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Research Article

Morphological Characterization of the White Baroque Donkey

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ABSTRACT

Backround/Aim: The white Baroque donkey (Austrian-Hungarian white donkey), belongs to a large group of domestic donkeys, where it stands out because of its snow white coat. During the Austrian Empire, white donkeys, were “objects of prestige”. After the Baroque period, this breed of donkey was forgotten. The white Baroque donkey was “rediscovered” in the early 1980-ies, when a few specimens were brought to Herberstain from Hungary.

Material and Method: The investigation of parameters of the exterior (36) for morphological characterization of the white Baroque donkey was done in Austria, on a population in Schloss Hof and the Neusiedlersee-Seewinkel National Park. Measurements were taken using the Lidtin’s stick, tape and mobile measuring instrument with nonius. Measured animals were 3 to 6 years old.

Results and Conclusion: Height at withers of the male was 108.4 cm – 120.3 cm, with an average value of 115.5 cm. In the female, height at withers was 104.2 cm – 122.2 cm with an average of 112.2 cm. Body length of male animals was 112.0 cm – 127.0 cm, with an average of 119.2 cm, which is 3.2% more than the height at withers. In female animals, body length was 108.9 cm – 133.0 cm, with an average value of 120.7 cm, which is 7.5% more than the height at withers. In the male, head length was 52.0 – 60.0 cm, with an average value of 55.0 cm, which is 47.62% of the height at withers. In the female, the variation interval for head length was 49.0 cm – 58.0 cm, with an average value of 54.5 cm.

Based on obtained results, Baroque donkeys have a rectangular body format, with a height at the rump above the height at the withers. According to its exterior characteristics the Baroque donkey conforms to the body type of the species described for other donkey breeds.

Key words: Baroque donkeys, exterior, Austria.

Kır Barok Eşeklerinin Morfolojik Karakterizasyonu

ÖZET

Giriş/Amaç: Kır Barok eşek ırkı (Avusturya-Macar kır eşeği), kar beyazı renkteki kır donuyla öne çıkan evcil eşek ırklarının büyük bir grubuna aittir. Avusturya İmparatorluğu döneminde kır eşekler saygınlık göstergesi idi. Barok dönemden sonra, bu eşek ırkı unutuldu. Kır Barok eşeklerinden birkaç tanesi 1980’lerin başında Macaristan’dan Herberstain’e getirildiğinde yeniden keşfedildi.

Materyal ve Metot: Kır Barok eşeğin morfolojik karakterizasyonu için dış yapısal parametrelerin (36 adet) saptanması için Avusturya’da bulunan Schloss Hof ve Neusiedlersee-Seewinkel Ulusal Parkı’ndaki bir populasyondan faydalanıldı. Ölçümler Lidtin bastonu, şerit metre ve kumpaslı mobil ölçüm cihazı kullanılarak yapılmıştır. Ölçülen hayvanlar 3 ila 6 yaşlarındaydı.

Bulgular ve Sonuç: Erkek eşeklerde cidago yüksekliği ortalaması 115,5 cm (108,4–120,3 cm); dişi eşeklerde ise ortalama 112,2 cm (104,2–122,2 cm), olarak ölçüldü. Erkek eşeklerin beden uzunluğu ortalaması 119,2 cm (112,0–127,0 cm) olarak belirlendi. Bu uzunluk cidago yüksekliğinden % 3,2 daha fazladır. Dişi hayvanlarda beden uzunluğu ortalaması 120,7 cm (108,9–133,0 cm) olarak belirlendi. Dişi eşeklerde bu uzunluk ise cidago yüksekliğinden %7,5 daha fazladır. Erkek eşeklerde kafa uzunluğu ortalaması 55,0 cm (52,0–60,0 cm) olarak saptandı, bu uzunluk da cidago yüksekliğinin %47,62’siydi. Dişi eşeklerde kafa uzunluğunun varyasyon aralığı 49,0 cm–58,0 cm olup, ortalama değeri 54,5 cm idi. Elde edilen sonuçlara dayanarak, Barok eşeklerinin sağrı cidagodan daha yüksek dikdörtgen bir beden formatına sahip olduğu ve beden özelliklerine göre diğer eşek ırkları için tanımlanan beden yapılarına uygun bir formda olduğu söylenebilir.

Anahtar Kelimeler: Barok eşek ırkı, dış yapı özelliği, Avusturya

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Introduction

The white Baroque donkey (Austrian-Hungarian white donkey), belongs to a large group of domestic donkeys, where it stands out because of its snow white coat, while its iris is not red, but "sky blue". The skin and hooves are not pigmented. The domestic donkey (*Equus asinus*) originated in Africa, where Nubian and Somali donkeys can be differentiated. Nubian donkeys have a height at withers of approximately 122 cm, while in Somali donkeys this is approximately 140 cm. As opposed to Somali donkeys, Nubian donkeys have a specific mark on the body, in the form of a colored stripe along the back which forms a cross on the shoulders (Svendsens, 2011). Regardless of the white color of their coat, white Baroque donkeys, also have a barely visible but evident "cross". This confirms that by their origin they are linked to Nubian donkeys.

