ACTA UNIVERSITATIS AGRICULTURAE ET SILVICULTURAE MENDELIANAE BRUNENSIS

Volume 63 91 Number 3, 2015
http://dx.doi.org/10.11118/actaun201563030815

COMPARISON OF SELECTED HERDS OF HUTZUL HORSES BRED IN THE CZECH REPUBLIC AND SLOVAKIA

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Abstract

ORAVCOVÁ IVANA, SOBOTKOVÁ EVA, JISKROVÁ IVA. 2015. Comparison of Selected Herds of Hutzul Horses Bred in the Czech Republic and Slovakia. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 63(3): 815–824.

The objective of the present study was to compare the individual breeds of Hutzul horses in Slovakia and in the Czech Republic in terms of their age, gender, line and conditions of breeding in which the horses live. First of all in each herd we analysed 14 body dimensions, from these data the hippo-metric indices were calculated and processed statistically using the statistical programme Unistat version 5.1. Then they were compared mutually. Most of the statistically significant differences were related to the effect of the place of measurements. According to the place of measurement only the tape measure and height in saddle were statistically insignificant. On average the largest horses come from the ranch in Janova Hora and the smallest from the Slovakian Hutzul Club and Zmrzlík. In the effect of a gender the geldings exhibited the highest average values of all the dimensions, with the exception of the front width of pelvis, while the stallions showed the lowest (with the exception of the cannon girth). In the effect of a line the average values were the highest in the Prislop line and the lowest in the lines Hroby and Gurgul. The age affected only one dimension, i.e. the chest width behind the shoulder blade. Eight-year-old horses exhibited the highest average values and 3-year-old and 19 to 20-year-old horses the lowest values.

Keywords: Hutzul horse, body dimensions, age, gender, line, place of measurement

INTRODUCTION

The Hutzul horse is a primitive breed of horses. The history of these horses as a culture breed started to write in 1856 in stud farm Luczina in Romania. The aim of the breeding was pack horse for the military purpose. Hutzul has a strong constitution; they are surefooted on the rough terrain; easy to feed; of undemanding nature and endurance. These qualities have been successfully preserved to the present day in spite of the fact that for many years the breeders strived to "improve" the Hutzul horse by crossing with draught and Fjord horses (efforts to make it stronger) or with Arabian thoroughbreds (efforts to upgrade the breed). Due to these tendencies at one point in time the Hutzul horse came close to extinction. Fortunately due to intensive breeding efforts, in 1979 this small horse was entered in the protected FAO gene pool. Later this breed was ranked among genetic resources not only in Slovakia and in the Czech Republic, but also in Hungary, Poland, Germany, Austria and Ukraine (Horný *et al.*, 2006). The gene pool of the Hutzul horse is classed among rare resources of genetic diversity. To preserve the high quality of the breeding material permanent monitoring, evaluation and comparisons deem necessary in all countries where this genetic resource exists in order to prevent any greater deviations from the breeding standard.

The Hutzul horse is a small mountain breed of well-defined type and typical pace when walking and when overcoming mountain obstacles. Their conformation is correct; the body is long with short and bony legs and tough hoof horn (Horný *et al.*, 2006). The head of the Hutzul horse is dry and robust, of medium length, wide brain base and

I: *Breeding standard in Czech Republic (http://www.hucul-achhk.cz/pdf/program.pdf)*

	Stallions			Mares		
	min.	average	max.	min.	average	max.
SM (cm)	136	140	144	134	138	142
HG (cm)	165	175	185	160	170	180
CG (cm)	18.2	19.2	20.2	17.5	18.5	19.5

II: *Breeding standard in Slovakia (http://sk.nztopolcianky.sk/images/stories/statut/1_HUCUL_2006.doc)*

	Stallions			Mares		
	min.	average	max.	min.	average	max.
SM (cm)	139	141.5	144	137	139.5	142
HG (cm)	166	171	176	170	173	176
CG (cm)	18.5	18.75	19	17.5	18	18.5

strong jowl. The neck is muscular, strong, of medium set, sometimes arched. Not very high-withered, the chest is large, deep and wide. The back is firm, flat, the hips are well bound and short; the croup is short, wide and slightly sloping, the tail is set low. The formation of the front legs is regular, hind legs sometimes bow-legged with converging thighs (allowing better movement in mountain terrains) (Jelínek, 2009). Thanks to its body conformation the horse can be used for work in the mountains and also as a draught horse, as a pack horse and for riding (Horný *et al*., 2006). In colour the Hutzul horse is usually bay, dun, black, or chestnut and piebald (Hučko, 1996). Albinotic markings are undesirable. There is different breeding standard in Czech Republic and Slovakia, as you can see in the Tabs. I and II.

