

Original Research Paper

Patterns of Growth and Development of Young Herd Horses of Eurasia

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Abstract: The aim of the research in a comparative aspect is to study the patterns of postembryonic growth and development of the herd horse population of the Republic of Kazakhstan and the Republic of Teva of the Russian Federation. In the Republic of Kazakhstan, the experimental part of the work was carried out in the farms "Urker" of Moyinkum and "Kaldybay" of Zhualy districts of Zhambyl region, respectively engaged in breeding Kazakh horses of the zhabe type of the southern population and the Kazakh breed of the southern population. In the Republic of Tuva, Tuvan horses from the State Unitary Enterprise "Choduraa" of the Tes-Khem district (southern steppe zone), ACF "Seserlig" of the Piy-Khem district (central mountain zone) of the Republic of Tyvaserved as the material for research. It was established that the young horses of the Kazakh breed in all periods of the experiment had superiority over the Kazakh horse of the zhabe type in almost all the studied measurements. Thus, at the age of 2.5 years, Kazakh horses surpassed the peers of the Kazakh horse of the zhabe type by 8.2 cm in height at the withers; the oblique length of the trunk by 7.10 cm; the chest girth behind the shoulders - 10.60 cm and the pastern girth - 0.70 cm, which characterizes the energy potential of growth and the possession of a massive physique. The colts of the Tuvan horse from the southern steppe zone are inferior to their peers from the central mountain zone in height at the withers, oblique length of the trunk, chest girth, but exceed the pastern girth by 0.2 cm. The same pattern is observed at 18 and 30 months of age. It was found that the live weight of colts of experimental groups increases unevenly from the age of three days to the age of 1 month. So foals received from the Kazakh breed at the age of 3 days weighed an average of 39.8, 1 month – 80.1 kg and foals from mares of the zhabe type in the same periods weighed 39.3 and 78.5 kg, young Kazakh horses at the age of 3 months on average had a live weight of 130.2 kg, 6 months - 179.6 kg, 12 months - 255.8 kg, 18 months - 307.3 kg and 30 months - 410.7 kg, which is more than their peers received from mares of the zhabe type at the studied ages respectively by 4.30; 8.9; 35.40; 26.80 and 58.20 kg ($P < 0.05$).

Keywords: Kazakh Breed, Kazakh Horse of the Zhabe Type, Tuvan Breed, Earliness, Body Measurements, Live Weight

Introduction

Centuries-old natural selection under the influence of harsh climatic conditions with extensive herd horse breeding and artificial selection that meets the requirements for a horse in a nomadic economy were the main factors in the formation of modern Horse breeding has always occupied a special position among other branches of animal husbandry, such as dairy and meat (Kruger, 2008).

populations of Kazakh horses. Their valuable advantage was their high adaptability to pasture maintenance throughout the year. The conditions of herd horse breeding have hardly changed for several centuries, so local Kazakh horses have been preserved without noticeable changes (Doreau and Boulot, 1989).

The development of the current Kazakh horse is the result of long-term breeding and improvement. Their development is closely connected with the need for the movement of nomads along the Silk Road. Kazakh horses are mainly distributed in western China, Kazakhstan, northeastern Kyrgyzstan, Mongolia and the western parts of the Altai Territory of the Russian Federation (Gemingguli *et al.*, 2016).

The Tuvan horse (*Equus ferus caballis*), which is related in origin to the Kazakh horse, but somewhat smaller in size, but at the same time larger than the Mongolian, is valued for its adaptability to year-round grazing in herds on pasture without feeding and premises. It is more resistant to abiotic and biotic stressors, including pathogens and is practically not susceptible to diseases (Chysyma *et al.*, 2017).

The spasmodic rhythm of the growth of young horses in herd breeding conditions is a reflection of the conditions of his life. In herd conditions, the growth and development of young horses depends on climatic and forage conditions, as well as on systematic selection work (Mongush and Yuldashbaev, 2019).

The development of individuals is determined not only by the main criterion of live weight, but also by indirect indicators characterizing the growth rate of different parts of the animal's body, that is, by body measurements (Kondybayev *et al.*, 2021). The growth and development of colts is different from that of fillies. Colts grow for a longer time and finish their development later than fillies. The tendency of colts to grow longer is associated with their later puberty. Under normal conditions of feeding and keeping mares, colts in the womb stay somewhat longer than filly and at birth are somewhat larger than them.