The white color of the coat is also seen in other breeds of donkeys. Thus, in Italy, there is the "Asino dell Asinara" breed, originating from Sardinia, also with a white coat and blue eyes. (Baroncini, 2014). The possibility that the white Baroque donkey originates from Italian white donkey from Sardinia is also mentioned by Altmann, F. D. (1994). The same author said that the population of Baroque donkeys about 20 individuals. He presumes that during the Baroque and Rococo (1575-1770), white donkeys were imported into Austria from Italy, via the port in Naples (Altmann, 1994). However, there are also opinions that the origin of this breed should be sought on the slopes of the Carpathian Mountains in Hungary, as well as in East Austria (Zoufal, 2014). At that time, the white color was considered a symbol of aristocracy, and such animals were especially valued. During the monarchy, white donkeys, were "objects of prestige" (Zoufal, 2014). After the Baroque period, this donkey breed was forgotten.

The white Baroque donkey was "rediscovered" in the early 1980-ies, when a few specimens were brought to Herberstain from Hungary, and in 1986 Prof. Dr. Fritz Dietrich Altmann found specimen of this breed and brought them to the zoo in Erfurt (Rote Listen, 2010). Dr. Kurt Kirchberger purchased a few animals belonging to the white Baroque donkey breed in Hungary. These animals were brought to the Neusiedlersee-Seewinkel national park, and formed the basis for breeding and

Table 1. Results of statistical analysis of measured parameters for males (N=19)
Tablo 1. Erkek eşeklerde ölçülen parametrelerin istatistiksel analiz sonuçları (N=19)

Parameter	$\bar{x}$±SD	SEM	IV	CV (%)
Height at withers	115.5±4.5	1.9	108.4-120.3	3.9
Height at back	112.8±6.5	2.5	102.1-119.1	5.7
Height at rump	118.3±5.7	2.5	111.1-125.1	4.8
Height at base of tail	107.8±5.3	2.3	99.5-114.0	4.9
Height at hock	45.6±1.6	0.7	44.0-48.0	3.7
Height at elbow	71.0±2.5	1.2	67.0-74.0	3.6
Body length	119.2±5.7	2.5	112.0-127.0	4.8
Chest width	24.6±2.7	1.2	22.0-29.0	10.9
Chest depth	49.2±1.6	0.7	48.0-52.0	3.3
Chest circumference, front	118.6±7.9	3.5	111.0-130.0	6.7
Chest circumference, rear	142.4±8.3	3.7	133.0-152.0	5.9
Shin circumference	14.0±1.2	0.5	13.0-16.0	8.7
Pelvis length	38.8±2.7	1.2	36.0-43.0	7.2
Pelvis width	34.6±2.7	1.2	32.0-39.0	7.8
Width of the sit bone tubercule	13.8±1.9	0.9	12.0-17.0	13.9
Head length	55.0±3.1	1.4	52.0-60.0	5.7
Skull length	24.8±1.4	0.7	23.0-27.0	5.9
Face length	30.2±2.7	1.2	28.0-35.0	9.1
Skull width	22.6±1.5	0.7	21.0-25.0	6.7
Face width	13.0±2.9	1.3	10.0-17.0	22.4
Face depth	20.0±1.4	0.6	19.0-22-0	7.1
Ear length	26.4±1.5	0.7	25.0-29.0	5.7
Knee height	73.6±3.7	1.7	67.0-76-0	5.1
Height at tip of sternum	77.0±5.7	2.5	68.0-82.0	7.5
Breast width	20.0±2.5	1.9	17.0-23.0	12.2
Neck length	34.6±5.0	2.2	30.0-42.0	14.6
Scapula length	38.8±3.0	1.3	36.0-43.0	7.8
Humerus length	30.4±2.0	0.9	27.0-32.0	6.8
Loin length	31.4±2.7	1.2	28.0-34.0	8.6
Shin length	42.4±3.0	1.4	38.0-46.0	7.2
Rump angle	21.0±4.1	1.8	15.0-25.0	19.9
Neck angle	24.0±5.4	2.4	15.0-30.0	22.8
Shoulder joint angle	83.0±5.7	2.5	75.0-90.0	6.8
Elbow joint angle	112.0±5.7	2.5	105.0-120.0	5.1
Knee joint angle	108.4±6.7	3.0	97.0-115.0	6.2
Hock angle	128.0±9.1	4.1	120.0-140.0	7.1
Height at the shoulder joint	81.2±2.4	1.1	79.0-85.0	3.0

preserving the breed.

