

## A COMPARISON AND DEVELOPMENT OF MORPHOMETRIC CHARACTERISTICS OF STALLIONS AND MARES ON THE LIPIZZANER STUD OF ĐAKOVO

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### ABSTRACT

The research was conducted on 20 stallions and 20 mares of the Lipizzaner breed in the Stud of Đakovo. Fifteen physical measures of stallions and mares were taken. The research results show a larger physical range of the Đakovo Lipizzaner breed in comparison with the same breed in Slovenia and Austria because of occasional blood refreshing with stallions from Hungary and Romania. According to the conducted research, the stallions had significantly and highly significantly larger physical measures except the body length and the chest girth, where the mares had a slightly bigger dimension.

Key words: horses / breeds / Lipizzaner breed / physical measures/ stallions / mares / Croatia

### PRIMERJAVA IN RAZVOJ MORFOMETRIČNIH LASTNOSTI ŽREBCEV IN KOBIL LIPICANSKE PASME V KOBILARNI ĐAKOVO

### IZVLEČEK

Raziskavo smo opravili na 20 žrebcih in 20 kobilah lipicanske pasme v kobilarni Đakovo, pri katerih smo izmerili 15 telesnih lastnosti. Raziskava je pokazala, da so konji lipicanske pasme v kobilarni Đakovo večjega okvirja v primerjavi z lipicansko pamo v Sloveniji in Avstriji zaradi občasnega uvoza žrebcev iz Madžarske in Romunije. V opravljeni raziskavi so žrebci imeli statistično značilno večje telesne mere razen dolžine telesa in prsnega obsega. Tudi kobile so imele malo večje telesne mere.

Ključne besede: konji / pasme / lipicanec / telesne lastnosti / žrebci / kobile / Hrvaška

### INTRODUCTION

Marking the working ability and usable value of the horse, beside grading the working ability, has also the physical horse frame, in other words, the development of certain body dimensions. For a better and safer working ability grade it is necessary to measure regularly the male and female breeding horses. The collected research results ensure a more successful selection in the aim of breeding the Lipizzaner horse for team sport.

Madroff (1935), Car (1950), Romić (1940), Rastija *et al.* (1991, 1993), Stipić (1980) and others dealt with the research of morphological characteristics of the Lipizzaner breed in Croatia. If we compare other Lipizzaner horse-farms, according to Stipić (1980) research, stallions and breeding stallions are higher than mares in all horse-farms. The most withers height measured by a stick had breeding stallions from the Hungarian horse-farm Szilvásvárada, and the highest

stallions in folk breeding come from Slovenia. The highest chest girth had breeding stallions from the Slovenian horse-farm Topol'canky, and from the folk breeding stand out stallions from Hungary. The highest cannon bone circumference had breeding stallions from Hungarian horse-farm, as well as stallions of their folk breeding. The lowest frame at all had breeding stallions and stallions from the folk breeding in Prnjavor.

Rastija *et al.* (2000) dealt with the comparison of morphological characteristics of Lipizzaner mares in horse-farm breeding and family farming. The latest research of the Copernicus team about the morphological measures of the Lipizzaner horses from the horse-farms in state property in seven countries in Central and Southeast Europe have been registered in order to characterize the basic population of Lipizzaner horse breeding. The research aim of the Copernicus project was to present the mid value and differences for the listed horse-farms in 37 physical measures following the standard procedure which was developed by Oulehla (1996). According to Zechner *et al.* (2001a,b,c) and Zohmann *et al.* (2001) differences were found for many morphological characteristics between horse-farms what indicates different breeding aims of those horse-farms. The measuring results showed that the Lipizzaner horse is rectangular. At all horse-farms, except in Monterotondo, the mid values for the withers height were 3–8 cm less than the values for the body length. According to Burczyk (1989) this relation is good for training horses, while a bigger difference is acceptable for team horses. Sölkner *et al.* (2001) claim that the Slovenian, Slovak and Croatian horse-farms breed modern riding horses while the Roumanian horse-farms breed stallions for breeding improvement of folk breeding.

The second criterion at horse breeding is the difference between the withers height and the back height. In most cases the withers height was about 1–2 cm higher than the back height. Zechner *et al.* (2001a,b,c) established that only Monterotondo's and Đakovo's stallions, and Fagarasa's mares show similar values for both measures. Horses from Monterotondo and Lipica did not differ much from horses from other horse-farms in height, but their bodies were shorter. The total crupper length was also smaller for both of these horse-farms, although the length of the front and back quarter did not show bigger deviations than at other horse-farms. Horses in Szilvásvárad showed the largest front part what is connected with their use in team riding. Measuring the chest depth was in correlation with the horse size and the chest and hip width. The width between the hip points was the largest in Piber what can be connected with the horse training. Thanks to different keeping and feeding, the chest growth of Italian and Roumanian horses was also smaller. As Zechner *et al.* (1998) established, the horse-farms differ mostly in the neck length and the cannon bone circumference. Horses from Szilvásvárad and Đakovo show the cannon bone circumference above the average, while horses from Lipica and Priber according to that characteristic are on average about two standard deviations below the mentioned horse-farms. Sölkner *et al.* (2001) established the largest withers height at the horse-farm Szilvásvárad. Only Đakovo's mares were not significantly lower. At the body length mares from Szilvásvárad were significantly longer than mares from other horse-farms. On the basis of these few measures, it is obvious that the horses from Szilvásvárad are on average higher than horses from other horse-farms. That is connected with the breeding aim, which is at this horse-farm successfully directed to the area of team sport. The mid values for Lipica's, Piber's and Topol'canky's horses were very close in many characteristics. There is a high connection between the cannon bone circumference and the bone strength. Above average are horses from Szilvásvárad and Đakovo, while the horses from Lipica and Piber are under average.

