

THE QUALITY OF THE YOUNG WARM-BLOODED STALLIONS DURING THE REARING PERIOD

KVALITA MLADÝCH TEPLOKREVNÝCH HŘEBCŮ V PRŮBĚHU ODCHOVU

Miroslav MARŠÁLEK, Lenka EIDELPESOVÁ

University of South Bohemia in České Budějovice, Agricultural faculty, Department of Special Livestock Breeding, Studentská 13, 370 05 České Budějovice, Czech republic, marsalek@zf.jcu.cz

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ABSTRACT

The aim of this study was to evaluate the quality of young stallions during the rearing period and to analyze the differences among several test rearing houses with various altitudes (up to 250, 250-300, 300-400, 400-500 and more than 500 meters above the sea level). In 227 stallions ending the rearing period in the years 2004 and 2005 the records from 5 foals' assortment were processed (it means the growth comparison with the growth standard, results of exterior classification and results of movement mechanics classification). The statistically significant differences among the rearing houses with various altitudes were found out in growth classification (13,614⁺⁺ to 27,679⁺⁺⁺), in exterior classification (13,136⁺⁺ to 20,281⁺⁺⁺) and in movement mechanics classification (17,930⁺⁺ to 26,526⁺⁺⁺). The relation between in-rearing and end-rearing classification was higher for growth (up to 0,862⁺) than for exterior (up to 0,652⁺) and movement mechanics (up to 0,585⁺). It's obvious, that the final foal's movement mechanics and exterior classification can't be faithfully estimated before the rearing finalization.

Key words: stallions; growth; exterior; movement mechanics; altitude

ABSTRAKT

Kvalita teplokrevných hřebců byla v průběhu odchovu posuzována v odchovnách umístěných v různé nadmořské výšce od 250 do 500 m n.m. Byly zpracovány výsledky hodnocení mladých hřebců, kteří ukončili odchov letech 2004 a 2005. Posuzován byl růst, kvalita exteriéru a mechanika pohybu u 227 mladých hřebců. Mezi jednotlivými odchovny byly zjištěny statisticky významné rozdíly v hodnocení růstu (13,614⁺⁺ až 27,679⁺⁺⁺), hodnocení zevnějšku (13,136⁺⁺ až 20,281⁺⁺⁺) a hodnocení mechaniky pohybu (17,930⁺⁺ až 26,526⁺⁺⁺). Vztah mezi hodnocením hříbat na začátku odchovu a na konci odchovu byl vyšší pro růst (až 0,862⁺) než pro hodnocení zevnějšku (až 0,652⁺) a mechaniky pohybu (až 0,585⁺). Je zřejmé, že konečné hodnocení mechaniky pohybu a kvality zevnějšku hříbat nemůže být správně odhadnuto před dokončením odchovu.

Klíčová slova: hřebci, růst, exteriér, mechanika pohybu, nadmořská výška

Podrobný abstrakt:

Cílem práce bylo posoudit kvalitu mladých hřebců plemene český teplokrevník chovaných v odchovných umístěných v různé nadmořské výšce (do 250, 2500 až 300, 300 až 400, 400 až 500 a nad 500 metrů nad mořem). Celkem byly sledovány výsledky 227 mladých hřebců, kteří ukončili odchov v letech 2004 a 2005. Byly zpracovány výsledky 5 hodnocení hříbat v průběhu odchovu, zahrnující posouzení růstu ve srovnání s růstovým standardem, hodnocení exteriéru a hodnocení mechaniky pohybu. Růst ve srovnání s růstovým standardem byl posuzován pomocí růstových pásem (hodnota od -3 do +3), exteriér a mechanika pohybu byla hodnocena bodovou stupnicí (1 až 5 bodů).

Pomocí programu STATISTICA byly zjištěny základní statistické charakteristiky a průkaznost rozdílů mezi skupinami byla ověřena Kruskal-Walisovým testem.

Mezi odchovnými umístěnými v různé nadmořské výšce byly zjištěny statisticky průkazné rozdíly v růstu hříbat (13,614⁺⁺ až 27,679⁺⁺⁺), v hodnocení zevnějšku (13,136⁺⁺ až 20,281⁺⁺⁺) i v hodnocení mechaniky pohybu (17,930⁺⁺ až 26,526⁺⁺⁺). Porovnání zařazení hříbat do růstových pásem podle růstového standardu na začátku a na konci odchovu ukázalo, že u 39% hřebců nedošlo ke změně zařazení hřebce do růstového pásma, u 30,9% hřebců se během odchovu zařazení zhoršilo a u 29,9% se zařazení zlepšilo. U 71,2% hříbat byla difference mezi zařazením na počátku a na konci odchovu nejvýše ± 1 růstové pásma.