The aim of this study is to morphologically describe this small populations of donkey and so far morphologically no investigated donkey breed.

Materials and Methods

The investigation of parameters of the exterior (36), for morphological characterization of the white Baroque donkey was done in Austria, on a population in Schloss Hof and the Neusiedlersee-Seewinkel national park. The observed population consisted of 34 individuals (19 males and 15 females) For all animals, following parameters of the exterior were established: height at the withers, height at the back, height at the rump, height at the base of the tail, height at the hock, height at the elbow, body length, chest width, chest depth, chest circumference at the scapula, chest circumference at mid thorax, shin circumference, pelvis length, pelvis width, and width of the sit bone tubercule, head length, skull length, face length, skull width, face width, face depth, ear length, height at the knee, height at the tip of the sternum, breast width, neck length, length of the scapula, length of the humerus, length of the loin, length of the shin, angle of the rump, angle of the neck, angle of the shoulder joint, angle of the elbow joint, angle of the knee joint, angle of the hock, height at the shoulder joint.

Measurements were taken using the Lidtin's stick, tape and mobile measuring instrument with nonius. Measured animals were 3 to 6 years old.

Data was statistically processed in GraphPad Prism 7 software. Mean values of observed parameters, minimum and maximum values and descriptive statistics parameters (coefficient of variation (CV), standard error of mean (SEM) and standard deviation (SD) are presented. Significances in difference of observed parameters found in males and females was calculated using the t-test.

Results and Discussion

Tables 1 and 2 present results of statistical analysis of following parameters : height at the withers, height at the back, height at the rump, height at the base of the tail, height at the hock, height at the elbow, body length, chest width, chest depth, chest circumference at the scapula, chest circumference at mid thorax, shin circumference, pelvis length, pelvis width, and width of the sit bone tubercule, head length, skull length, face length, skull width, face width, face depth, ear length, height at the knee, height at the tip of the sternum, breast width, neck length, length of the scapula, length of the humerus, length of the loin, length of the shin, angle of the rump, angle of the neck, angle of the shoulder joint, angle of the elbow joint, angle of the knee joint, angle of the hock, height at the shoulder joint for males and females.

In males, height at withers was 108.4 cm – 120.3 cm, with an average value of 115.5 cm. In females, this was 104.2 cm – 122.2 cm, with an average value of 112.2 cm. The height at withers for the male, with a coefficient of variation of 3.9% shows that this is a stable biological characteristic. In females, the coefficient of variation is somewhat higher (5.1%), but this can still be considered a sufficiently stable exterior characteristic. On the average, the height at the back in males was, 112.8 cm, and in females a 109.3 cm. For the height at the back, it is visible that males had a somewhat higher variability (CV=5.7%) than females (CV=4.8%). It can be said that this is a stable exterior characteristic in both sexes, and that the back is always lower than the withers. Height at the rump in females was 108.2 cm – 126.5 cm, with an average value of 117.0 cm, and in males the variation interval was 111.1 cm – 125.1 cm, with an average of 118.3 cm. The height at the rump is a characteristic with relatively low variability of 4.8% in males, and 4.6% in females. The base of the tail in males is at an approximate height of 107.8 cm, and in females of 106.5 cm. Body length of males was 112.0 cm – 127.0 cm, with an average of 119.2 cm, which is 3.2% more than the height at withers. In females body length was between 108.9 cm and 133.0 cm, with an average value of 120.7 cm, which is 7.5% more than the height at withers.

The height at the hock for males was 45.6 cm on the average, i.e. 39.48% of the height at withers, while and in females on the average, the hock was at a height of 43.7 cm, which is 38.95% of the height at withers. In females the elbow joint was at an average height of 68.5 cm, which is 61.05% of the height at withers. In males the elbow joint was at an average height of 71.0 cm, which is 61.47% of the height at withers. Relations between the height at the hock and height at the elbow, as well as the height at the knee, are of exceptional importance for biomotorics and biokinematics. In the males, the hock is at 64.22% of the height at the elbow and 61.96% of the height at the knee. For this species of domestic animal it is characteristic that the knee and the elbow are at approximately the same height (Urosevic et al., 2015). In males, the average height of the elbow joint is 71.00 cm, and of the knee joint 73.6 cm. In females, the height at the hock is 63.79% of the height at the elbow, and 71.2% of the height at the knee. The height at the elbow is on the average, 68.5 cm, and at the knee 71.2 cm. Donkeys are characterized by low set hip joints, and since they have high set knee joints, this preconditions short thigh bones. Analogously to the system of mechanical levers, such a lever has a small radius of movement, but is very strong. All parts of the extremities function as a system of levers (Urosevic et al., 2015).

