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RESEARCHES REGARDING CANNON BONE PERIMETER AVERAGE PERFORMANCES IN ROMANIAN HUCUL HORSE BREED – PIETROSU BLOODLINE

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Abstract

Study of average performances in a population have a huge importance because, regarding a population, the average of phenotypic value is equal with average of genotypic value. So, the studies of the average value of characters offer us an idea about the population genetic level. The biological material is represented by 91 Hucul horse from PIETROSU bloodline divided in 3 stallion families analyzed at 18, 30 and 42 months old, owned by Lucina hucul stood farm. The average performances for cannon bone perimeter was 17.20 cm. at 18 months, 18.04 cm. at 30 months old and 18.63 cm. at 42 months old. We can observe a good growth rate from one age to another and significant differences between sexes. The average performances of the character are between characteristic limits of the breed.

Key words*:horse, Hucul, Lucina, Pietrosu, bloodline.*

INTRODUCTION

The individual can no longer be a reliable source of information on genetic determinism or in mechanisms of phenotypic manifestation for the quantitative character considered, which makes the unit of study for these characters extend to the population level. Also, in order to study the nature of the quantitative differences regarding the manifestation of the same character in different individuals in different populations, measurements are required which generally do not express the character itself but its value.

The character's average performances, in a population, have a great value because it can offer an overview of the genotypic value. All this is possible because, regarding to a population, the average phenotypic values is equal with the average of genotypic values (Maftei, 2015). More than that, the study of average values of characters, in a population, can offer an idea about populational genetic level.(Maftei, 2015).

Tracking of body growth can be done by periodic determination of body weight and body dimensions. As a rule, there is a direct relationship between the weight of an animal and its volume, which means that the dynamics of the weight will, indicate also the dynamics of the dimensions. Determining only the body weight can not always indicate the clearest picture of the evolution of the growth process, as it may happen when the weight remains the same between two determinations (Popescu – Vifor, 1978; 1985).

The growth process can be followed by: growth energy, growth rate, growth intensity, and growth coefficient.

Perhaps more than in other species of economic interest, in horses, phenotypic characters occupy an important place in the breeding programs, as they play an essential role in the expression of production characters.

In this group of characters, the characters expressing the growth process (height, cannon bone perimeter, thoracic perimeter) and those expressing the body conformation specific to the production specificities (running, sports, jumping, recreation, traction) are predominantly included. These characters belong to the group of morphological characters and are determined by somatometry. Somatometry is the most objective method of assessing the exterior of the horses. In principle, it consists in direct measurement, on

the live animal, of the dimensions of the different body regions, or even the characteristic size of the species. In this study we use the cannon bone perimeter values.

MATERIALS AND METHODS

The purpose of using somatometry in assessing the exterior of the horses is to determine, first of all, body development, but also to establish the overall harmony of the specimen (Marginean et al., 2005).

In this study we analyze the cannon bone perimeter, measured with the ribbon and representing the circumference of the middle third of the whistle.

Body size judgments (valid for both young and adult animals) are usually based on the scales set for the standard of each breed, or according to the scales set by the breeding program.

The characteristic limits for each character are different from a breed to another and also between the two sexes. To reach the maximum limit, note 10 is given. For the minimum limit and below this limit, note 4 is given. The exceeding of the maximum values is penalized by subtraction of the note.

For realising purposed objectives, the biologic material became from Lucina stood farm. It is a sample of 91 horses from Hucul breed – Pietrosu bloodline, divided in 3 stallions families: Pietrosu VIII, Pietrosu IX and Pietrosu X, presented in Table 1. It was 44 males and 47 females analyzed at three different ages: first grading at 18 months old, second grading at 30 months old and third grading at 42 months old. After the third grading the individual will be tested for energetic capacity. The sample of 91 horses was extracted from population in according with registered performances, for all three ages, in order to have one balanced experimental plan (Popa, 2009).

The individuals was studied at three different ages:18, 30 and 42 months old.

We had calculate statistics like Average, variant, average error, standard deviation, and coefficient of variability. We applied significance tests like Student. The Fisher test was applied to the case of several samples, preceded by a variance analysis. The calculated F value was obtained by reporting the average squares value between the samples at the average squares from sample. The Tukey test involves calculating a statistic, noted

$$w = q_{(p;GL_e;\alpha)} \times s_{\bar{X}}$$

where q represents the standardized amplitude read from the table at the desired significance level (α), p being the number of groups, and GLe - degrees of freedom from the intragroup component of the variance analysis table. The value is obtained by the fact that MPe is the intragroup squares average value, and n is the average size of the groups. Applying Fisher or Tukey tests had the advantage to highlight, to allows us to see between which families we recorded significant differences.