Korelační koeficienty mezi výsledky jednotlivých třídění (hodnocení) ukázaly těsnější vztah v hodnocení růstu (0,517⁺ až 0,862⁺) než u kvality zevnějšku (0,489⁺ až 0,652⁺) a kvality mechaniky pohybu (0,159⁺ až 0,585⁺).

Z výsledků je zřejmé, že v průběhu odchovu nelze u hřebců spolehlivě odhadnout kvalitu mechaniky pohybu a výsledek hodnocení zevnějšku při ukončení období odchovu.

Introduction

According to [9], the collective rearing of several foals (preferably in couples) impacts favorably the growth, because the animals stimulate each other to move and the ligament- and osteogenesis are supported. Foals' weaning is the one of the critical stage, where the animal is stressed because of separating from its mother, changing the surrounding, changing the feeding (feeding rate without mother milk), changing the daily cycle. As well [1] and [4] considered the weaning as one of the most stressful period in the foal's life.

[2] mentioned that one of the most important demands after weaning is the rearing technology. It means enough

of paddocks and pastures and enough stay there. Free stables admit group breeding, thereby more social contacts and moving activities [9].

Pasture conditions and forage quality have the main influence on the health, condition and welfare of the animals [16]. [5] reported that the foal's body weight should be 30% and 65-88% from its mother weight at 3 months of age and 1-2 years of age, respectively.

According to "Czech warmblood horse breeding program" (2004), the foals' growth and development is judged at least by three-man commission during the spring and autumn assortment. Growth is judged by comparison with growth standards. Exterior and movement mechanics are judged by the total grade from 1 to 5 (1 means the worst, 5 means the best). Movement mechanics at walk and trot and fundament correctness are assessed at the hard surface. The part of movement quality classification is an assessment of free jump.

Material and Methods

Background material was obtained from the results of young stallions rearing in the test rearing houses of the Czech warmblood horse society. In 227 foals finished the test rearing in the years 2004 and 2005 the records from 5 foals' assortment were processed.

The data from 5 foals' assortment including results of growth comparison with the growth standard (value from -3 to +3), results of exterior classification (value 1 to 5) and results of movement mechanics classification (value 1 to 5) were processed.

For the growth and development evaluation in various altitudes the rearing houses were divided in following groups:

- I. up to 250 meters above sea level
- II. 250 – 300 meters above sea level
- III. 300 – 400 meters above sea level
- IV. 400 – 500 meters above sea level
- V. above 500 meters above sea level

In these data, the basics statistical characteristics were determined with the use of the STATISTICA software. The differences among particular groups were proved by Kruskal-Wallis test and were considered as:

(+) statistically probably significant at $P \leq 0,05$

(++) statistically significant at $P \leq 0,01$

(+++), statistically highly significant at $P \leq 0,001$

The relation among the results of particular foal's assortments was proved by Spearman's correlation coefficient.

Table.1 – The foals' growth according to the rearing house's altitude (Růst hřbat podle nadmořské výšky odchoven)

Assortment	1			2			3			4			5			
	n	x	S _x	n	x	S _x	n	x	S _x	n	x	S _x	n	x	S _x	
Meters above sea level																
I. up to 250	25	0,640	1,410	32	-0,593	1,388	25	-0,080	1,647	35	-0,028	1,362	29	0,068	1,483	
II. 250-300	22	0,636	1,188	27	0,962	1,400	22	1,454	1,558	20	1,600	1,562	23	1,217	1,381	
III. 300-400	41	0,512	1,483	50	0,780	1,360	46	0,847	1,366	52	0,038	1,48	37	0,135	1,527	
IV. 400-500	34	0,676	1,657	39	1,205	1,555	32	0,656	1,760	38	0,815	1,553	32	0,750	1,887	
V. above 500	29	0,689	1,440	28	0,107	1,496	27	1,074	1,488	28	1,178	1,440	15	0,333	1,619	
TOTAL	151	0,622	1,468	176	0,545	1,573	152	0,782	1,617	173	0,560	1,592	136	0,470	1,653	
K-W test		2,911			20,621 ⁺⁺⁺						27,679 ⁺⁺				13,614 ⁺	

Results and discussion

Selected rearing houses were divided into 5 groups made according to their altitude (tab.1). The statistically significant differences were found among particular groups at 2nd , 3rd , 4th and 5th assortment (13,614⁺⁺ to 27,679⁺⁺⁺), however the direct relationship between the results of foals' growth and the rearing house's altitude is not obvious. The lowest growth level was found in 1st group (up to 250 meters above sea level), the highest growth level was found in 2nd group (250-300 m a. s. l.), in 4th group at second assortment (1,205) and in 5th group (above 500 m a. s. l.) at third and fourth assortment. This suggests that it's possible to provide as well good feeding conditions in the higher altitude as in lowlands.

