



Comparative study of the main parameters of conformation and constitution in Gidran brood mares (*Equus ferus caballus*) from Romania

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Abstract. The aim of this study was to investigate some conformation traits and body indices in two Romanian Gidran stud farms: Tulucești and Cislău. The target of this study is to establish an optimal breeding selection and mating program, which will lead to the modification of the genetic structure in order to increase population performances. The targeted conformation traits were: height at withers, thorax perimeter, and cannon bone circumference. In all cases, the coefficient of variation was low (under 10%) for all studied characters, and this indicates that in the studied horse population a continuous genetic improvement activity has been carried out over several generations. Comparing the thorax perimeter value of Romanian Gidran mares (184.2 cm) with the values reported in Croatian and Hungarian populations, we can conclude that Croatian and Hungarian mare population recorded higher values (190.3 and 192.7 cm). Regarding the height at withers, the mean height in the Romanian population (161.8 cm) was similar with that reported for Croatian population (161.9 cm), Hungarian population (161.7 cm). The cannon bone circumference values were similar: 20.4 cm in Romanian mares, 20.5 cm in Croatian mares and 19.9 cm in Hungarian mares.

Key Words: selection program, mating program, conformation traits, constitution traits, *Equus ferus caballus*.

Introduction. The Romanian horses have always been appreciated for their special qualities (energetic capacity, resistance, food conversion, traction, production traits, etc.), (Cighi et al 2019; Stuparu et al 2017), contributing to the consolidation of the genetic background of famous European stud farms. Very famous stud farms from the Austro-Hungarian Empire, from Germany, France or Denmark, imported and raised horses from Romanian countries, due to their qualities.

The conformation scoring of horses offer very useful information for the breeders. Conformation parameters and measurement indices can be an objective source to characterize an animal (Mihók 2004).

As far as conformation is concerned, one may find that it is very different from one breed to another. Conformation data together with other important breed data are listed in the breed standard. Due to the breeding program and selection, the breeds are changing, and the information from the breed standards must be updated (Bene 2014).

Today, from a total of 904 horse breeds, 87 of them are extinct, 202 breeds are in some level of vulnerability, while only 137 are not in the risk of disappearance (FAO 2015). The reported data indicate that 53% horse breeds have unknown status of their biological endangerment level. However, nowadays the breeds combinations resulted from crossings are preferred, in order to create new genotypes having desirable working features. Breeds are also part of the cultural heritage that has been for centuries incorporated in the life of

rural areas, and for this reason, we should be aware of the need to preserve the traditional breeds in order to maintain their genetic structure, which could serve as the basis for obtaining useful genotypes in horses (Ivankovik 2016; Erdelyi 2007).

Among the Romanian horse breeds we can say that Gidran is the one with the smallest effective, and this is why the conservation and gene preservation raise some special issues (Pataki 1996).

Since 1999, Tulucești stud farm has been specialized in the Gidran horse breeding. Also Cislău stud farm has a very valuable and unique biological material, which must be preserved for further improvement. The breeding program is based on pure breed (zootechnical lines and families). The improvement of the biological material is done by selection within the classification programs and by mating management. Due to the breeding process, a continuous improvement of the conformation, constitution, and energetic capacity of the biological material can be observed (<http://hergheliidestat.ro/herghelii.html>).

Gidran horse breed has a limited number of brood-mares, so maintaining the heterozygosity of the breeds is very important to prevent the inbreeding (Mihók 2009). Gidran population structure (just for reproduction) from Cislău stud farm is divided in three main categories: 44% brood mares, 6.6% stallions and 53.4% young horses (3.3% are 0-6 months old, 20.8% are 6-12 months old, 11% are 1-2 years old, 11% are 2-3 years old, 3.3% are young horses in the training process).

Our study was focused on analyzing the main conformation and constitution of specimens from a Gidran brood mares population from Cislău and Tulucești stud farms, Romania.

Material and Method. This trial was carried out within Cislău stud farm, Buzău County and Tulucești stud farm, Galați County. Our data are based on measurements made on the studied biological material. Biological material consisted of brood mares who participated in the reproduction (2015-2017). A total of 49 brood mares were measured for height at withers, thorax perimeter and cannon bone circumference, and a total of 15 mares (randomized selected) from each stud farm for comparative analysis of the conformation traits mean values.

The body indices were also determined, as follows: massive index, bone index, and dactylo-thoracic index. Zoo-meter and ribbon represent the equipment used for the measurements.

The raw data were statistically processed using the BIOSTAT software.

Results and Discussion

The mean values and dispersion indices for conformation traits. Table 1 highlights the mean values of the studied traits: height at withers (161.8 cm), thorax perimeter (184.2 cm), and cannon bone circumference (20.4 cm).

Table 1
Mean values and dispersion indices in brood mares for conformation traits

<i>Trait</i>	<i>n</i>	$\bar{x} \pm s_x$ (cm)	<i>s</i> ²	<i>s</i>	<i>V</i> %	<i>A</i>
Height at withers	49	161.8±0.26	3.44	1.85	1.15	8
Thorax perimeter	49	184.2±0.70	24.22	4.92	2.67	22
Cannon bone circumference	49	20.4±0.10	0.47	0.69	3.37	3

The standard deviation and the coefficient of variation suggest the homogeneity and uniformity of the brood mare population for the studied characters.

For all 3 studied traits the coefficient of variation was low (under 10%). This fact suggests the population homogeneity, and we consider that it is the result of the good breeding program and selection management.

