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Conformation traits of Hungarian Fallow Donkey mares according to their basic colour

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Abstract

The breed reconstruction program of Hungarian Fallow Donkey has begun in 2021 in order to unify the domestic donkey population. It has several elements, e.g., according to the breed standard, the selection of individuals to be entered in the nucleus part of stud book based on, among other things, their conformation and constitutional characteristics. Currently, the number of registered mares exceeds 1000 individuals. The purpose of this combined processing is to compare the colour variants of the registered donkeys based on some major body measurements and body indices. Trait investigated were corrected for age 7 years, and then the effect of colour variants, time of recording, and location as a fixed effect, as well as the year of birth as a covariate, were examined using a linear model. No differences in colour variants were detected for either body measurements or indices. In addition, the population investigated is about 117 cm high at the withers, it has a relatively shallow chest and long trunk for its withers height. However, location had a significant effect on body measurement and index values in all cases ($P < 0.001$). SEM values remained low, except for the most complexly calculated body capacity index, which characterizes a population of uniform shape. These results contribute to the establishment of the Hungarian Fallow Donkey seed stock. A larger national population of that breed is expected to play a specific segment in the food chain as a favourite animal for climate change and ecological livestock farming.

Keywords: Hungarian Fallow Donkey, body measurements, body indices

Introduction

The Hungarian Donkey Breeders' Association (MSzE) was established on 13 April 2002 in Rudabánya with the participation of some active donkey keepers and breeders, as well as supporters trying to improve the situation of donkey breeding in Hungary. The Association has faced and still faces difficult tasks today: in addition to mapping the scattered, almost invisible donkey population in Hungary, strengthening a hitherto non-existent donkey breed, since in Hungary we could only talk about the donkey species (ERNST, 2004). The aim of MSzE is that this history-related animal species can finally integrate into consciously bred domestic animals

in Hungary in a worthy way as is the case in several European countries, where donkey breeding associations can look back on decades.

The MSzE want to like and spread this breed, which is still unjustly neglected, and whose characteristics, calm nature, adaptability and intelligence make it perfectly suitable both for use as a family hobby animal and for small and large-scale work on farms. Currently, the number of registered mares exceeds 1000 individuals, although the Hungarian donkey population is about of 3000-4000.
The Association has achieved the following results in recent years:

2003. Recognition of the Hungarian Fallow Donkey breed and the recognition of its breeding association, the MSzE.
2004. Amendment of the Livestock (1993 CXIV. law on animal husbandry; prior to the law in force today) Act and extension of its scope to donkeys.
2005. Declaration of the protected native breed of the Hungarian Fallow Donkey.
2021. Adoption of the breed-reconstruction program and open nucleus stock.

The breed reconstruction program of Hungarian Fallow Donkey has successfully begun in order to unify the domestic donkey population. It has several elements, e.g., according to the breed standard, the selection of individuals to be entered in the nucleus part of stud book based on, among other things (e.g. microsatellite diversity, mtDNA descendance), their conformation (ZÁBORSZKY, 2005) and constitutional characteristics (constitutional faults included, LÉNÁRT et al. 2017). Only and exclusively individuals of known origin (molecular parentage control) that meet the breed standard and achieve satisfactory results in terms of appearance, behaviour and movement, results of a complex judging, may enter the nucleus stock in both sexes. The creation of the nucleus stock first started in the Game Management Landscape Centre, Bőszénfa.
The purpose of this combined processing is to compare the colour variants of the registered donkeys based on some major body measurements and body indices by what we would like to contribute to the enlargement of the Hungarian Fallow Donkey seed stock.

Material and method

The Hungarian Donkey Breeders' Association (MSzE) provided us with the availability of the livestock owners. The recording of body measurements of a total of 208 mares was conducted in two periods of time (2016-2017 and 2020-2021) on 16 farms in Hungary (the average number of “jennets” per farm was 13).
The following body measurements were taken: height at withers (the highest point of the withers measured from the ground), chest depth (distance between the sternum and vertebra behind withers), heart-girth (the circumference of the chest, measured just behind the elbow), and diagonal trunk length (distance between the greater tubercle of humerus and the ischial tuberosity). To measure the donkeys measuring tape and measuring stick were used. From the investigated parameters the height at withers, chest depth, and diagonal trunk length were measured by measuring stick. The heart-girth was recorded by tape measure.
In the current study four body indices were calculated determined by body measurements and body weight according to the Table 1. The larger the index value, the more pronounced is the index property at the animal.