The length of the thigh bone of 31.4 cm in males and 32.5 cm in females, clearly shows that these are strong parts of the extremities. As opposed to the thigh, the shin is considerably longer. In females, the shin in on the average, 41.4 cm, and in male animals 42.4 cm long. A very high statistical significance ($P<0.0001$) was established for the relationship between these two parameters. The knee joint plays a fundamental role in the transmission of biokinetic energy, i.e. its transformation into thrust, which enables the forward movement of the body. Due to the disproportion in length of individual parts of the hind leg, i.e. the short thigh, the length of the step is short, but the body is quite stable when in movement. (Urosevic et al., 2015)

For biostatic and biodynamic stability, the height to the tip of the sternum is of the utmost importance. The center of gravity is in a plane parallel to the ground and is at the level of the tip of the sternum. If the tip of the sternum is placed low, the center of gravity goes upward and vice versa. In addition to moving upward and downward, the center of gravity also moves forwards and backwards. When the center of gravity moves forward, which happens when the rump is raised and is higher than the withers, the rear part of the body is disburdened and can produce more biokinetic energy more easily (Urosevic et al., 2015).

The more horizontal the sternum, the tip of the sternum is lower, which means that the center of gravity is also lower. Such biostatic characteristics cause an increase of stability during movement while simultaneously reducing speed (Urosevic et al., 2015).

The coefficient of variation for the height at the tip of the ster-

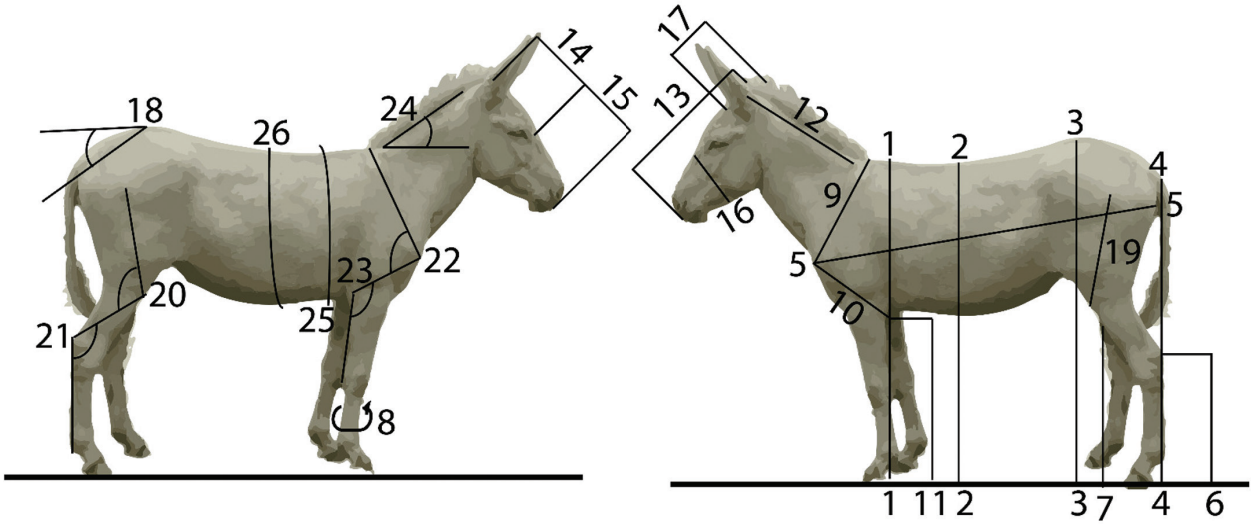
num of 7.5% in males, and 3.3% in females, indicates a stable biological exterior characteristic. The height at the shoulder joint was in the interval between 79.0 and 85.0 cm, with an average value of 81.2 cm in males, and between 75.0 and 85.0 cm, with an average of 80.3 cm in females. It should be emphasized that the height at the shoulder joint (81.2 cm) in males is higher that ne height at the tip of the sternum. In females, the shoulder joint is at an average height of 80.3 cm, and the tip of the sternum at 75.6 cm.

Chest width in males was between 22.0 cm and 29.0 cm, with an average value of 24.6 cm. In females the variation interval was 25.0 cm to 35.0 cm, with an average of 30.1 cm. Chest depth in males was on the average 49.2 cm, which is 42.59% of the height at withers. In females, the average chest depth was 52.2 cm, which is 46.52% of the height at withers. Chest circumference, measured behind the scapulae in males was in the interval between 111.0 cm and 130.0 cm, with an average value of 118.6 cm. This is 2.70% more than the height at withers. In females, chest circumference behind the scapulae was in the interval between 111.0 cm and 135.0 cm, with an average value of 124.5 cm, which is 10.96% more than the height at withers. The average chest circumference, measured in the middle of the chest in males was 142.4 cm on the average, which is 23.30% more than the height at withers. In females the average value for this exterior parameter was 159.1 cm, which is 41.80% more than the height at withers.