Table 1. Analyzed biological material

PIETROSU families	Individuals	Males	Females
Pietrosu VIII	6	2	4
Pietrosu IX	65	31	34
Pietrosu X	20	11	9
TOTAL	**91**	**44**	**47**

RESULTS AND DISCUSSIONS

The average performances for cannon bone perimeter, in Pietrosu bloodline, is presented in Table 2, and the dynamics of the same character can be observed in Figure 1

Analyzing the data presented, there is a more pronounced variability of the cannon bone perimeter, in the Pietrosu bloodline at the first ranking (18 months old), in males. This is most likely due to the environment, or possibly intangible factors. From the analysis of the data can notice the existence of differences with a high degree of significance between individuals belonging to the two sexes.

The calculated Fisher test scores reveal distinctly significant differences between half sibs (males and females) families, in the Pietrosu bloodline for the cannon bone perimeter, but only at the age of 42 months old (F = 6.53).

Tukey's test calculated values show that at the age of 42 months old there are significant differences between the performance of the Pietrosu VII and Pietrosu X families, as well as between the performance of the Pietrosu IX and Pietrosu X families.

Table 2. Average performances for cannon bone perimeter in Pietrosu bloodline

Family	Sex	Age (months)											
		18				30				42			
		n	$\overline{X} \pm S_{\overline{X}}$	s	v%	n	$\overline{X} \pm S_{\overline{X}}$	s	v%	n	$\overline{X} \pm S_{\overline{X}}$	s	v%
P VIII	M	2	18	0	0	2	18.5 ± 0.5	0.71	3.84	2	18.5 ± 0.5	0.71	3.84
P IX		31	17.42 ± 0.13	0.75	4.31	31	18.29 ± 0.11	0.63	3.44	31	18.82 ± 0.12	0.68	3.61
P X		11	17.41 ± 0.22	0.74	4.25	11	18.64 ± 0.24	0.78	4.18	11	19.45 ± 0.17	0.57	2.93
Total M		**44**	**17,44 ± 0,11**	**0.73**	**4.19**	**44**	**18.39 ± 0.1**	**0.67**	**3.64**	**44**	**18.97 ± 0.11**	**0.70**	**3.69**
P VII	F	4	16.75 ± 0.15	0.29	1.73	4	17.75 ± 0.15	0.29	1.63	4	17.63 ± 0.24	0.48	2,72
P IX		34	17.04 ± 0.1	0.59	3.46	34	17.72 ± 0.09	0.52	2.93	34	18.32 ± 0.13	0.73	3,98
P X		9	16.83 ± 0.22	0.66	3.92	9	17.72 ± 0.26	0.79	4.46	9	18.56 ± 0.15	0.46	2,48
Total F		**47**	**16,98 ± 0,09**	**0.59**	**3.47**	**47**	**17.72 ± 0.08**	**0.56**	**3.16**	**47**	**18.31 ± 0.1**	**0.70**	**3.82**
Total		**91**	**17,20 ± 0,07**	**0.70**	**4.07**	**91**	**18.04 ± 0.07**	**0.70**	**3.88**	**91**	**18.63 ± 0.08**	**0.77**	**4.13**
Significance of observed differences		3.54 ***				5.58 ***				4.71 ***			

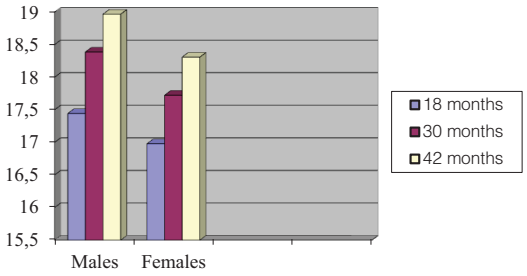

Figure 1. Dynamics of cannon bone perimeter

CONCLUSIONS

The calculated values for Fisher test reveal the existence of some distinctly significant differences between half sibs families from Pietrosu bloodline, for cannon bone perimeter, but only at 42 months old (F=6.53). Values of Tukey test shows that at 42 month old are significant differences between performances of families Pietrosu VII and Pietrosu X, and also between Pietrosu IX and Pietrosu X families. From the data presented in for the cannon bone perimeter whistle, it is observed that, at this three ages, the average values of the character are approximately equal, at all the genealogical lines, for both sexes