According to the rearing houses' altitude (tab. 2) it is obvious; that the confirmative differences among observed groups at particular assortments represent the diversity between group I and others groups. In this case the interaction among particular rearing houses' differences and among the rearing houses sorted by altitude should be supposed. It's because there were several rearing houses having had the worst results in particular rearing houses comparison in the group I (up to 250 m. a. s. l.), which showed the worst exterior results. Though there are no obvious differences in exterior classification among remaining four groups and in the table 4 it isn't evident connection between the rearing house's altitude and the quality of reared foals exterior, the 1st group's results indicate that it is unsuitable to rear the foals in lower altitude (up to 250 m a. s. l.).

At sorting the movement mechanics results according to the rearing house's altitude (tab. 3) it's obvious that the worst statistically significant results are achieved in the rearing houses located up to 250 m a.s.l. during the rearing period. The most expressive difference was found out at 2nd assortment, the average mark in this altitude was 2,84 while the average marks of others groups achieved 3,3 – 3,7 (K-W test = 26,526⁺⁺⁺). At the 5th assortment the lower movement quality continues (x = 3,083), although there is no statistically significance between this group and the others (K-W test= 3,926). The average mark of movement mechanics classification in remaining groups is in the range 3,0 – 3,6 at 5th assortment. Although there aren't the significant differences at 5th assortment, the results indicate the problems with movement mechanics in foals reared in lowlands up to 250 m a. s. l. , which might be manifested by the worse sport results of these horses at their maturity. According to [3], the foal's deftness is evolved during its early-age and it is not possible to improve it markedly by practice later. It may be concluded, that the movement in moderately downy and hilly terrain contribute to exterior formation and

Table 2 – Average total exterior grade of the foals according to the rearing house's altitude
(Průměrné hodnocení zevnějšíku hříbat podle nadmořské výšky odchoven)

Assortment	1			2			3			4			5		
	n	x	S _x	n	x	S _x	n	x	S _x	n	x	S _x	n	x	S _x
Altitude															
I. up to 250 m	19	2,826	0,511	44	2,959	0,433	43	2,934	0,736	43	2,867	0,601	37	2,743	0,643
II. 250-300m	19	3,368	0,525	36	3,169	0,478	27	3,222	0,585	36	3,286	0,484	33	3,336	0,47
III. 300-400m	9	3,277	0,532	53	3,275	0,46	33	3,478	0,578	52	3,394	0,526	37	2,986	0,575
IV. 400-500m	40	3,427	0,758	40	3,33	0,648	38	3,178	0,517	23	3,391	0,588	37	3,264	0,436
V. above 500m	17	3,652	0,621	17	3,058	0,683	29	3,186	0,566	29	3,189	0,515	15	3,233	0,543
TOTAL	104	3,33	0,688	190	3,174	0,544	170	3,183	0,635	183	3,216	0,581	159	3,09	0,586
K-W test		13,889 ⁺⁺			20,281 ⁺⁺⁺			6,867			13,136 ⁺⁺			18,807 ⁺⁺⁺	

Table3. – Average total movement mechanics grade of the foals according to the rearing house's altitude
(Průměrné hodnocení mechaniky pohybu hříbat podle nadmořské výšky odchoven)

Assortment	1			2			3			4			5		
	n	x	S _x	n	x	S _x	n	x	S _x	n	x	S _x	n	x	S _x
Altitude															
I. up to 250 m	19	3,036	0,351	44	2,84	0,508	43	3,03	0,657	43	2,872	0,591	36	3,083	0,618
II. 250-300m	0			36	3,313	0,493	27	3,344	0,581	27	3,581	0,41	33	3,593	0,438
III. 300-400m	9	3,166	0,333	53	3,33	0,455	33	3,6	0,538	51	3,431	0,34	35	3,357	0,515
IV. 400-500m	18	3,388	0,487	40	3,695	0,554	38	3,605	0,475	23	3,739	0,507	37	3,456	0,681
V. above 500m	29	3,641	0,676	29	3,437	0,603	29	3,565	0,51	29	3,379	0,535	15	3,466	0,385
TOTAL	75	3,37	0,583	202	3,308	0,589	170	3,41	0,609	173	3,347	0,563	156	3,378	0,587
K-W test		16,469 ⁺⁺			26,526 ⁺⁺⁺			7,190			17,930 ⁺⁺			3,926	

movement abilities evolving.