The circumference of the carpal bone in males was in the interval between 13.0 cm and 16.0 cm, with an average value of 14.0 cm, which is 12.12% of the height at withers. In females, the value of this exterior parameter was in the interval from 12.0 cm to 14.0 cm with an average of 13.0 cm, which is 11.59% of the height at withers. The average length of the pelvis in males was 38.8 cm, which is 33.59% of the height at withers. The average length of the pelvis in females was 40.7 cm, i.e. 36.30% of the height at withers. The average width of the pelvis in males was 34.6 cm, which is 29.96% of the height at withers. In females the average value for the width of the pelvis was 39.5 cm, i.e. 35.20% of the height at withers. On the average, width of the tuberculum ischiadicum in males was 13.8 cm, and in females 14.6 cm.

Table 2. Results of statistical analysis of measured parameters for females (N=15)
Tablo 2. Dişi eşeklerde ölçülen parametrelerin istatistiksel analiz sonuçları (N=15)

Parameter	$\bar{x}$±SD	SEM	IV	CV (%)
Height at withers	112.2±5.7	1.4	104.2-122.2	5.1
Height at back	109.3±5.2	1.3	102.0-118.7	4.8
Height at rump	117.0±5.4	1.4	108.2-126.5	4.6
Height at base of tail	106.5±4.3	1.1	101.0-114.7	4.0
Height at hock	43.7±3.0	0.7	38.0-47.0	6.9
Height at elbow	68.5±3.1	0.8	63.0-74.0	4.5
Body length	120.7±7.5	1.9	108.9-133.0	6.3
Chest width	30.1±2.9	0.7	25.0-35.0	9.7
Chest depth	52.2±2.2	0.5	48.0-55.0	4.3
Chest circumference, front	124.5±6.9	1.7	111.0-135.0	5.5
Chest circumference, rear	159.1±12.3	3.1	138.0-180.0	7.7
Shin circumference	13.0±0.9	0.2	12.0-14.0	7.1
Pelvis length	40.7±2.2	0.5	36.0-44.0	5.5
Pelvis width	39.5±2.7	0.7	35.0-44.0	6.9
Width of the sit bone tubercule	14.6±2.1	0.5	12.0-18.0	14.8
Head length	54.5±2.7	0.7	49.0-58.0	5.0
Skull length	25.0±1.3	0.3	22.0-27.0	5.3
Face length	29.2±2.4	0.6	26.0-34.0	8.2
Skull width	22.0±1.2	0.3	20.0-24.0	5.5
Face width	12.5±1.8	0.4	9.0-16.0	15.0
Face depth	19.8±1.5	0.4	17.0-22.0	8.0
Ear length	27.4±2.1	0.5	25.0-32.0	8.0
Knee height	71.2±4.6	1.2	64.0-78.0	6.5
Height at tip of sternum	75.6±2.5	0.6	71.0-80.0	3.3
Breast width	20.7±1.4	0.3	17.0-22.0	7.1
Neck length	35.3±4.2	1.1	30.0-46.0	12.1
Scapula length	39.8±2.3	0.5	36.0-44.0	5.7
Humerus length	30.8±2.5	0.6	27.0-35.0	8.6
Loin length	32.5±2.1	0.5	29.0-37.0	6.5
Shin length	41.4±3.3	0.8	35.0-46.0	8.0
Rump angle	21.2±4.3	1.1	15.0-30.0	20.2
Neck angle	22.1±5.2	1.3	15.0-30.0	23.7
Shoulder joint angle	83.33±4.8	1.2	75.0-95.0	5.8
Elbow joint angle	115.5±6.5	1.6	105.0-125.0	5.7
Knee joint angle	114.0±5.4	1.3	110.0-125.0	4.7
Hock angle	130.7±6.2	1.6	120.0-140.0	4.7
Height at the shoulder joint	80.3±2.9	0.7	75.0-85.0	3.6



Legend

1. Height at withers
2. Height at back
3. Height at rump
4. Height at base of tail
5. Body length
6. Height at hock
7. Knee height
8. Shin circumference
9. Scapula length
10. Humerus length
11. Height at elbow
12. Neck length
13. Head length
14. Skull length
15. Face length
16. Face depth
17. Ear length
18. Rump angle
19. Femur length
20. Knee joint angle
21. Hock angle
22. Shoulder joint angle
23. Elbow joint angle
24. Elbow joint angle
25. Chest circumference, front
26. Chest circumference, rear

Head length in males was 52.0 – 60.0 cm, with an average value of 55.0 cm, which is 47.62% of the height at withers. In females, the variation interval for head length was 49.0 cm – 58.0 cm, with an average value of 54.5 cm, representing 48.57% of the height at withers. Skull length in males was 45.10% of the total head length, while in females skull length was 45.87% of head length. In males, face length was 54.90% of head length, while in females face length was 54.13% of head length.