In the present study we focused on 4 important herds bred in the Czech Republic and in Slovakia, i.e. the National Stud Farm Topoľčianky, Slovakian Hutzul Club in Lom nad Rimavicou, Farma Hucul (Hutzul Ranch) in Janova Hora and the Hutzul Club Zmrlík in Prague. In each herd we analysed 14 body dimensions, calculated the body indices and statistically processed the results. The objective of our study was to carry out comparisons of selected herds of Hutzul horses in terms of their age, gender, line and place of measurement; to detect potential deviations and to analyse the possible causes.

MATERIAL AND METHODS

The results of field measuring of the herds of Hutzul horses in Slovakia and in the Czech Republic served as groundwork material for our research.

In total we measured 111 Hutzul horses. In the National Stud Farm Topoľčianky we measured 22 breeding Hutzul mares and 5 Hutzul stallions. Horses of the following private breeders were measured:

- M. Gonda – Lom nad Rimavicou (Slovakian Hutzul Club), i.e. 17 Hutzul mares and 1 Hutzul stallion.
- I. and M. Karbusičtí – Vítkovice in the Krkonoše Mts. (Janova Hora), i.e. 22 Hutzul mares, 10 Hutzul geldings and 4 Hutzul stallions.
- Hucul Club in Prague (Zmrzlík), i.e. 20 Hutzul mares, 6 Hutzul geldings and 4 Hutzul stallions.

III: *High altitude of places of measurement*

Place of measurement	Cases	High altitude
Janova Hora	36	1100 m
SR Hutzul Club	18	900 m
Zmrzlík	30	330 m
Topoľčianky	27	220 m

We analysed 14 body dimensions of which 6 were height dimensions, 3 length dimensions, 2 width dimensions, 2 circumferences and 1 depth dimension. As aids we used the stick measure (a three-part square folding metal stick with an engraved scale in cm, with two perpendicular arms of which one arm was adjustable) and the tape measure for horses (wax tape with a scale).

All the horses were measured in October–December by two assistants using the same aids (therefore eliminating errors in the results). Each dimension was measured three times and in the study we included the resulting average value from these 3 dimensions.

During measuring the horses were standing on a flat firm surface and all the 4 limbs were equally weighted. When viewed from the side the chest and pelvis limbs overlapped (as you can see in the Fig. 1). In all the measurements we took into account the height of the horseshoe which was then subtracted from the measured values.

To obtain correct and as accurate as possible data we used only dimensions which were not in any way disturbed by movement of the horses during the measuring process.

Definition of body dimensions by Dušek (1999):