Table 3. Observational and causative components of variance at18 months old

Cannon bone perimeter	Components of variance	Observational			Causative		
		S_F^2	S_I^2	S_i^2	V_A	V_D	V_M
	Abs. val.	0.4659	0.0064	0.4595	0.0256	0.0554	0.3849
	%	100.00	1.37	98.63	5.49	11.89	82.62

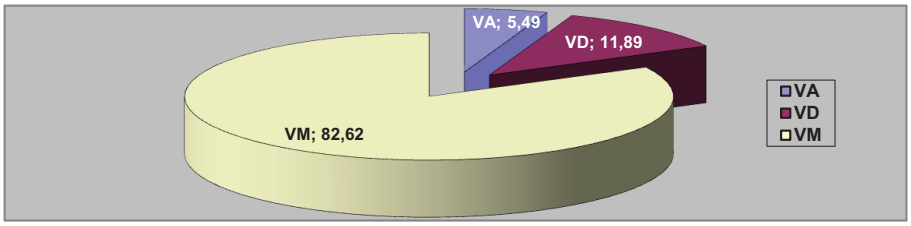

Figure 2. Percentage of causal components of variance for cannon bone perimeter at 18 months

Table 4. Observational and causative components of variance at 30 months old

Cannon bone perimeter	Components of variance	Observational			Causative		
		S_F^2	S_I^2	S_i^2	V_A	V_D	V_M
	Abs. val.	0.4414	0.0012	0.4402	0.0048	0.1194	0.3172
	%	100.00	0.27	99.73	1.09	27.05	71.86

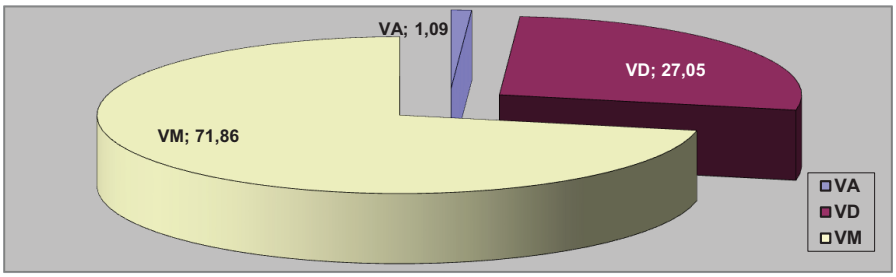

Figure 3. Percentage of causal components of variance for cannon bone perimeter at 30 months

Table 5. Observational and causative components of variance at 42 months old

Cannon bone perimeter	Components of variance	Observational			Causative		
		S_F^2	S_I^2	S_i^2	V_A	V_D	V_M
	Abs. val.	0.6177	0.0656	0.5521	0.2624	0.0238	0.3315
	%	100.00	10.62	89.38	42.48	3.85	53.67

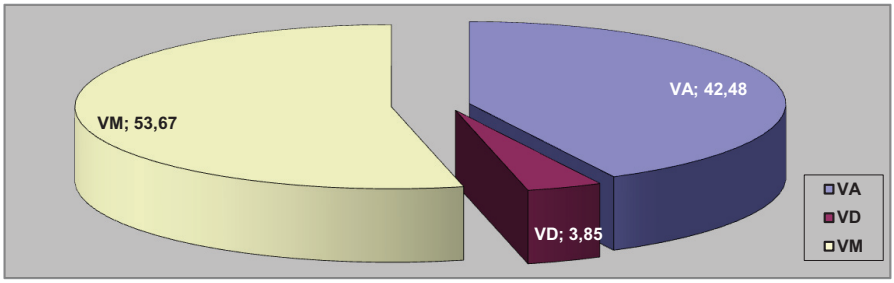

Figure 4. Percentage of causal components of variance for cannon bone perimeter at 30 months

The results obtained in the analysis of the causal components of the variance, presented in Tables 3, 4 and 5 and in Figures 2, 3 and 4, for the cannon bone perimeter at this three ages, lead to the following additions:

The perimeter of the whistle is a character that shows a very poor genetic determinism at the first two ages, the share of the additive genetic variance in the total phenotypic variance being very small: 5.49% 1.5 years and 1.09% 2.5 years.

At 3.5 years, the situation changed radically, the additive genetic variation accounting for a significant share of the phenotypic variance (42.48%).

At 2.5 years, there is a significant share of the variance due to dominance (27.05%).

The environmental variation also has significant weightings at the three studied years, but it shows a decreasing trend (82.62% at 1.5 years, 53.67% at the 3.5 years ranking).

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