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Morphometric description of the Boric Arabian horse mare families

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Abstract

The Boric Arabian horse has a long tradition of breeding in the territory of Bosnia and Herzegovina (BiH) dating back to 1884. The Borike Stud Farm, which ceased operations in 2018, played a significant role in breeding this population of horses. Today, the Boric Arabian horse is preserved in BiH thanks to private breeding. The aim of this research was to determine whether there is phenotypic uniformity between different mare families: Kadina, O'Bajan, Luna, El Hafi, and Hamdani. In this study, a total of 36 mares were measured, and 7 measurements were taken from each mare: withers height, back height, croup height, chest circumference, cannon bone circumference, body length, and back length. A simple analysis of variance with unequal repetitions was conducted to assess the significance of differences between mares of different families. The significance of the obtained differences was tested using Duncan's test. The average: withers height ranged from 142.6 cm (Luna and El Hafi) to 144.98 cm (Kadina), back height from 134.8 cm (El Hafi) to 137.12 cm (Kadina), croup height from 137.12 cm (Kadina) to 144.4 cm (El Hafi). The average chest circumference ranged from 166.91 cm (O'Bajan) to 176.62 cm (Kadina), and cannon bone circumference ranged from 17.23 cm (O'Bajan) to 17.75 cm (Luna). The average back length ranged from 73.45 cm (O'Bajan) to 77.4 cm (El Hafi), and body length ranged from 135 cm (O'Bajan) to 137 cm (El Hafi). The results showed no statistically significant differences in measurements between different mare families.

Key words: morphometry, body measures, mares, Boric Arabian horse

INTRODUCTION

The Boric Arabian horse is a breeding not registered with WAHO (World Arabian Horse Organization), but it possesses remarkable resilience and overall health (Žiga et al., 2008). The first stud farm for breeding Arabian horses in Bosnia and Herzegovina was established in 1895 in Sarajevo. Due to lack of space in Butmir, the stud farm was relocated to Borike near Rogatica in 1898. In 1900, the stud farm moved to Goražde, and during and after the war, it relocated between Modriča, Goražde, and Sarajevo until it finally settled in Borike in 1930 (Telalbašić et al., 2008). Today, the survival of the Boric Arabian horse in the territory of Republika Srpska is thanks to the enthusiasm of private breeders.

The morphometry of this horse population from Bosnia and Herzegovina or Croatia has been the subject of many studies (Grković 1932, Hrasnica 1937, Romić 1948, Bartolović 1962, Telalbašić and Pajanović 1981, Rastija et al. 1992, Božić 2000, Telalbašić et al. 2008, Korabi 2012). However, no recent studies can be found that have investigated the phenotype of the Boric Arabian horses in the territory of Bosnia and Herzegovina. On the other hand, morphometric analyses of horses are still very common as a working method in the research of domestic animals, particularly horses. For instance, Rogić et al. (2018, 2019, 2022, 2024), Preradović et al. (2024) have investigated morphometric measures of Lipizzan horses of stud farm Vučijak. Meanwhile, Sobczuk and Komosa (2012) and de Siqueira & Cordeiro (2024) have focused on the morphometric measures of Arabian horses.

Through generations and selective breeding at the Borike Stud Farm, six stallion lines were formed: Saabich, Lenkoran, Gazal, Kuhaylan Zaid, Mabrouk, and Siglavy, as well as five mare families: Kadina,

Hamdani, O'Bajan, Luna, and El Hafi (Ćutković, 2024). The cessation of operations at the Borike Stud Farm also meant the discontinuation of proper record-keeping. With the establishment of the Association of Breeders of the Boric Arabian Horse of Republika Srpska (in 2021), activities have begun which aim to eventually restore the breeding of this horse population to its proper course. One of the conditions that needs to be fulfilled for this horse population to be recognized as a is uniformity of morphological and production traits over the last three generations. The aim of this study was to phenotypically characterize the existing representatives of the Boric Arabian horse mares and to determine the significance of differences in morphometry between mare families.