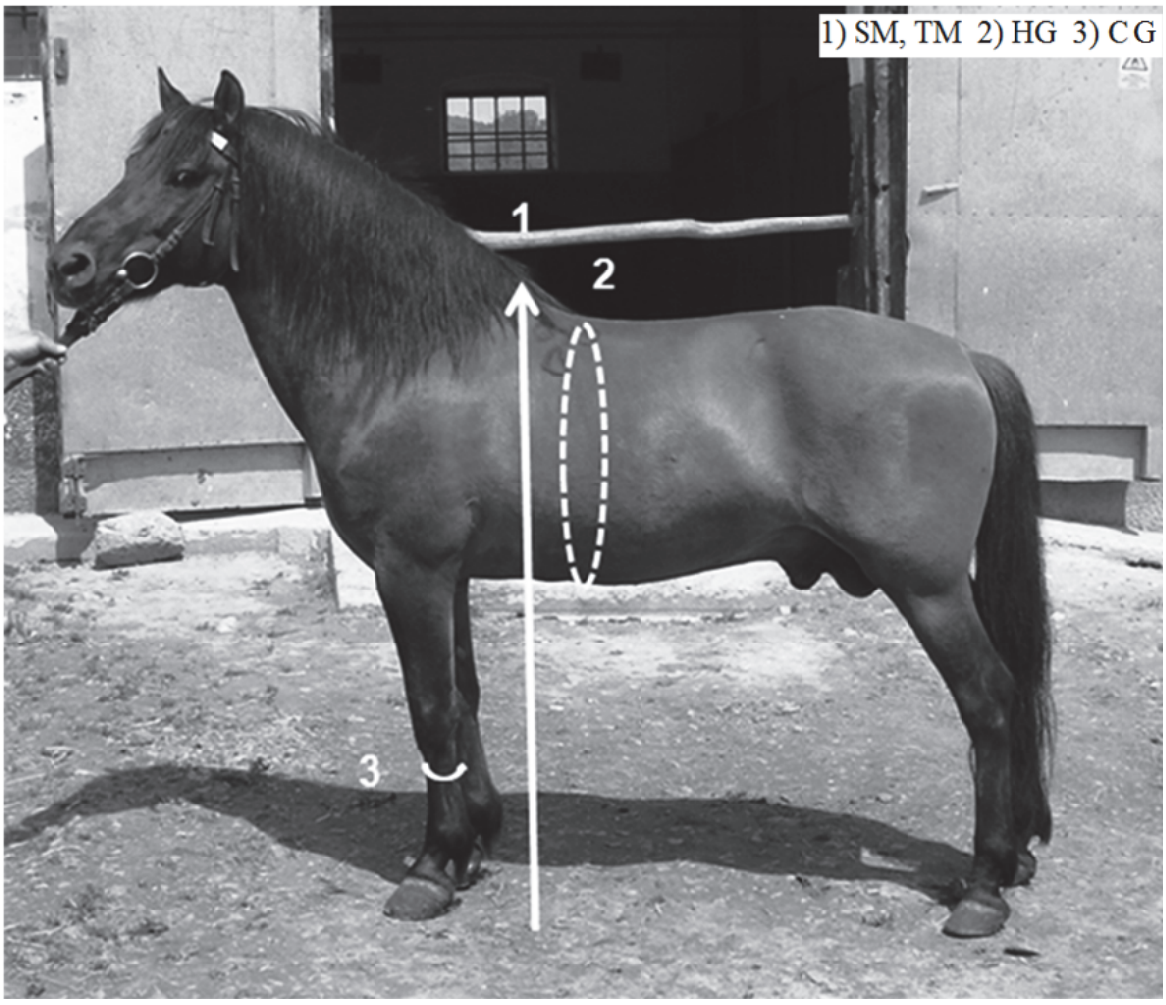
1. *Stick measure (SM)* – perpendicular distance of the highest point of withers from the ground.

2. *Tape measure (TM)* – distance from the outside heel of the left front limb to the highest point of the withers.
3. *Height in saddle (HS)* – perpendicular distance of the deepest part of the back from the ground.
4. *Height in hips (HH)* – perpendicular distance of the highest point on the back (sacral bone) from the ground.
5. *Height of the dock (HD)* – perpendicular distance from the setting of the tail to the ground.
6. *Height in breastbone (HB)* – perpendicular distance of the breastbone to the ground.
7. *Diagonal length of body (DLB)* – distance from the shoulder joint to the protrusion of the buttocks.
8. *Length of head (LH)* – distance from the centre of the vertex to the centre of the line joining the top of the nostrils.
9. *Heart girth (HG)* – measured behind the shoulder blade and withers at the point of the smallest girth.
10. *Cannon girth (CG)* – measured at the weakest point of the cannon bone on the left front limb, i.e. at the point where the upper third of the cannon bone passes into the second third.
11. *Width of chest behind the shoulder blade (WCHSB)* – measured immediately behind the shoulder blades.
12. *Front width of pelvis (FWP)* – measured at the most distant points of the loins.
13. *Length of pelvis (LP)* – distance from the lumbar joint to the buttocks.
14. *Depth of chest (DCH)* – summing up SM – HB.

Definition of hippo-metric indices by Bílek (1955):

1. *Index of the body conformation (IBC)* – (diagonal length of body / stick measure) × 100.
2. *Index of robustness (IROB)* – (heart girth/tape measure) × 100.
3. *Index of compactness (ICOM)* – (heart girth/diagonal length of body) × 100.
4. *Index of boniness (IBON)* – (circumference of the shank/stick measure) × 100.

The data were processed using the programme MICROSOFT EXCEL 2000.