The main zootechnical indicators that are taken into account when assessing the economic and physiological earliness of animals: live weight and average daily weight gain (Baimukanov *et al.*, 2021).

Horses of the indigenous type are the animals that have

preserved the type of the local horse to the greatest extent. Mares of the indigenous type have good adaptive properties and represent a valuable maternal basis for crossing with factory breeds in order to obtain crossbreeds of the desired type (Chirgin *et al.*, 2021).

The aim of the work is to study the patterns of postembryonic growth and development of the herd horse population of the Republic of Kazakhstan and the Republic of Tyva of the Russian Federation in a comparative aspect.

Materials and Methods of Research

In the Republic of Kazakhstan, the experimental part of the work was carried out in the farms "Urker" of the Moyinkum and "Bektobe" of the Zhambyl districts of the Zhambyl region, respectively engaged in breeding Kazakh horses of the zhabe type of the southern population and the Kazakh breed of the southern population.

In the Republic of Tyva, the Tuvan breed of SUE "Choduraa" of the Tes-Khem district (southern steppe zone), ACF "Seserlig" of the Piy-Khem district (central mountain zone) served as the material for research.

To clarify the specific features of the growth and development of young animals of different groups, we studied the indicators of linear growth of foals by body measurements (height at the withers, oblique length of the trunk, chest and pastern girth) and live weight in the age aspect (3 days, 1 month, 3 months, 6 months, 12 months, 18 months and 30 months) (Mongush, 2016; Instructions for valuing local and factory horses (IVLFH), 2014).

Research Results

According to Kris Hiney, the growth and development of young animals is usually determined by weight gain. Weight gain from birth to about 12 months occurs relatively quickly and more or less linearly. The rate of weight gain slows down in one-year-olds and mature weight is reached at the age of 36 to 60 months. As it is known, from 50 to 60% of the mature weight is achieved at the expense of 12 months and 80-90% of the mature weight is achieved by 24 months. Withering growth increases faster than body weight. By the age of two, 90% of the mature body weight was achieved (Hiney, 2016; Musaev *et al.*, 2021).

According to the indicators of measurements, it is possible to judge the formation of a body type that determines the direction of subsequent productivity. It was established that the young horses of the Kazakh breed in all periods of the experiment had superiority over the Kazakh horse of the zhabe type in almost all the studied measurements. Thus, at the age of 2.5 years, Kazakh horses surpassed the peers of the Kazakh horse of the zhabe type by 8.2 cm in height at the withers; the oblique length of the trunk by 7.10 cm; the chest girth behind the shoulders - 10.60 cm and the pastern girth - 0.70 cm, which characterizes the energy potential of growth and the possession of a massive physique (Table 1).

The stallions of the Tuvan horse breed from the southern steppe zone are inferior to their peers from the central mountain zone in height at the withers, oblique length of the trunk, chest girth, but exceed the pastern girth by 0.2 cm. The same pattern is observed at 18 and 30 months of age.

It was found that the live weight of colts of experimental groups increases unevenly from the age of three days to the age of 1 month. So foals received from the Kazakh breed at the age of 3 days weighed on average 39.8±0.27, 1 month – 80.1±0.47 kg and foals from mares of the zhabe type in the same periods weighed 39.3±0.47 and 78.5±0.65 kg. The difference in favor of Kazakh breed foals by 0.5 and 1.6 kg, respectively, is not significant. This is due to the fact that during this suckling period, foals feed only on milk and receive all the necessary energy materials necessary for the growth and development of the body from the mother.

Starting from the age of 3 months, there is a significant difference in body weight gain between the studied groups of animals. The highest indicators of live weight growth in subsequent periods were noted in young Kazakh horses, which are probably related to the realization of the genetic potential inherent in this breed. Thus, young Kazakh horses aged 3 months on average had a live weight of 130.2±1.05 kg, 6 months

- 179.6±1.12, kg, 12 months - 255.8±1.25 kg, 18 months - 307.3±2.10 kg and 30 months - 410.7±2.24 kg, which is more than the peers obtained from mares of the zhabe type by the studied ages, respectively, by 4.30; 8.9; 35.40; 26.80 and 58.20 kg (P<0.05).