MATERIAL AND METHODS

During the research, a total of 36 mares were measured, and seven body measurements were taken for each of them (Table 1). The body measurements of length and height were measured using a Lydtin stick, while the measurements related to circumference were measured using a tape measure. All the mares were four years old or older, meaning they had completed their physiological growth and development. The measured mares were representatives of four families: O'Bajan (11 representatives), Kadina (eight representatives), Luna (10 representatives), and El Hafi (five representatives), and Hamdani (one representative). The Hamdani family, due to the insufficient sample size, was not taken into further consideration or data processing.

To analyze the significance of the differences in phenotypic measures, a One-way ANOVA with an unequal number of repetitions was used. Microsoft Excel and SPSS were used for data processing.

Table 1. Morphometric measures and their description

HW	Height of withers	Vertically from the ground behind the hoof of the front leg to the highest point of the withers
HB	Height of back	Vertically from the ground to the highest point of the last thoracic vertebra
HR	Crop height	Vertically from the ground to the highest point of the croup, that is, to the point where the line connecting the hips intersects the spine
CC	Circumference of chest	Using a tape measure around the body, behind the shoulders
Ccc	Circumference of cannon bone	Using a tape measure at the thinnest point of the front left leg
LB	Body length	From the most cranial point of the shoulder joint to the most caudal point of the sit bone
BL	Back length	From the withers to the highest point of the croup

RESULTS AND DISCUSSION

The descriptive statistical analysis for the seven measures of different mare families is presented in Table 2. The average withers height ranged from 142.6 cm (Luna and El Hafi) to 144.98 cm (Kadina), the minimum measured was recorded for the O'Bajan family (136 cm), while the maximum height was recorded for the Kadina family (152 cm). The average back height ranged from 134.8 cm (El Hafi) to 137.12 cm (Kadina), the minimum measured was recorded for the Luna and El Hafi families (130 cm), while the maximum value for this measure was recorded for the El Hafi family (143 cm). The average croup height ranged from 137.12 cm (Kadina) to 144.4 cm (El Hafi), the minimum measured was recorded for the Kadina family (131 cm), and the maximum for the O'Bajan mare family (147 cm).

Table 2. Results of descriptive statistical for seven measures by families

Mare families	Count	Mean	Standard Error	Standard Deviation	Coefficient of variation	Minimum	Maksimum
HW – Height a withers							
O'Bajan	11	142,82	1,32	4,38	3,07	136	148
Kadina	8	144,98	1,28	3,61	2,49	142	152
Luna	10	142,60	0,93	2,95	2,07	138	146
El Hafi	5	142,60	1,60	3,57	2,50	140	147
HB – Height of back							
O'Bajan	11	135,36	0,93	3,07	2,27	131	140
Kadina	8	137,12	1,55	4,39	3,20	131	142
Luna	10	135,40	0,95	2,99	2,21	130	140
El Hafi	5	134,80	2,31	5,17	3,84	130	143
HR – Crop height							
O'Bajan	11	142,91	1,40	4,66	3,26	137	149
Kadina	8	137,12	1,55	4,39	3,20	131	142
Luna	10	142,40	0,93	2,95	2,07	139	148
El Hafi	5	144,40	0,87	1,95	1,35	142	147
CC – Circumference of chest							
O'Bajan	11	166,91	2,17	7,20	4,31	156	180
Kadina	8	176,62	3,39	9,59	5,43	165	194
Luna	10	174,30	2,73	8,64	4,96	164	191
El Hafi	5	171	1,30	2,91	1,70	168	175
Ccc – Circumference of cannon bone							
O'Bajan	11	17,23	0,40	1,33	7,72	14	19
Kadina	8	17,44	0,30	0,86	4,93	16	19
Luna	10	17,75	0,27	0,86	4,85	16	19
El Hafi	5	17,70	0,12	0,27	1,53	17,50	18
BL – Back length							
O'Bajan	11	73,45	1,32	4,37	5,95	67	81
Kadina	8	76,12	1,26	3,56	4,68	70	81
Luna	10	75,40	1,45	4,57	6,06	70	85
El Hafi	5	77,40	1,80	4,04	5,22	73	83
LB – Body Length							
O'Bajan	11	135	1,39	4,63	3,43	129	141
Kadina	8	136,25	1,46	4,13	3,03	131	143
Luna	10	136,90	1,74	5,51	4,02	129	146
El Hafi	5	137	1,38	3,08	2,25	133	141