Table 1. Applied calculations of body indices

Stubbiness index =	(greater trunk length/height at withers)*100
Index of long-leggedness =	(height at withers-chest depth)/chest depth*100
Strength back index =	(rump with I/shoulder width)*100
Body capacity index =	(shoulder width+rump with I)/2*chest depth*diagonal trunk length/1000

Sqrt – Square root; rump with I – distance between coxal tubers of left and right ilium; shoulder width – distance between greater tubercles of left and right humerus

The merged dataset was used for a combined processing. At the beginning, all values were adjusted for age at 7 years by linear regression. The age of donkeys was known from date of birth registered in their 'equine passport' or stud book, but several times the microchip number was used for retrievement of birth date. The average age of investigated mare population was seven years (from a range of 1-21 years).
For the investigated body measurements and indices the (LSM - Least Square Means) and its error (SEM – Standard Error of Mean) were computed by a General Linear Model (TIBCO Software Inc., 2020) with fixed effects of time of recording, basic colour of the animal and farm, and year of birth as covariate (a covariate is a variable that is possibly predictive of the outcome under study; in this study LSM was computed for 2014 from a range of 1995-2019).
The most common basic hair colours are the brown, black, and grey in their shade variants. Donkeys usually have “swallow belly” in each colours. The end of the legs is often lighter than the shade of the body. However, there are also entirely black exemplars. Individuals carry often a “cross” made of the dorsal strip and the stripes running down each of their shoulders. But shade and colour variant were not considered when separating colour groups. Results (LSM and SEM) are presented in this paper for colour groups only, while the significance levels (P-value) are shown for all three effects.

Results and discussion

As it is presented in Table 1 and Table 2, no differences in colour variants were detected for either body measurements or indices. Further on, SEM values remained low, except for the most complexly calculated body capacity index, which characterizes a population of uniform shape.
According to a former experience (LÉNÁRT et al, 2017), the colour of the animal could determine the size. A possible explanation can be found in the origin of the donkeys. It can be supposed that the brow individuals are the descendants of a large framed Italian donkey, Martina Franca (which was used in creation of mule in Hungary in the past, KUGLER et al., 2008), while the grey individuals stem from smaller sized Balkan donkeys. However, VLAEVA et al. (2016) published data about donkey eco-types in Bulgarian which were nearly the same as our ones (119.8 and 121.0, respectively). MATIUTI et al. (2011) informed us about much less values (105.0 cm) of donkey population in Banat (Romania). Sadly, the pedigree information is incomplete currently.

In addition, the mare population investigated is about 117 cm high at the withers (Table 2). It has about 51 cm deep chest, 138 cm large heart-girth, and 94 cm long greater trunk length.

Table 2. Body measurements adjusted for 7 years of age and birth year 2014 (cm)

Effect	Hight at withers		Chest depth		Heart-girth		Diagonal trunk length	
	LSM	SEM	LSM	SEM	LSM	SEM	LSM	SEM
Time of recording, P-value	<0.001		0.015		0.155		0.004	
Colour group, P-value	0.664		0.145		0.412		0.496	
brown (n=86)	117.0	0.892	51.6	0.605	138.6	1.273	94.5	0.687
black (n=26)	117.0	1.378	52.0	0.935	139.1	1.967	94.0	1.062
grey (n=74)	116.1	0.881	50.4	0.598	136.8	1.259	93.5	0.679
Farm, P-value	<0.001		<0.001		<0.001		<0.001	
Year of birth, P-value	0.494		0.111		0.704		0.535	

The mean value stubbiness index is about 81% (Table 3). A value being below 100 % is to mean that the trunk of the body is longer than the height at withers; so the shape of the Hungarian Fallow Donkey from side view is rather elongated than rectangular.
The average value of long-leggedness index is about 130%. This can be considered as a high value, which indicates that the Hungarian Fallow Donkey is a long legged animal, it has relatively long fore limbs for its chest depth. None of the effects investigated were influencing the index of long-leggedness.
Based on strength back index (which is about 140% on average), the donkey mares have a remarkable wider pelvis region than their chest.
we can state that the mares have a relatively shallow chest and long trunk for its withers height.

Table 3. Body indices adjusted for 7 years of age and birth year 2014 (cm)

Effect	Stubbiness index		Index of long-leggedness		Strength back index		Body capacity index	
	LSM	SEM	LSM	SEM	LSM	SEM	LSM	SEM
Time of recording, P-value	0.575		0.882		0.099		<0.001	
Colour group, P-value	0.553		0.241		0.645		0.115	
brown (n=86)	80.7	0.910	129.4	2.071	140.7	1.975	154.9	3.197
black (n=26)	81.2	1.381	127.7	3.142	142.7	3.052	155.1	4.941
grey (n=74)	81.8	0.883	132.6	2.008	139.7	1.952	147.3	3.161
Farm, P-value	<0.001		<0.001		<0.001		<0.001	
Year of birth, P-value	0.146		0.154		0.020		0.518	

As the colour variant, the year of birth did not show significant impact on the body measurement and body indices.
However, farm had a significant effect on body measurement and index values in all cases (P <0.001). SEM values remained low which characterizes a population of uniform shape. Except for the most complexly calculated body capacity index, where a SEM of 4.0 corresponds to a coefficient of variation of approximately 18%.

Time of recording appeared to be of significant effect in four cases. To our mind, the significant effect of recording can be argued by size preference in the different farms, which is manifested in keeping of larger or smaller bodied individuals. There were two farms in overlap and four individuals in the combined processing which were recorded in both occasions. The statistical comparison of them did not revealed significant impact of time of recording for the four traits in question. So, it is concluded our recordings in two different times were satisfactorily carried out.

Conclusion and recommendation

These results contribute to the establishment of the Hungarian Fallow Donkey seed stock. A larger national population of that breed is expected to play a specific segment in the food chain as a favourite animal for climate change and ecological livestock farming.

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