When studying the dynamics of the live weight of horses of the Tuvan breed, it was found that in young animals up to 3 months of age, the difference was 5 kg. At 180 days of age, the difference in live weight did not exceed 2.1 kg. When reaching the age of one year, the difference was 5 kg. At 30 months of age, superiority in live weight was observed in colts of the central mountain zone 383.8±0.28 and in comparison with the southern steppe zone 370.2±0.89, the difference was 13.6 kg.

It was found that the average measurements of the body of adult stud horses of the Kazakh breed were (cm): height at the withers - 154.3, oblique length of the trunk - 156.6, chest girth - 185.2, pastern girth - 19.7, live weight- 512.4 kg. The average measurements of the population of local stallions of the zhabe type were respectively (cm): 146.6; 150.1; 180.4 and 19.5 cm, which is lower than that of stallions of the Kazakh breed by 7.7; 6.5; 4.80 and 0.2 cm, respectively. In terms of live weight, stallions are lighter to the zhabe than stallions of the Kazakh breed by 46.70 kg (Table 2).

Table 1: Growth and development of foals - colts of various origins

Breed	Age, year	Height at the wither's	Oblique length of the trunk	Chest girth	Pastern girth	Live weight
♂ Zhabe × Zhabe ♀ n= 45	3 days	92,0±0,135	72,2±0,09	79,0±0,083	10,4±0,051	39,3 ±0,47
	1	97,0±0,330	80,3±0,067	86,2±0,492	11,5±0,08	78,5±0,65
	3	106,3±0,170	97,0±0,173	104,0±1,204	13,1±0,13	125,9±0,84
	6	120,6±0,896	115,0±0,148	121,5±0,902	14,2±0,20	170,7±1,15
	12	126,4±0,232	128,1±0,08	140,5±0,337	14,8±0,07	220,4±1,27
	18	133,5±0,717	131,7±0,335	151,5±0,979	15,1±0,08	280,5±1,65
	30	139,2±0,45	138,5±0,37	159,7±0,28	17,5±0,05	352,5±2,15
♂ Kazakh breed × Kazakh breed ♀ n=39	3 days	92,2±0,27	72,0±0,43	78,5±0,17	10,5±0,14	39,8±0,27
	1	98,0±0,25	80,1±0,31	86,7±0,17	11,6±0,19	80,1±0,47
	3	109,0±0,35	99,5±0,18	107,0±0,29	13,7±0,09	130,2±1,05
	6	122,5±0,45	116,5±0,22	125,0±0,36	14,8±0,03	179,6±1,12
	12	128,3±0,39	127,8±0,33	144,6±0,20	15,3±0,10	255,8±1,25
	18	140,0±0,27	142,5±0,35	160,5±0,33	16,0±0,08	307,3±2,10
	30	147,4±0,17	145,6±0,25	170,3±0,34	18,2±0,06	410,7±2,24
Tuvan breed (central mountain zone) n=10	3 days	97,8±0,3	97,9±0,3	104,9±0,5	13,5±0,3	79,8±0,50
	1	99,0±0,28	98,3±0,067	107,2±0,492	12,5±0,08	89,5±0,65
	3	111,9±0,67	107,5±0,48	119,2±0,43	14,1±0,13	149,4±2,2
	6	118,2±0,3	116,3±0,4	127,2±0,3	14,3±0,1	238,3±0,21
	12	122,5 ±0,3	125,3±0,5	136,2±0,4	15,3±0,5	270,2±0,36
	18	127,3±0,7	128,0±0,5	147,4±1,0	16,6±0,7	292,4±0,48
	30	132,6±0,5	134,2±0,5	158,4±0,9	18,4±0,9	383,8±0,28
Tuvan breed (southern steppe zone) n=10	3 days	94,3±0,4	93,9±0,2	101,2±0,4	13,6±0,5	77,8±0,44
	1	102,3 ± 0,6	103,5±0,70	111,8±0,85	13,2±0,08	118,7±0,61
	3	107,7±0,80	105,9±0,60	117,5±0,80	14,2±0,10	144,4±2,3
	6	117,3±0,5	115,1±0,6	128,1±0,2	14,3±0,1	236,4±0,13
	12	122,1±0,4	124,6±0,8	135,8±0,8	15,9±0,6	265,2±0,41
	18	127,1±0,6	127,7±0,9	147,5±0,6	16,7±0,4	282,7±0,42
	30	132,4±0,5	133,4±0,7	158,3±0,3	18,5±0,2	370,2±0,89