Average skull width in males was 22.6 cm, and in females 22.0 cm. Average face width in males was 13.0 cm, and in females 12.5 cm. Face depth was 20.0 cm in males and 19.8 cm in females. Average ear length in males was 26.40 cm, and in females 27.4 cm.

Height at knee joint was between 67.0 cm and 76.0 cm in males, with an average value of 73.60 cm, while in females the variation interval was 64.0 cm – 78.0 cm, with an average value of 71.20 cm. In males the height at the knees represented 63.72% of the height at withers, while in females this was 63.46%. On the average, the tip of the sternum is at a height of 77.0 cm in males, and 75.6 cm in females.

Average breast width in males was 20.0 cm, and in females 20.7 cm. Neck length in males was from 30.0 cm to 42.0 cm, with an average value of 34.6 cm. In females the variation interval for neck length was from 30.0 cm to 46.0 cm. The neck in males was 29.95%, and in females 31.46% of the height at withers. The length of the scapula was 33.59% of the height at withers in males, and 35.50% of the height at withers in females.

The average length of the humerus in males was 30.40 cm, and in females 30.80 cm. The average length of the scapula in males was 38.8 cm, with a variation interval of 36.0 to 43.0 cm. In females, the average length of the scapula was 39.8 cm, varying from 36.0 to 44.0 cm. The analysis of the interrelationship between these two parameters established a very high statistical significance ($P<0.0001$).

The angle of the rump was between 15.0 degrees and 25.0 degrees, with an average value of 21.0 degrees in males, while in females the variation interval for the rump angle was from 15.0 to 30.0 degrees, with an average value of 21.20 degrees. The average angle of the neck was 24.0 degrees in males, and 22.10 degrees in females. The angle of the shoulder joint was from 75.0 to 90.0 degrees, with an average of 83.0 degrees in males, while the variation interval for this joint in females was from 75.0 degrees to 95.0 degrees, with an average value of 83.33 degrees. In addition to the rump which by raising moves the center of gravity forward, the neck also has the same function. The angle between the neck and the body should be over 30 degrees. In females, the average value was 22.1 degree, and in males 24.0 degrees. The variation interval of the neck angle, in both sexes, was very wide, ranging between 15.0 and 30.0 degrees, with a coefficient of variation of 22.8%, i.e. 23.7%, this is a rather unbalanced exterior parameter. The fact that the angle of the shoulder is relatively sharp clearly shows that this joint cannot open up very much, i.e. that the front leg is not able to take a long step. Coupled with the fact that the humerus is shorter than the scapula, it becomes clear that the length of the step of the front legs is coordinated with the length of the step of hind legs.

The average angle of the elbow joint was 112.0 degrees in males, and 115.5 degrees in females. In males, the angle of the knee joint was from 97.0 to 115.0 degrees, with an average of 108.4 degrees, with a coefficient of variation of 6.2%. In females, the angle of the knee joint was from 110.0 to 125.0 degrees, with an average of 114.0 degrees, with a coefficient of variation of 4.7%. The power of thrust of the hind legs is in the knee joint. Females had an average knee joint angle of 114.0 degrees. The average value of the hock angle was 128.0 degrees in males, and 130.7 degrees in females (Table 1 and Table 2).

Available literature contains only one source pertaining to some exterior parameters of this donkey breed, however morphological characterization of the breed was not done. Zoufal, K. (2014) states that the shape of the body of the white Baroque donkey is rectangular, with a long rib cage, short, delicate, legs, and strong neck. Compared to the body, the head is large. Ears are up to 30 cm long. The back is straight or mildly concave. Height at withers is from 105 cm to 125 cm.