1: *Basic body dimensions of horses (photo E. Sobotková)*

Monitored effects:

a) Age – based on age the horses were divided as follows:
- horses of 3–6 years of age were put into one group,
- horses of 7–12 years of age were put into one group,
- horses of 13–18 years of age were put into one group,
- horses of 19 years and older were put into one group.

b) Gender – based on gender the horses were divided into 3 groups:
- stallions,
- mares,
- geldings.

c) Line – based on lines the horses were divided into 5 groups:
- Goral,
- Gurgul,
- Hroby,
- Oušor,
- Prislop.

d) Place of measurement – based on the place of measurements the horses were divided into 4 groups:
- Janova Hora,
- Topoľčianky,
- SR Hutzul Club,
- Zmrzlík.

We used the database to monitor correlations among the body dimensions and indices and age, gender, line and place of measurement. Data on the conformation and indices were statistically processed using the statistical programme UNISTAT version 5.1.:
- by basic numerical characteristics of mean values and rates of variations (the following mean values and rates of variation were evaluated: dispersion and variation coefficient);
- by the GLM (linear model with consistent effects) method.

Model equation of linear model with consistent effects (GLM):

$$y_{ijklm} = \mu + a_i + b_j + c_k + d_l + e_{ijklm},$$

where
y_{ijklm}.....observation of the body rate or index,
μ.....total mean,
a_i.....consistent effect of the age of the horse (i = 1, 2, 3, 4),
b_j.....consistent effect of the gender of the horse (j = 1, 2, 3),
c_k.....consistent effect of the line (k = 1, 2, 3, 4, 5),
d_l.....consistent effect of the place of measurement (l = 1, 2, 3, 4),
e_{ijklm}.....random residual error.

If the impact of the monitored effect was statistically significant we specified the differences among the respective factors of age, gender, line and place of measurement by means of the method of multiple comparisons (Tukey – B method).

RESULTS AND DISCUSSION

In the Tab. IV you can find basic numerical characteristics of measuring herds.

Our measurement from Tab. IV we compared with the breeding standard of Czech Republic (Tab. I) in the case that the place of measurement was from Czech Republic and with breeding standard of Slovakia (Tab. II) in the case the place of measurement was from Slovakia. We found out that current breeding population responds to the breeding standard range. Compared to the average,

IV: *Basic numerical characteristics*

Body dimensions	Numerical characteristics	Janova Hora	Zmrzlík	SR Hutzul Club	Topoľčianky
SM	$\bar{x}$ (cm)	141.9	139.3	138.7	141.2
	max (cm)	149	146	145	144
	min (cm)	134	129	129	137.5
	σ	3.7	3.9	4.5	2.3
	coefficient of variance (%)	2.6	2.8	3.2	1.6
HG	$\bar{x}$ (cm)	188.3	175.4	182.9	181
	max (cm)	206	189	198	191
	min (cm)	174	154	168	168
	σ	6.8	8.8	9.6	5.7
	coefficient of variance (%)	3.6	5	5.3	3.2
CG	$\bar{x}$ (cm)	20.8	19.5	18.5	18.5
	max (cm)	23	21	20.5	20
	min (cm)	19	18	17.5	17.5
	σ	0.9	0.7	0.8	0.5
	coefficient of variance (%)	4.4	3.6	4.7	2.9

the Hutzul horses breed in Janova Hora had higher values of SM by 2.9 cm from the dimensions which presents breeding standard of Czech Republic. Hutzul horses breed in Topoľčianky had higher values of SM by 0.7 cm and horses from SR Hutzul Club had lower values of SM by 1.8 cm as average of this dimension which presents breeding standard of Slovakia. Regarding dimension HG, every place of measurement exceeds the average of breeding standard. Nearest this average is only Zmrzlík. This fact can be caused by breeding condition of horses by their measurement. In dimension of CG only Hutzul horses from Slovakia corresponding with breeding standard. Hutzul horses breed in Janova Hora and Zmrzlík had higher values of CG as average of breeding standard of Czech Republic.