Jakubec *et al.* (1999) prove that the distance between Lipizzaner stallions from Szilvásvárad and Kladrub is less than the distance between stallions from other Lipizzaner horse-farms, although the horses from the Kladrub breed are bigger than the Lipizzaners. The average withers height was 167 cm for the Kladrub stallions, 158 cm for Szilvásvárad's stallions and 154–157 cm for other measured Lipizzaner's horse-farms. The distance between Szilvásvárad and other Lipizzaner horse-farms are smaller in mares than in Kladrub mares.

The aim of this research was to establish the difference between the stallion's and mare's physical measures in breeding as well as the improvement in relation to earlier research.

## MATERIAL AND METHODS

Authors conducted research on 20 stallions and 20 mares of the Lipizzaner breed, which were chosen by chance and which take 40% of the complete population at the Stud Đakovo. 15 physical measures were taken into consideration and measuring was performed by cattle-ribbon and the Lydtin stick. Measuring data were processed by the statistical program SPSS/PC (Nie *et al.*, 1975), and the testing of differences in measures of stallions and mares was conducted by the "t" test.

## RESULTS AND DISCUSSION

The research values of development refer to 20 stallions and 20 mares of the Lipizzaner breed at the horse-farm Đakovo, and are shown in tables 1 and 2. All in all 15 measures were taken which indicate a physical development of grown-up stallions and mares. The withers height measured by a stick and ribbon was highly significant bigger in stallions. The back height and lumbago height were highly significant more expressed in stallions, while the tail root's length was significantly bigger in stallions. The body length and the chest width were uniform in both sexes, while the shoulder width, chest depth and cannon bone circumference were more significantly developed in stallions. Mares had for 1.95 cm bigger crupper's width and for 3.00 cm bigger crupper's length than the stallions. The gained differences are statistically justified at the level of 5%, other values of measuring differences in stallions and mares do not have a statistical justifiability.

Table 1. Physical measures of the Lipizzaner stallions (n=20)

Physical measure	$\bar{x}$	s	v	Relative measure, %
Withers height (by stick)	159.20 <sup>***</sup> ± 0.83	3.72	2.34	100
Withers height (by ribbon)	168.10 <sup>***</sup> ± 0.80	3.60	2.14	105.59
Back height	150.85 <sup>***</sup> ± 0.70	3.15	2.10	94.75
Lumbago height	157.75 <sup>***</sup> ± 1.05	4.67	2.96	99.65
Tail's root height	147.00 <sup>*</sup> ± 1.34	6.08	4.09	92.34
Body length	155.45 ± 0.76	3.39	2.18	97.60
Chest width	47.60 ± 1.08	3.83	7.92	30.59
Shoulder width	47.00 <sup>**</sup> ± 0.43	1.94	4.14	29.52
Chest depth	72.30 <sup>***</sup> ± 0.51	2.29	3.17	47.41
Crupper width	54.55 ± 0.54	2.43	4.46	34.26
Crupper length	50.15 ± 0.87	3.93	7.82	31.50
Chest girth	184.25 ± 2.06	9.25	5.02	115.73
Cannon bone circumference	21.22 <sup>***</sup> ± 0.14	0.63	3.00	13.33
Head length	60.65 ± 0.48	2.18	3.59	38.09
Forehead width	20.60 ± 0.23	1.05	5.13	12.94

According to research of Rastija *et al.* (1993) the withers height of the Lipizzaner stallions measured by stick was lower for 2.66 cm, while the mare's height corresponds to our research. The stallions tail root's length of our research was bigger for 2.88 cm in relation to measures in

mentioned literature. The stallion's body length in our research in relation to data of mentioned authors was shorter for 4.67 cm, and in mares for 1.81 cm. The stallion's chest depth of our research was shorter for 2.00 cm, and in mares for 11.63 cm in relation to earlier measuring. The chest girth of stallions and mares of our research was a little lower in relation to statements in literature, the stallion's cannon bone circumference of our research is uniform to statements of authors, while the mares of our measuring had a thicker cannon bone for 1.0 cm. Other values are mostly uniform with earlier research. The mare's withers height according to Car (1950) was 148.50 cm, and to Romić (1940) 154.30 cm. The chest depth according to Romić (1940) was 72.50 cm, and the chest girth 183.90 cm. Car (1950) got the chest depth of 69.50 cm.