Table 2: Average body measurements and live weight of adult horses of various origins

Horse breed	n	Height at the withers	Oblique length of the trunk	Chest girth	Pastern girth	Live weight
Kazakh horses						
Stallions of the zhabe type	6	146,6±0,4	150,1±0,6	180,4±0,7	19,5±0,04	465,7±4,2
Fillies of the zhabe type	120	144,5±0,3	150,2±0,4	179,6±0,8	18,6±0,02	445,1±4,7
Stallions of the Kazakh breed	5	154,3±0,5	156,6±0,7	185,2±1,3	19,7±0,03	512,4±4,5
Fillies of the Kazakh breed	105	151,5±0,4	154,3±0,6	180,7±1,1	18,7±0,04	481,7±5,7
Tuvan horses						
Stallions of the central mountain zone	10	134,9±0,5	136,2±0,6	160,1±1,1	18,8±0,3	406,8±7,1
Fillies of the central mountain zone	10	134,3±0,5	135,7±0,8	159,8±1,0	18,5±0,2	379,1±6,9
Stallions of the southern steppe zone	10	133,6±0,5	134,9±0,8	159,9±0,7	18,7±0,1	394,3±8,3
Fillies of the southern steppe zone	10	132,9±0,5	133,4±0,9	159,4±0,7	18,3±0,1	351,2±6,2

The same pattern of indicators in favor of the Kazakh breed in body measurements and live weight is observed in experimental mares of the Kazakh breed. Thus, the average body measurements of Kazakh breed mares were: height at the withers – 151.5 cm, oblique length of the trunk -154.3 cm, chest girth - 180.7 cm, pastern girth -18.7 cm, which is higher than the corresponding indicators of mares of the zhabe type by 7.0; 4.10; 1.10, 0.1 cm. In terms of live weight, Kazakh breed mares outperform zhabe type mares by 36.6 kg.

When analyzing the data, it was established that in terms of body measurements, the stud horses of the Tuvan breed of the southern steppe zone were inferior to their peers of the central mountain zone. The average measurements of stud horses of the Tuvan breed of the southern steppe zone were: height at the withers is 133.6 cm, oblique length of the trunk is 134.9 cm, chest girth is 159.9 cm, pastern girth is 18.7 cm and live weight is 394 kg. Stud horses of the central mountain zone by all indicators surpassed their peers by 1.3, 1.3, 0.7, 0.1 cm. In terms of live weight, the stallions of the central zone slightly exceeded the southern steppe zone by 12.5 kg.

height at the withers - 134.3, oblique length of the trunk - 135.7, chest girth - 159.8, pastern girth - 18.5. and live weight - 379.1 kg. Their peers from the southern steppe zone were inferior to them by 1.4, 2.3, 0.4, 0.2 cm. The difference in live weight was 27.9 When observing changes in the body measurements of mares of the Tuvan breed of the two studied zones, the superiority of individuals of the central mountain zone in all the studied positions was established. Measurements of mares of the central mountain zone were (cm): kg.

Conclusion

The established patterns of growth and development characterizing the earliness of horses of cultural and aboriginal breeds of the Republic of Kazakhstan and the Republic of Tyva of the Russian Federation are recommended to be used as a scale for assessing the age dynamics of changes in body measurements and live weight from three days old to 2.5 years old.

It was found that the live weight of colts of experimental groups increases unevenly from the age of three days to the age of 1 month. So foals received from the Kazakh breed at the age of 3 days weighed an average of 39.8, 1 month – 80.1 kg and foals from mares of the zhabe type in the same periods weighed 39.3 and 78.5 kg, young Kazakh horses at the age of 3 months on average had a live weight of 130.2 kg, 6 months - 179.6 kg, 12 months - 255.8 kg, 18 months - 307.3 kg and 30 months - 410.7 kg, which is more than their peers received from mares of the zhabe type at the studied ages respectively by 4.30; 8,9; 35.40; 26.80 and 58.20 kg (P<0.05).

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Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and no ethical issues involved.

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