Current breeding population also responds to the range of maximum and minimum values of basic body dimensions by breeding standard of Czech and Slovak Republic. With the assessment of individual horses from our measurement we found out that the maximum values of basic body dimensions by breeding standard do not corresponding these horses:

SM – 1 stallion (1126 Oušor Robin), 2 geldings (Veles and Zeeland) and 1 mare (Božka),
HG – 1 stallion (710 Goral XV-8), 1 gelding (Paprsek) and 2 mares (30 Mira and Stela),
CG – 2 stallions (Castor and 25 Gurgul X), 1 gelding (Sirius) and 1 mare (Arnika).

On the other hand minimum values of basic body dimensions by breeding standard do not corresponding these horses:

SM – 1 stallion (Cedr) and 1 mare (Riva),
HG – 1 stallion (Cedr).

From these results are obvious that population of Hutzul horses has problem with upper limit of values of basic body dimensions by breeding standard of Czech and Slovak Republic. Differences between our measurement and measurements when horses entered into Stud-book can be caused by subjective influence, different place and aids of measurement, higher age or worse healthy or breeding conditions or by mare gravidity.

For variance values it applies that the higher they are, the higher the variance coefficient and the less balanced is the herd. The most stable is the herd in Topoľčianky which exhibits the lowest values of variance and variance coefficient of all the basic dimensions. This is probably due to the highest degree of breeding and to the strictest selection of all the herds under study and naturally to the fact that they do not purchase horses from various breeders but that they have had their own breed for dozens of years. The second most stable herd in terms of SM and HG comes from Janova Hora. However, the cannon girth dimension is the highest of all the herds so in this dimension it is the least balanced. The least stable herd comes from the SR Hutzul Club; SM and HG exhibit the highest values and CS the second highest. Of all the herds this one has existed for the shortest time and the horses were purchased from various countries (Hungary, Poland…) and so it is obvious that the herd is relatively unbalanced. Zmrzlík exhibits mean variance values in all dimensions.

Statistical processing of the data by means of the programme Unistat 5.1 revealed statistically significant and highly significant differences. Tab. V gives a basic outline illustrating the measures and indices of the given effects which came out as statistically significant.

Comparisons of the Effect of the Place of Measurement

Most of the statistically significant differences were detected when comparing the effect of the place of measurements. Of the 14 measured body dimensions 12 were statistically highly significant (TM, HH, HD, HB, DLB, LH, HG, CG, WCHSB, FWP, LP, DCH) and one was statistically significant (SM). Only the height in saddle was statistically insignificant. The largest horses came from Janova Hora and the smallest from the SR Hutzul Club and from Zmrzlík (the mean measured dimensions of TM of horses in Janova Hora differed by 3.6 cm from the dimensions of horses from the Zmrzlík – as you can see in the Tab. VI; the HG measured in Janova Hora differed from Zmrzlík by 13 cm – as you can seen in the Tab. VII and CS measured in Janova Hora differed from Zmrzlík by 1.5 cm).

Janova Hora is a farm which lies in the highest altitudes (1100 m) and during the whole year the horses are kept outdoors in runs. This farm has existed for several decades and so the horses can reflect the effect of geomorphological and climatic conditions. Horses of the Hutzul Club are of a more recent date; they were purchased in Hungary, Poland, Slovakia, and in the Czech Republic. Even though this herd is raised in harsh conditions and in a high altitude (900 m), the horses have preserved their short build. Zmrzlík (330 m) and Topoľčianky (220 m) are situated in the lowest altitudes of all the herds we measured. However, the body dimensions of horses in Topoľčianky are higher than of horses in Zmrzlík; most probably due to the better quality of pasture.

Comparisons of the Effect of Gender

Gender affected 8 body dimensions; the effect on TM, CG, WCHSB, FWP and DCH was statistically highly significant and on SM, LP and LH it was statistically significant. Geldings showed the highest averages of all the body dimensions, with the exception of FWP. Mares had the highest average FWP (by 2 cm more than stallions); and the lowest average CG (by 1.85 cm less than geldings as you can see in the Tab. VIII). Sobotková *et al.* (2006) discovered statistically highly significant differences in the CG between the genders of the Old Kladruby horses (the CG of stallions was statistically significantly larger by 0.6 cm than the CG of mares) as well as Simčič *et al.* (2012) who measured the primitive breed of Posavje horse in Slovenia (the

V: *Overall results of statistical analysis*

Measures/Effect	Age	Gender	Line	Place
SM		*		*
TM		**		**
HS				
HH				**
HD				**
HB				**
DLB			*	**
LH		*		**
HG				**
CG		**		**
WCHSB	*	**	**	**
FWP		**	**	**
LP		*		**
DCH		**		**
IBC		*	*	**
IROB			*	**
ICOM				*
IBON		**		**