Comparing the thorax perimeter value of Romanian Gidran mares (184.2 cm) with the values reported in Croatian and Hungarian populations (Ivankovik 2016; Bene 2014; CAA 2016), we find that Croatian and Hungarian mare population recorded higher values (190.3 cm and 192.7 cm). Regarding the height at withers, the mean height in the Romanian population (161.8 cm) was similar with that reported for Croatian population (161.9 cm) and I Hungarian population (161.7 cm). Similarities may be also observed concerning the cannon bone circumference values, respectively: 20.4 cm in Romanian mares, 20.5 cm in Croatian mares and 19.9 cm in Hungarian mares.

The actual breeding standard mentions that the values corresponding to the height at withers are within the interval 161-167 cm, for the mares, and within the interval 162 - 170 cm for the stallions. The standard also specifies the circumference of cannon values between 19.5 and 22 cm for the mares, and between 21 and 22.5 cm for the stallions.

According to The Romanian National Agency for Animal Husbandry "Prof. dr. G. K. Constantinescu", there are several criteria for scoring the reproduction horses. One of them is the scoring by body size. Based on this criterium, points are awarded according to the body size (Table 2).

Table 2

Evaluation of mares by body size according to the Romanian National Agency for Animal Husbandry "Prof. dr. G. K. Constantinescu"

<i>Gidran breed (scoring by body size)</i>			
<i>Height at withers (cm)</i>	<i>Thorax perimeter (cm)</i>	<i>Cannon bone circumference (cm)</i>	<i>Scoring points</i>
164	188	21.0	10
162*	187	21.0	10
160	185*	20.5*	9
158	183	20.0	8
156	181	19.5	7
154	179	19.0	6-7
152	177	18.5	6
150	175	18.0	5-4

*average values recorded in our study.

Comparative analysis of the mean values of the conformation traits in brood mares. Tables 3, 4 and 5 reflect the comparative analysis (analysis of differences) of biological material from the studied stud farms: Cislău and Tuluțești. For this analysis 15 mares from each stud farm were randomly extracted.

Table 3

Analysis of differences for the height at withers

	<i>n</i>	$\bar{x} \pm s_x$ (cm)	<i>t-Test</i>			<i>Significance</i>	
			s^2	<i>d</i>	<i>sd</i>		<i>t</i>
Total	30	161.8±0.36	3.91				
Tulucești	15	160.8±0.51	3.89	1	0.62	1.60	ns
Total	30	161.8±0.36	3.91				
Cislău	15	162.7±0.38	2.21	0.9	0.53	1.71	ns
Tulucești	15	160.8±0.51	3.89				
+ Cislău	15	162.7±0.38	2.21	1.9	0.64	2.98	**

Table 4

Analysis of differences for the thorax perimeter

	<i>n</i>	$\bar{x} \pm s_x$ (cm)	<i>t-Test</i>			<i>Significance</i>	
			s^2	<i>d</i>	<i>sd</i>		<i>t</i>
Total	30	183.57±0.87	22.94				
Tulucești	15	183.40±1.17	20.69	0.17	1.46	0.12	ns
Total	30	183.57±0.87	22.94				
Cislău	15	183.7±1.34	26.78	0.13	1.60	0.08	ns
Tulucești	15	183.40±1.17	20.69				
+ Cislău	15	183.7±1.34	26.78	0.3	1.78	0.17	ns

Table 5

Analysis of differences for the cannon bone circumference

	<i>n</i>	$\bar{x} \pm s_x$ (cm)	<i>t-Test</i>			<i>Significance</i>	
			s^2	<i>d</i>	<i>sd</i>		<i>t</i>
Total	30	20.4±0.13	0.48				
Tulucești	15	20.5±0.19	0.55	0.1	0.23	0.44	ns
Total	30	20.4±0.13	0.48				
Cislău	15	20.3±0.17	0.42	0.1	0.21	0.48	ns
Tulucești	15	20.5±0.19	0.55				
+ Cislău	15	20.3±0.17	0.48	0.2	0.25	0.79	ns

The differences between the mean values of the mare's height at withers from Tulucești, respectively from Cislău, are distinctly significant (Table 3). Between the mean values of the height at withers corresponding to the groups of mares coming from Tulucești, respectively, Cislău, and the mean of the trait by the total number of mares, the differences are non-significant. Concerning the thorax perimeter and cannon bone circumference, our study shows that the differences are statistically non-significant (Tables 4 and 5).

Calculation of body measure indices. Some body measurement indices were also determined: massive index, bone index, dactylo-thoracic index. The calculation method of body measurement indices (Marchiș 2015; Mureșan 2012) is shown in Table 6.

Calculation model of body indices

<i>Parameter</i>	<i>Formula</i>
Massive index	Thorax perimeter/height at withers x 100
Bone index	Cannon bone circumference/height at withers x 100
Dactylo-thoracic index	Cannon bone circumference/thorax perimeter x 100

Using the relations between the body measurements, physical indices may be obtained. These indices give us important information about horse conformation (Table 6). The mean value of the massive index in mares from Cislău is lower compared the value recorded for the same index in Tulcești stud farm. We consider that this lower value is the result of the breeding process of mares' population.

The coefficient of variation was low for all studied indices (between 2.6% and 3.9%), which means a very good homogeneity. The minimum value (2.6%) is recorded for the body index, while the maximum value (3.9%) was found for the dactylo-thoracic index. The dactylo-thoracic index was found to be higher (11.1 cm) in Romanian mares compared with Croatian mares (10.8 cm).

Conclusions. Concerning the studied traits, we can conclude that there are differences for all the traits in favor of the mares from Cislău stud farm, but only in the case of height at withers the statistical differences are evident.

Our study reveals new body measurements data of the evaluated Gidran brood mares from Romania. These data can be useful for breed characterization, and for improving the conformation scoring.

Population of Gidran horses from Romania has a homogeneous phenotype indicating a good management of breeding program and selection for these indices.

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