The average chest circumference ranged from 166.91 cm (O'Bajan) to 176.62 cm (Kadina), the minimum value was recorded for the O'Bajan family (156 cm), while the maximum for the Kadina family (194 cm). The average cannon bone circumference ranged from 17.23 cm (O'Bajan) to 17.75 cm

(Luna), the minimum cannon bone circumference for the O'Bajan family (14 cm), while the maximum was recorded for the O'Bajan, Kadina, and Luna mare families (19 cm). The average back length ranged from 73.45 cm (O'Bajan) to 77.4 cm (El Hafi), the minimum back length was recorded for the O'Bajan mare families (67 cm), while the maximum for the Luna (85 cm). The average body length ranged from 135 cm (O'Bajan) to 137 cm (El Hafi), the minimum body length was recorded for the Luna and O'Bajan (129 cm), while the maximum was recorded for the Luna mare families (146 cm).

Table 3. Results of the analysis of variance for seven phenotypic measures

	O'Bajan	Kadina	Luna	El Hafi	F	p*
HW	142,82	144,98	142,60	142,60	0,75	0,54
HB	131	131	130	130	0,54	0,66
HR	142,91	137,12	142,40	144,40	0,88	0,46
CC	166,91	176,62	174,30	171	2,75	0,06
Ccc	17,23	17,44	17,75	17,70	0,56	0,64
LB	135	136,25	136,90	137	0,37	0,77
BL	73,45	76,12	75,40	77,40	1,22	0,32

* $p>0.05$ - no significance

In order to determine the significance of the obtained differences in body measurements between different mare families, a simple analysis of variance was performed. Table 3 shows the results of the analysis of variance for all seven measures. It can be concluded from the table that there is no statistically significant phenotypic difference between representatives of the four mare families in all of the seven measures. Rastija et al. (1992) states that the projected values of traditional Arabian horse mares in Croatia were: height of withers 154.78 cm, chest circumference 175.89 cm, canon bone circumference 18.22 cm. Comparing the results obtained in this paper, it can be seen that mares of the traditional Arabian horse in Croatia have slightly higher average values in compare. Romić (1948) states that the average values of mares of the traditional Arabian horse were: height of withers 149.13 cm, height of back 139.24 cm, height of withers 145.10 cm, length of body 144.63 cm, chest circumference 174.36 cm and canone bone circumference 18.45 cm. Comparing the results obtained in this work, it can be noticed that the traditional Arabian horse from the Vrbik stable has also slightly higher values in compare with Boric Arabian mares. In his doctoral dissertation, Korabi (2012) analyzed three populations of Arabians: purebred Arabians, Shagia Arabians and traditional Arabian horses originating from Borik. In his results, Korabi, (2012) states that the average values of traditional Arabian horse mares were as follows: height of withers 146.5 cm, height of back 138.1 cm, height of withers 145.1 cm, girth of chest 173.1 cm, girth of withers 17.3 cm, length of back 76.6 cm and length of trunk 147.4 cm. Comparing the results obtained in this paper, it can be seen that the traditional Arabian horse from Croatia has slightly higher values for the height of the withers, the height of the back, the height of the withers and the length of the trunk, while the other measurements are in agreement with those obtained in this paper.

CONCLUSION

Based on the obtained results for the seven body measurements (withers height, back height, croup height, body length, back length, cannon bone circumference, chest girth) for 35 representatives of the four mare families of Boric Arabian horse (O'Bajan, Kadina, El Hafi, and Luna), it can be concluded that there are no statistically significant differences in body measurements between mares of different families. The obtained results showed that there is no significant difference in morphometry between the studied the mare families. These results will be useful in further steps aimed at improving the breeding of the Boric Arabian horse in Republic of Srpska. In future work, it is necessary to continue morphometric characterization, not only of mares but also of stallions, which would include more body measurements and a larger number of animals. It is also necessary to conduct genetic and genomic research to obtain data necessary for a comprehensive characterization of this horse population.

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