* indicates a statistically significant effect $p \leq 0.05$
** indicates a statistically highly significant effect $p \leq 0.01$

VI: *Comparisons of the effect of the place of measurement by TM*

Place of measurement	Cases	Average	Zmrzlík	SR Hutzul Club	Topoľčianky	Janova Hora
Zmrzlík	30	146.25				*
SR Hutzul Club	18	146.60				*
Topoľčianky	27	147.13				
Janova Hora	36	149.85	*	*		

VII: *Comparisons of the effect of the place of measurement by HG*

Place of measurement	Cases	Average	Zmrzlík	Topoľčianky	SR Hutzul Club	Janova Hora
Zmrzlík	30	175.38		*	*	*
Topoľčianky	27	181.04	*			*
SR Hutzul Club	18	182.92	*			*
Janova Hora	36	188.35	*	*	*	

VIII: *Comparisons of the effect of gender by CG*

Gender	Cases	Average	Mares	Stallions	Geldings
Mares	81	19.15		*	*
Stallions	14	20.11	*		*
Geldings	16	21.00	*	*	

CG of stallions was statistically significantly larger by 2.1 cm than the CG of mares).

The average values of all the dimensions, with the exception of CG, were the lowest in stallions. It appears that the low measures of body dimensions of stallions are caused, among others, by the technologies of their breeding which differ from the geldings and mares. Most of the herds of geldings and mares are kept outdoors on pastures throughout the whole year. By contrast Hutzul stallions are housed indoors in stables for the greater part of the day; they are either let out to graze one at a time and they take turns, or they are used for work only and during their free time they are housed inside the stable. In this way the free movement of the stallions is to a certain extent limited and may affect their body conformation. Even though the GLM method did not show a statistically significant

effect of the gender on the heart girth, at least the basic average values of the gender are given in the present study, because the differences between them are relatively high (between the highest and lowest average value the difference is more than 8 cm). Geldings have the highest average heart girth (185.69 cm) and stallions the lowest (177.64 cm). The mean average value of the mares is 182.28 cm. That the mares have a larger heart girth is partly due to their gravidity at the time of measuring. When comparing the body conformation between Hutzul horses bred in the Czech Republic and in Poland Matoušová-Malbohanová *et al.* (2004) discovered differences in the heart girth based on the effect of the gender. Here again we see differences between stallions and mares. The mares have a considerably larger heart girth than the stallions (by 6.84 cm; in the present study it was by 4.64 cm). Sobotková *et al.* (2006) discovered statistically highly significant differences in the heart girth between the genders (the heart girth of mares was statistically significantly larger by 15.7 cm than the heart girth of stallions) as well as Jakubec *et al.* (2000) who measured the Old Kladruby horses. Purzyc *et al.* (2010) reached the same conclusions; i.e. that adult Hutzul mares bred in Poland had a larger heart girth and smaller dimension of the bone than stallions. Furthermore, they consider the hypothesis that subsequent pregnancies in mares additionally transfer some of the function of the thoracic diaphragm, through indirect pressure, to inhaling muscles of the chest; this could result in greater arching of the ribs, and by extension – greater circumference of the chest, in mares. It is therefore likely that Hutzul mares are more robust and deeper than stallions which are bonier and which become considerably stronger after castration.

Comparisons of the Effect of the Line

Analysis showed that the effect of the line was statistically significant on DLB and statistically highly significant on WCHSB and FWP. In all cases horses of the Prislop line exhibited the highest average values, while the lines Hroby and Gurgul exhibited the lowest average values (DLB by an average of 7cm and WCHSB by an average of 3 cm less than the line Prislop; and FWP by an average of 3.5 cm less than the line Prislop, respectively). Even though the GLM method did not show that the line had a statistically significant effect on the heart girth in the present study the author gives at least the basic average values of the lines, because the difference between them is relatively big (between the highest and lowest average value the difference is 9 cm). Here again the line Prislop reached the highest average value of HG and the line Gurgul the lowest (188 and 179.38 cm, respectively).