To date the Baroque donkey was not studied in this manner, however when studying the exterior of other Apulian donkeys in Dalmatia, (Babic, 1939.) established that the loins were higher than the withers, and that the middle of the back was lower than the withers. In addition, he established that the length of the pelvis was 32.45% of the height at withers. Large pelvic width was found. Head length was 42.23% of the height at withers. Chest circumference was 106.21% of the height at withers, and chest depth was 42.31% of the height at withers. Shin circumference was 16.3 cm, i.e. 12.65% of the height at withers. Essert, (1959) also had similar results when investigating the exterior of the domestic donkey on the island of Mljet. He established that the rump was higher than the withers, and that the center of the back was mildly concave. In Albania, the exterior of donkeys was studied by Papa and Kumek (2012, cit. Stanisic et al. 2014), and they established that the average height at withers was 107.80 cm, and chest depth 46.10 cm. The body had an elongated shape since body length was more than the height at withers (113.40 cm). The width of the rib cage was 26.70 cm, and chest circumference 125.20 cm. Studying angles and relationships between morphometric parameters of the hind leg of the donkey, (Urosevic et al., 2015.) established that there is no statistically significant difference for the height at the loins between males and females. Also, there is no statistically significant difference between sexes for the thigh and the shin. Differences in height at the knee and the hock were also without statistical significance. However, it was established that there is a statistical difference (t=0.030) for the angle of the rump for males and females, and that established differences for the angle of the knee statistically significantly differ (t=0.005). As opposed to these donkeys, Baroque donkeys are higher at the withers.

Investigating the types of donkeys in Croatia, (Ivankovic et al., 2000.) established that the height at withers was from 96.93 cm to 124.07 cm, depending on the region in Primorje where they were raised. In all three types it was established that the loins were higher than the withers. In the lowest type this difference was 3.01%, and in the highest 3.40%. This confirms that the biostatic model of a donkey is the same regardless of the height at withers, because both tall and short animals move on the same terrain. Chest circumference was 116.32% in the shortest, and 116.07% in the tallest animals. They all had an elongated body type because body length was more than the height at withers (112.75 cm, 144.01 cm). Donkeys have a relatively narrow front section of the body. Authors have established that breast width in the shortest type was 23.84% of the height at withers, and in the tallest type 24.05%. Regardless of the type, they all had a long pelvis, the length of which relative to the height at withers was 33.50% in the shortest and 33.10% in the tallest type. Since the pelvis is very important for body constitution and in enabling mobility, in relative terms, it is the same regardless of the height at withers (Urosevic et al., 2015).

Djermanovic et al. (2012) spoke about the basic indicators of body development of the Balkan donkey. Obtained results indicate that the Balkan donkey has an almost square body, since its length is above the height at withers by only 1%. Exterior parameters of the Balkan donkey were also reported. (Stanisic, et al., 2014). Presented results indicate that the height at the back is less than the height at withers by 1.8%. Height at the loin is 3.38% more than the height at withers. Chest depth is 44.92% of the height at withers. The body has an elongated form and its length is 7.73% more than the height at withers. These investigations have also shown that the donkey has a long pelvis. Its length is 30.43% of the height at withers. Authors state that the width of the pelvis was larger than its length by 7.93%. Chest circumference was 10.82% more than the height at withers. The width of the rib cage was 23.20% of the height at withers. Head length was 46.38%, and head width 43.75% of head length. Height at the hock was 39.13% of the height at withers. In the Baroque donkey it was also noted that the back is lower than the height at withers. Height at the rump is more than the height at the withers, and body length is also more than the height at withers: 3.2% in males, and 7.5% in females, which is similar to the results of investigations by previous authors. Morphological characteristics of the Catalan donkey were studied by Folch, P. and Jordana, J. (1997). On the average, head length in males was 61.24 cm, and in females 58.25 cm. In relation to the height at withers, in males this was 43.10%, and in females 42.74%. Also, in this donkey breed it was established that the height at the rump surpasses the height at the withers, in males by 0.56%, and in females by 1.56%. Like other authors, here it was also shown that the midpoint of the back is lower than the height at the withers, in males by 3.35%, and in females by 2.65%. The body had a mildly elongated form, since its length is more than the height at withers by 2.53% in males and by 5.57% in females.

In Catalan donkeys, head length in males was 43.10%, and in females 42.74%, of the height at withers. Skull length was 45.13% of total head length in males, and 45.49% in females. In males the face is longer than the skull. In relation to the total length of the head face length is 66.49% in males, and 54.51% in females. Skull width was 34.88% of total head length in males, and 33.94% in females. Chest circumference, measured behind the scapula, was 10.41% more than the height at withers in males, and 12.39% more in females. Height at the knee in males was 23.74% of the height at withers, and in females 21.24% of the height at withers. In males height at the hock was 28.92%, and in females 27.59% of the height at withers. Frontal width of the shoulder joints in males was 24.64%, and in females 2377% of the height at the withers. Shin circumference in males was 19.54 cm, and in females 17.81 cm. Ear length was 32.45 cm in males and 33.81 cm in females.