One of the important breeding aspects is the sustainability of the classification level at particular assessments during the foal's rearing. If the presumption of minimal changes in foal's classification during its rearing is realized, there would be the perspective of the excellent young foal in the beginning of rearing having been a first-rate horse at the performance test at the end of rearing. However, this evokes the requirement of very accurate selection and classification of young foals at ranking to the rearing houses. In the table 4, there is the number and percentage of cases, which showed improvement or deterioration in growth classification in comparison with growth standard from 1st to 5th assortment. In more than 50% foals there weren't available the data about the growth zone ranking at both assortments, that's why only 97 pairs of a foal's data were evaluated. Seeing that the cause of this missing data wasn't the foal's quality, it is possible to consider this selection as incident and representing real situation (see tab. 4). 39,2% of foals have the same ranking at 1st and 5th assortment, 71,2% of foals differ in the ranking mark one grade maximally. If we compare the cases of improvement or deterioration, it's seen, that 30,9% of cases were deteriorated and 29,9% were improved. These results indicate that it's possible to estimate the growth intensity only in 40% of foals at moving to the rearing houses and the likelihood of foal's reclassifying into the higher or lower growth zone is roughly identical till the end of rearing. Therefore the periodic half-yearly assortment of the foals is an eligible thing, which develops the conditions for elimination of the strong minus growth-variations. That's according to [2], who reports that during the assortment the unsatisfactory foals are eliminated and the young stallions are chosen for castration.

The gradual specifying of results estimation at particular assortments may be assumed during the rearing period. The accuracy level of this estimation could be expressed e.g. by the correlation relation between the foal's ranking to the growth zone at the 1st and 5th assortment, at 2nd and 5th; 3rd and 5th; 4th and 5th assortment respectively. The tightness of this relation is expressed by the Spearman's coefficient of ordinal correlation (tab. 5). It's obvious, that the relations between all tested pairs of data are statistically significant. It's in agreement with the premise about gradual rising of the estimation accuracy. Similar results between standard level at 2nd, 3rd and 4th assortment (0,795⁺, 0,800⁺ and 0,862⁺) indicate, that the foal's ranking doesn't markedly change after the second assortment.

In the table 6, there is the tightness of the relation between the exterior classification at first four assortments

and at the last assortment during the rearing period. The results of Spearman's coefficient of ordinal correlation show rising of the dependence among observed indexes again. Lower data value (0,489⁺ to 0,652⁺) indicates, that the result of the stallion's exterior formation at maturity can't be reliably estimated even at 4th assortment.

In the table 7 there is the number and percentage of the foals whose total exterior classification was changed from 1st to the last assortment. Only 21% of observed cases had no change during the rearing period, 22% showed improvement and 57% showed deterioration in exterior quality. These data have to be considered as low-accurate because only less than half of observed sampling was involved.

The relations displayed in the table 8 between the movement mechanics classification at particular assortments and the last assortment at the end of rearing were statistically significant again. The correlation coefficients were less significant than in exterior classification (0,159⁺ to 0,585⁺). This level induces, that the movement mechanics is markedly changing during the rearing period. Even if the relation among movement mechanics classifications at particular assortments was demonstrated, it wouldn't be possible to estimate the movement mechanics at the final classification reliably during the rearing period.

The frequency of movement mechanics changes during the rearing period is displayed in the table 9. The aim of this comparison was to estimate the differences in movement mechanics which happen during the foals' staying in the rearing house. It's obvious, that only 10 foals (i.e. 19% from the total number of 52 foals) were classified by the same score at first assortment (at ranking to the rearing house) and at the last assortment (before rearing finalization). In 18 foals (35%) the classification result was improved, on the contrary in 24 foals (46%) the result was deteriorated according to the breeding commission checking. Although the total number of estimated foals (52) doesn't include the whole sampling, the results indicate the necessity of paying enhanced attention to foals' movement during the rearing period, because of high number (46%) of deteriorated movement mechanics in observed animals.

