, Article ID 8816983. DOI: <https://doi.org/10.1155/2020/8816983>
- Khaleel, A.G., Lawal, L.A., Nasir, M., Hassan, A.M., Abdu, M.I., Salisu, N., Kamarudin, A.S. (2020) Morphometric characterization of donkeys (*Equus asinus*) in D/Kudu Kano state for selective breeding and genetic conservation. *Journal of Agrobiotechnology*, 11 (2), 12-21. DOI: <https://doi.org/10.37231/jab.2020.11.2.216>
- Kostuková M., Jiskrová, I., Subotková, E., Petlachová, T., Pířová, M., Králová, B., Bihonková, I., Černohorská, H. (2012) Factors influencing the selected body parameters and hippometric indexes in donkey's population. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 60 (6), 167-172. DOI: <http://dx.doi.org/10.11118/actaun201563020419>
- Nengomasha, E.M., Pearson, R.A., Smith, T. (1999) The donkey as a draught power resource in smallholder farming in semi-arid western Zimbabwe. 1. Live weight and food and water requirements. *Animal Science*, 69 (2), 297-304. DOI: <https://doi.org/10.1017/S1357729800050864>
- Nininahazwe, P.C., Sow, A., Roamba, R.C., Kalandi, M., Ahmed, H.D., Ouédraogo, G.A., Sawadogo, G.J. (2017) West African donkey's liveweight estimation using body measurements. *Veterinary World*, 10 (10), 1221-1226. DOI: <https://doi.org/10.14202/vetworld.2017.1221-1226>
- Sargentini, C., Roberto, T., Giangiacomo, L., Benedetta, G., Andrea, M., Sara, G. and Alessandro, G. (2009) Morphological characteristics of Amiata donkey reared in Tuscany. *Italian Journal of Animal Science*, 8, 721-723.
- StatSoft Inc. (2002) STATISTICA Data analysis software system (Release 6.1) Available at: www.statsoft.bg
- Vlaeva, R., Georgieva, S., Barzev, G., Ivanova, I. (2016) Morphological and phenotypic characteristics of donkeys in some regions of Bulgaria. *Trakia Journal of Sciences*, 1, 92-95.
- Yilmaz, O., Ertuğrul, M. (2011) Some morphological traits of Donkeys Raised in Iğdir, Turkey. *Journal of the Institute of Science and Technology, Iğdir University*, 1 (2), 113-116.
- Yilmaz, O., Ertuğrul, M. (2012) The morphologic traits of Donkeys Raised in East and Southeast of Turkey. *Hayvansal Üretim*, 53 (1), 10-13.