Investigating donkeys in Romania, Macedonia and Turkey, (Urosevic et al., 2015) established that there are no statistically significant differences in head length or pelvis length. Anatomically, as body parts, the head and the pelvis, are very important for the biomotoric effect and biomechanical thrust, therefore, it is logical that there are no significant differences in the length of the head and the length of the pelvis. In the donkey population in Romanian head length was 48.5%, in Macedonia 50.6%, and in Turkey 48.5% of the height at withers The length of the pelvis in donkeys in Romania was 35.2%, in Macedonia 34.7%, and in Turkey 34.7% of the height at withers. Studying morphological parameters of donkeys on Stara planina, in Serbia, (Trailovic et al., 2011) established that the body had a mildly elongated form. Body length was 5.99% more than the height at withers. Chest circumference was 8.25% more than the height at withers. Shin circumference was 12.67 cm. It was established that head length was 47.61% of the height at withers. As for relationships of the head, results show that the skull is shorter than the facial section. The skull was 47.90% of head length, and the facial section 52.10%. Head width was 92.41% of skull length. The average measured ear length was 27.44 cm.

That the donkey has a specific pelvis was mentioned. (Brem et al., 1998). Describing the desirable shape of the pelvis in the horse, they state that the “donkey pelvis” enables good thrust. Such a pelvis drops off to the side, with a low position of the hip.

Conclusion

Taking in account the obtained results and their perception from the aspect of investigations of other donkey breeds, it can be concluded that the Baroque donkey does not deviate from the principle of body constitution of the species. In the Baroque donkey, body length is more than the height at the withers, giving it a rectangular format. The height at the rump was more than the height at the withers. Head length was 48% of the height at the withers, while the average angle of the rump was 21 degrees. Like other breeds, the Baroque donkey also has a narrow front section of the body. The width of the rib cage in males was between 22.0 cm and 29.0 cm, with an average value of 24.6 cm, in females the variation interval was from 25.0 cm to 35.0 cm, with an average of 30.1 cm.

References

Altmann F.D. (1994): Europäische weiße esel- Haustierkundlich unbedingt erhaltenswerte raritäten. Stočarstvo; Paper for the improvement of animal husbandry*, 48(9-10)*, pp. 291-292.

Babic E. (1939): Beitrag zur Kenntnis des apulischen Esels in Dalmatien. Veterinarski arhiv, Zagreb, pp. 228-252

Baroncini R. (2014): L asino, il mulo e il bardotto. Edagricole, Milano, pp. 198

Brem G. (1998): Exterieurbeurteilung landwirtschaftlicher Nutztiere. Verlag Ulmer, Stuttgart, pp 122-148

Esseret Z. (1959): Domestic Ass of Island of Mljet. Veterinaria, Sarajevo, pp. 41-54

Đermanovic V., Mitrovic S., Trailovic R., Trailovic D., Ivanov S. (2012): Phenotype variability and correlation of body and preservation of body frame in Balkan Donkey. Proceedings of the 3rd Regional Symposium of Equine Breeding, Reproduction and Health Protection, Novi Sad, pp. 155-162

Svendsens E. (2011): Eselbuch. Ulmer Verlag, Stuttgart, pp 22.

Folch P., Jordana J. (1997): Characterization, reference ranges and the influence of gender on morphological parameters of the endangered Catalonian Donkey Breed. Journal of Equine Veterinary Science, pp.102-111

Graph Pad Prism 7 software (2017): Graph Pad Software Inc. Windows, Version 7.04

Ivankovic A., Caput P., Mioč B., Pavić V. (2000): The phenotype Features of Donkeys in Croatia. Agriculturae Conspectus Scientificus, Vol. 65, No.2, pp. 99-105

Rote Listen - Gefährdeter Tiere Österreichs (2010): Vol 14/4, pp. 98

Trailovic R., Ivanov S., Dimitirijevic V. Trailovic D. (2011): Some morphological and Heath Characteristics of Domestic Balkan Donkey on Stara planina. Proceedings Equine Nutrition and Pathology, Novi Sad, pp.180-187

Stanisić Lj., Simeunović P., Dimitrijević V., Lakić N., Stanimirović Z. (2014): Body Measures in Endangered Domestic Balkan Donkey Breed. Proceedings of the International Symposium on Animal Science, Belgrad-Zemun, pp. 111-118

Urošević M.M. Nemecek M., Drobnjak D., Urošević B.M., Stojić P., Matarugić D., Pračić N. (2015): Angulation and Relation of Morphometric Parameres on Back Leg of Donkyes. Proceedings of Research Papers. Vol. 21, No. 3-4, pp. 133-138.

Zoufal K. (2013): Weißer Barokesel. ARCHE Austria, Ausgabe 3, pp 8-10

Zoufal K. (2014): Der Österreichisch-Ungarische Weiße Barockesel. WildTiereZeit, Ausgabe 1, pp.4-8