In her dissertation thesis Matoušová-Malbohanová (2003) reached the same conclusions when comparing Hutzul horses bred in the Czech Republic and in Poland. Some of the body dimensions of the lines Pietrosu and Prislop showed higher average values than other lines; by contrast characteristic for horses of the lines Gurgul and Hroby is a relatively small depth of the chest. If we study the average values of body dimensions in greater detail we see that the line Pietrosu has preserved the large body dimensions of its founder. It is of common knowledge that the body dimensions of both the line Prislop and the line Pietrosu are larger than of the other Hutzul lines. Also the body dimensions of the sire Prislop IX-90 bred in Topoľčianky were above-standard (SM 149 cm, TM 161 cm, HG 190 cm, CG 20.0 cm) Matoušová-Malbohanová *et al.* (2004).

Comparisons of the Effect of Age

The last effect was the effect of the age of Hutzul horses. Age affected one dimension only, i.e. the WCHSB. The average value was the highest in 8-year-old horses and the lowest in 3-year-old horses and horses 19 and 20 years of age (on average by 5 cm less than the 8-year-old horses). Matoušová-Malbohanová *et al.* (2004) reached the same conclusions when comparing the body conformation of Hutzul horses bred in the Czech Republic and in Poland. It is therefore probable that the average values of WCHSB increase up to the age of 7–9 years and when the horses reach this age these values again decrease. This may be explained by the fact that this body dimension is connected with the nutritional status and condition of the animals which usually decrease with age.

Indexes of Body Conformation

Comparison analysis revealed that the gender, line and place of measurement have a significant effect on the IBC of Hutzul horses. Multiple comparisons showed statistically highly significant differences, particularly among the places of measurement. In warm-blood breeds this index ranges roughly around 100, in heavy horses around 109. In Hutzul horses this index ranges within these two values. Horses from Janova Hora and the SR Hutzul Club exhibited the highest dimension of IBC (108.10 and 106.32, respectively as you can see in the Tab. IX). Compared with others herds the body of these horses is longer.

The line and place of measurement had a statistically significant effect on the index of robustness. Multiple comparisons showed differences, particularly among the places of measurements. The index of robustness decreased from heavy horses to the lighter breeds Bílek *et al.* (1955). The most robust horses come from Janova Hora; this is quite obvious considering the highest measured values of the heart girth.

By means of multiple comparisons we discovered that the place of measurement has a significant effect on the index of compactness. The most compact horses are bred in Topoľčianky; besides a high ICOM the herd is the best balanced of all the herds we studied. This outcome is definitely also the result of the long-term and targeted high level of breeding

IX: *Comparisons of the effect of the place of measurement by IBC*

Place of measurement	Cases	Average	Topoľčianky	Zmrzlík	SR Hutzul Club	Janova Hora
Topoľčianky	27	102.98			*	*
Zmrzlík	30	104.70				*
SR Hutzul Club	18	106.32	*			
Janova Hora	36	108.10	*	*		

X: *Comparisons of the effect of the place of measurement by ICOM*

Place of measurement	Cases	Average	Zmrzlík	Janova Hora	SR Hutzul Club	Topoľčianky
Zmrzlík	30	120.23			*	*
Janova Hora	36	122.91				
SR Hutzul Club	18	124.12	*			
Topoľčianky	27	124.61	*			

XI: *Comparisons of the effect of gender by IBON*

Gender	Cases	Average	Mares	Stallions	Geldings
Mares	81	13.67		*	*
Stallions	14	14.25	*		
Geldings	16	14.71	*		

and selection. Hutzul horses from Topoľčianky also exhibit a relatively high heart girth and smallest diagonal body length making them the most compact horses of all those measured (as you can see in the Tab. X).

Comparative analysis established that the gender and place of measurement had a significant effect on the index of boniness of Hutzul horses. Multiple comparisons detected statistically highly significant differences between the genders. Mares exhibited the lowest values of the IBON and stallions and geldings the highest (as you can see in the Tab. XI). When comparing the body conformation of Hutzul horses bred in the Czech Republic and in Poland Matoušová-Malbohanová *et al.* (2004) reached the same conclusions; i.e. they found differences between stallions and mares where stallions had a higher IBON than mares.

Multiple comparisons also revealed statistically highly significant differences among the places of measurement. The index of boniness was higher in herds which also exhibited the highest values in the cannon girth. Janova Hora is a farm which lies in a high altitude so the high index of boniness is by no means surprising; as concerns Zmrzlík the high index of boniness is due to the high value of CG and low value of SM.