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Literature:

Table.4 – Evaluation of changes in foals' classification into the standard category during the rearing period
(Změna hodnocení růstu hříbat během odchovu)

n	values	%	%
1	-4	1	30,9
6	-3	6,2	
12	-2	11,3	
11	-1	12,4	
38	no change	39,2	39
19	1	19,6	29,9
5	2	5,2	
3	3	3,1	
1	4	1	
1	5	1	
97		100	100

Table.5 – Relation among particular assortments in standard
(Vztah mezi výsledky jednotlivých třídění podle růstového standardu)

	n	Spearman's correlation
1: 5	97	0,517 ⁺
2: 5	120	0,795 ⁺
3: 5	109	0,800 ⁺
4: 5	126	0,862 ⁺

Table.6 – Relation among particular assortments in exterior
(Vztah mezi výsledky jednotlivých třídění u exteriéru)

	n	Spearman's correlation
1: 5	90	0,524 ⁺
2: 5	160	0,489 ⁺
3: 5	133	0,633 ⁺
4: 5	145	0,652 ⁺

Table 7 – Changes in exterior classification during the rearing period
(Změny v hodnocení exteriéru v průběhu odchovu)

Change	number of foals	%
improvement	20	22
no change	19	21
deterioration	51	57
n	90	100

Table 8 – Relation among particular assortments in movement mechanics
(Vztah mezi výsledky jednotlivých třídění u mechaniky pohybu)

	n	Spearman's correlation
1: 5	52	0,159 ⁺
2: 5	156	0,481 ⁺
3: 5	131	0,506 ⁺
4: 5	135	0,585 ⁺

Table 9 - Changes in movement mechanics classification during the rearing period
(Změny v hodnocení mechaniky pohybu během odchovu)

Change	number of foals	%
improvement	18	35
no change	10	19
deterioration	24	46
n	52	100

[1] APTER, RC., HOUSEHOLDER, DD.: Weaning and weaning management of foals: A review and some recommendations. *J. Equine Vet Sci* (1996)16 (10), 428 – 435.

[2] DUŠEK, J. et al.: Chov koní. Brázda Praha: (2001), 352.

[3] HANÁK, J.: Výkonnostní bariéry dostihových koní v Československu. Aktuální otázky chovu anglického plnokrevníka, VŠZ Brno (1990) 52 – 62.

[4] HELENSKI, CR., SHELE, AC., NIELSEN, BD., ZANELLA, AJ.: Influence of housing on weaning horse behavior and subsequent welfare. *Appl. Anim. Behav. Sci.* (2002) 78, 291 – 302.

[5] HOIS, C., KIENZLE, E., SCHULZE, A.: Prediction of body weight and weight development in growing horses. *Pferdeheilkunde* (2005) 21, 552–558.

[6] LANSADE, L., BERTRAND, M., BOUISSOU, MF.: Effects of neonatal handling on subsequent manageability, reactivity and learning ability of foals. *Appl. Anim. Behav. Sci.* (2005) 92, 143 – 158.

[7] LANSADE, L., BERTRAND, M., BOIVIN, X., BOUISSOU, MF.: Effects of handling at weaning on manageability and reactivity of foals. *Appl. Anim. Behav. Sci.* (2004) 87, 131 – 149.

[8] MAL, ME., McCALL, C.A., NEWLAND, C., CUMMINS, K.A.: Influence of preweaning handling methods on post – weaning learning – ability and manageability of foals. *Appl. Anim. Behav. Sci.* (1994) 40, 187 – 195.

[9] MEYER, H. a COENEN, M.: Krmení koní – současné trendy ve výživě. Euromedia Grup, k.s. – Ikar v Praze (2003) 256.

[10] MISAŘ, D. a JISKROVÁ, I.: Chov a šlechtění koní. Mendelova zemědělská a lesnická univerzita v Brně (2001)170.

[11] MOONS, C., LAUGHLIN, K., ZANELLA, AJ.: Effects of short – term maternal separations on weaning stress in foals. *Appl. Anim. Behav. Sci.* (2005) 91, 321 – 335.

[12] ROGERS, CW., GEE, EK., FARAM, TL.: The effect of two different weaning procedures on the growth of pasture – reared thoroughbred foals in New Zealand. *N. Z. Vet. J.*(2004) 52, 401 – 403.

[13] ŠLECHTITELSKÝ PROGRAM ČT: <http://www.schct.cz/chov> (citováno 10. 6. 2006)

[14] SONDERGAARD, E., HALEKOH, U.: Young horses' reactions to humans in relation to handling and social environment. *Appl. Anim. Behav. Sci.*(2003) 84, 265 – 280.

[15] WARREN, LK., LAWRENCE, LM., PARKER, AL., BARNES, T., GRIFFIN, AS.: The effects of weaning age on foal growth and radiographic bone density. *J. Equine Vet Sci.* (1998)18, 335.

[16] ZASTAWNY, J. et al.: The analysis of forage quality and grasslands utilization for livestock production on organic farms. Proceedings of the 4 SAFO Workshop, The University of Reading, Switzerland: (2005) 7-14.