Table 2. Physical measures of the Lipizzaner mares (n=20)

Physical measure	$\bar{x}$	s	v	Relative measure, %	Relationship stallion – mare
Withers height (by stick)	152.50±0.92	4.15	2.72	100	95.79
Withers height (by ribbon)	163.85±1.10	4.90	2.10	107.44	97.47
Back height	144.60±0.85	3.83	2.68	94.82	95.86
Lumbago height	151.95±0.80	3.60	2.37	99.36	96.32
Tail's root height	142.00±1.14	5.09	3.60	93.12	96.60
Body length	156.60±1.02	4.58	2.92	107.70	100.74
Chest width	46.80±0.62	2.95	6.99	30.68	98.32
Shoulder width	44.45±0.78	3.51	7.91	29.14	94.57
Chest depth	60.65±0.87	3.71	4.31	46.15	96.33
Crupper width	56.50*±0.44	1.98	3.51	37.05	103.57
Crupper length	53.15*±0.83	3.73	7.02	34.85	105.98
Chest girth	186.85±1.32	5.92	3.16	122.52	101.41
Cannon bone circumference	20.27±0.18	0.81	4.03	13.29	95.52
Head length	59.50±0.65	2.91	4.89	39.01	98.10
Forehead width	20.82±0.19	0.87	4.21	13.65	101.07

If we compare the lines, the withers height of the Lipizzaner stallions according to Rastija *et al.* (2002) was the highest in the Conversano line (166.33 cm), and the lowest in the Neapolitano line (164.00 cm). The withers height of the Lipizzaner stallions according to Zechner *et al.* (2001a) research was 167.00 cm at the horse-farm Kladruby, 158.00 cm at the horse-farm Szilvásvárad and between 154.00 cm and 157.00 cm at other Lipizzaner horse-farms. The given data correspond to results of Rastija *et al.* (2002) while the stallions in Kladruby and Szilvásvárad were higher. Rastija *et al.* (1993) point at a bigger stallion's chest girth (188.81 cm). Rastija *et al.* (1991) give the largest withers height of Đakovo's stallions measured by ribbon (167.10 cm) in the line Favory, and the least (163.67 cm) in the Tulip line, while the values in Prnjavor were from 148.00 cm and 161.67 cm. The chest girth was between 183.82 cm in the Pluto line and 186.89 cm in the Conversano line. The results of Zechner *et al.* (2001a) point at a slightly bigger values of the chest girth. Rastija *et al.* (1991) give the stallion's chest girth at the horse-farm Đakovo according to lines between 184.31 cm (Tulipan) and 188,00 cm (Favory). The chest girth at the horse-farm Prnjavor varied between 158.00 cm (Maestoso) and 188.33 (Siglavý). The cannon bone circumference (Rastija *et al.* 2002) also shows a uniform bonniness in measured stallion's lines. The cannon bone circumference according to Zechner *et al.* (2001a) is in the frame of the mentioned research values. Rastija *et al.* (1993) established the cannon bone circumference in Lipizzaner stallions of 21.06 cm. The average values of three basic physical measures also estimated Sölkner *et al.* (2001) for the Lipizzaner mares at seven

different horse-farms. The average withers height, the chest girth and the cannon bone circumference in mares in cm was for Beclean (153.70-178.90-19.50), for Fagaras (154.70-181.60-19.60), for Đakovo (155.40-193.30-20.40), for Lipica (153.20-188.00-19.20), for Piber (153.30-190.10), Szilvásvárád (156.80-189.30-20.50) and for Topol'canky (153.20-191.40-19.50).

Today's look and type of the Đakovo's Lipizzaner described Mandić and Rastija (1997): "Bigger frame and height, excellent bonniness, rib cage and chest wide and well developed, good and very abundant walk, head slightly rougher, eyes big and lively, ears of adequate size and well positioned, neck well tighten and positioned, wither long and wide but very expressed, back short – straight with a strong connection, crupper long and wide with a good positioned tail."

Just the own research compared to the literature prove that the breeding aim was accomplished at the horse-farm Đakovo. Today there is a Lipizzaner which looks different than the Lipizzaner in Lipica. The assignment and use during the years imposed a type change to a bigger and larger Lipizzaner. That is also the aim of other Lipizzaner horse-farms in Europe. As this horse-farm has a significant place in riding sport (two-horse team and four-horse team), the breeding aim in horse-farming as well as in union breeding is to raise quality horses for sports and recreation. In gaining bigger frames and bonniness of the Lipizzaner horse breeding at the horse-farm Đakovo, occasionally Lipizzaner stallions from Hungary and Romania, and Austria and Slovenia were used as blood refreshers. Today the Đakovo's Lipizzaner belongs to the largest breeding of this horse. By blood refreshing already the first generation of the offspring showed a bigger physical frame and bonniness.

## CONCLUSION

Based on the carried out research we come to following conclusions:

Research was conducted on 20 stallions and 20 mares at the Đakovo's Lipizzaner breeding. Stallions had a significant and highly significant larger values in most measures in relation to mare's measures.

Mares had significantly larger length and crupper width than stallions.

By blood refreshing of the Đakovo's Lipizzaner with stallions from Hungary and Romania this breeding belongs to Lipizzaners of bigger frames what was also the aim in gaining a quality horse for riding.

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