The objective of the present study was to analyse the effect of the age, line, gender and place of measurement on the body conformation of Hutzul horses bred in some herds in the Czech Republic and in Slovakia. The database consisted of 111 horses (81 mares, 16 geldings and 14 stallions) which were measured during field measurements in the individual herds. The data were collected using the Microsoft Excel 2000 programme and were statistically processed using the statistical programme Unistat version 5.1. Analysed were the effects of age, line, gender and place of measurement on the body dimensions and indices of body conformation. The data were evaluated statistically using the general linear model (GLM) and if any effect proved to be statistically significant we assessed the respective body dimension and index with a follow-up multiple comparison according to Tukey.

Most of the statistically significant differences appeared when analysing the effect of the place of measurement. Out of the 14 measured body dimensions 11 were statistically highly significant and one was statistically significant and out of the 4 indices of body conformation 3 were statistically highly significant and one was statistically significant. From the results it can be assumed that the place of measurement has the greatest effect on the body dimensions of the Hutzul horses. The effect of the place of measurement embraces not only the environment of the horse, but also the technique and technology of rearing. The effect of the gender showed important statistical differences. The average values of the CG, WCHSB, DCH and LP were measured in the geldings and the lowest (with the exception of CG where mares showed the lowest average values) in stallions. It can therefore be assumed that mares are deeper and more robust than stallions. Stallions are bonier and after castration they become considerably stronger but do not increase their height any more. The line has a significant effect on the DLB, IBC and IROB and a highly significant effect on the WCHSB and FWP. Horses of the Prislop line achieved the highest average values and the Hroby and Gurgul horses the lowest. The effect of the age was significant only on WCHSB. The highest average values were achieved

by 8-year-old horses and the lowest by 3-year-old and 19 and 20-year-old horses. The herd in Topoľčianky was the most balanced, while the least balanced was the SR Hucul Club herd.

The results indicate that there are certain differences among the populations of Hutzul horses, but the indisputable difference is among the places of measurement. To raise the standard and improve the herd the authors recommend, in particular, a higher level of selection and breeding to be implemented as well as to change the conditions of rearing the Hutzul horses to accommodate the demands of the horses and to avoid changing their precious conformation due to unfavourable conditions. Further recommendation is to harmonise the standard of breeding the Hutzul horses within the HIF (Hutzul International Federation) (to be identical for all countries where this horse is bred) and to agree on where the breeding should be headed. The Hutzul is a horse resistant to harsh conditions, undemanding, easy to feed, healthy, calm with good disposition and we should do our utmost to preserve it in this condition for the future generations.

CONCLUSION

The objective of the present study was to analyse the effect of the age, line, gender and place of measurement on the body dimensions and indices of body conformation of Hutzul horses bred in some herds in the Czech Republic and in Slovakia. The database consisted of 111 horses (81 mares, 16 geldings and 14 stallions) which were measured during field measurements in the individual herds. The data were collected using the Microsoft Excel 2000 programme and were statistically processed using the statistical programme Unistat version 5.1. The data were evaluated statistically using the general linear model (GLM) and if any effect proved to be statistically significant we assessed the respective body dimension and index with a follow-up multiple comparison according to Tukey. The results indicate that there are certain differences among the populations of Hutzul horses, but the indisputable difference is among the places of measurement. Out of the 14 measured body dimensions 11 were statistically highly significant and one was statistically significant and out of the 4 indices of body conformation 3 were statistically highly significant and one was statistically significant. The effect of the gender showed important statistical differences. The average values of the CG, WCHSB, DCH and LP were measured in the geldings and the lowest (with the exception of CG where mares showed the lowest average values) in stallions. It can therefore be assumed that mares are deeper and more robust than stallions. Stallions are bonier and after castration they become considerably stronger but do not increase their height any more. The line has a significant effect on the DLB, IBC and IROB and a highly significant effect on the WCHSB and FWP. Horses of the Prislop line achieved the highest average values and the Hroby and Gurgul horses the lowest. The effect of the age was significant only on WCHSB. The highest average values were achieved by 8-year-old horses and the lowest by 3-year-old and 19 and 20-year-old horses. The herd in Topoľčianky was the most balanced, while the least balanced was the SR Hucul Club herd.

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