Bulgarian Journal of Agricultural Science, 24 (No 2) 2018, 290–295
Agricultural Academy

STUDIES OF THE EXTERIOR OF THE KARAKACHAN HORSE BREED

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Abstract

Popova, M., V. Nikolov, N. Krastev and G. Gradev, 2018. Studies of the exterior of the Karakachan horse breed. *Bulg. J. Agric. Sci.*, 24 (2): 290–295

A study of the exterior of horses from the Karakachan breed and the influence of some factors on it was conducted. The study covers the period from 2013 to 2016. Data on the body measurements of 52 horses were used and 404 body measurements were analyzed. It was established that the horses from the Karakachan breed have average height at the withers 130.22±0.81 cm, the body length is 140.57±1.34 cm, the chest girth is 157.51±1.54 cm, and the cannon girth is 17.67±0.14 cm. Significant source of influence on the cannon girth are the populated area ($P < 0.05$), the sex ($P < 0.001$) and the sex in the populated area ($P < 0.05$), the last factor is influencing reliably the chest width ($P < 0.05$), too. The horses of the modern population of the Karakachan horse breed are bigger compared to those from the beginning of the last century. They are taller, with prolonged profile, the chest is larger, and the bones are more massive. The horses are slightly downhill built and with sway back, which is not characteristic for the Karakachan horses of the last century.

Key words: exterior measurements; Karakachan horses; autochthonous breeds

Introduction

Karaivanov and Barzev (1994) classify Karakachan horse as a local, primitive (autochthonous) breed of Bulgarian origin. The breed was created by national selection, under very specific conditions. Their economic purpose is riding and carrying loads to places with difficult access. For a long period of time, the only published scientific researches on the economic and biological characteristics of the breed were the works of Al. Petrov (1939a, b; 1940; 1941), made in the 1940s. Nowadays, the data for the Karakachan horse has been quoted by Barzev et al. (2005), in the breeding programme of the breed (Sabeva, 2009), and in almanacs and other popular sources, without referring to new original data.

Exterior takes central place for the characteristics of the breed. It is defining for horses, as it is connected to their work capacity – their ability to pull loads, to jump over obstacles, and to run along the track. Holstrom and Phillipsson (1993), Hermsen (2001), Schacht (2011), Higgins and Martin (2012), evaluate the great significance of the exterior and the constitution for the work capacity of horses.

Exterior measurements, basic element of the characteristics of horses, are used for the objective characteristics of the exterior, and they are in integrated part of the breeding programmes for the breeds (Sabeva, 2009, 2012, 2015; Sabeva and Kaschiev, 2010; Asenov, 2011; Barzev et al., 2011; Hinkovski et al., 2011). In horse breeding, body measurements are considered to be growth and development indicators, both for the separate parts of the axial skeleton and for the whole body (Barzev, 2011).

The study of the exterior, together with the other biological qualities, the ecological and economic characteristics, is of great importance in preserving the genetic resources of autochthonous, sparse breeds, which Karakachan horse

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belongs to. This provokes our interest in exterior studies of contemporary representatives of horses from this breed as well as in the influence of some factors on it.

Materials and Methods

The study covers the period from 2013 to 2016. The subject of the study are horses from the Karakachan breed which are bred in the villages of Levka, Tazha, Karlievo, Plana, Vlahi and the towns of Karlovo and Kalofer. The exterior measurements of the horses from Levka were taken in June 2014 and June 2016. The rest of the horses were measured at an earlier stage, the data was taken from the registers of the Association for Breeding Indigenous Breeds in Bulgaria (ABIB).

The study includes 52 horses (10 males and 42 females) and were analyzed 404 body measurements. The exterior measurements were taken in horses with complete growth. The measurement was performed with routine zootechnical instruments, on level ground and have met all zootechnical requirements for taking a body measurements.

When processing the data and establishment of the influence of some factors on the studied trait we used multifactor dispersion analysis as the linear model had the following statistical type:

$$Yijk = \mu + Ci + Sj + CSij + eijk,$$

where: Yijk – observation vector; μ – overall average constant; Ci, Sj are fixed effects corresponding to the populated area (i = 7); the sex of the horse (j = 2); CSij is random effect of interaction sex*populated area; eijk. – residual variance.

The statistical processing was done with the program SPSS 19.

Results and Discussion

The study of the exterior of the animals from the Karakachan horse breed has been conducted in six localities, in different regions of the country (Figure 1). The village of Levka (at altitude of 176 m) is situated in the southern spurs of the Sakar Mountains (at altitude of 856.1 m), the town of Karlovo (at altitude of 386 m), the town of Kalofer (at altitude of 603 m) and the village of Tazha (at altitude of 496 m) – at the feet of the southern slopes of Stara Planina (at altitude of – 961 m), the village of Karlievo (at altitude of 596 m) – in the Zlatitsa-Pirdop Valley (at altitude of – 750 m), the village of Plana (at altitude of 1192 m) – in the Plana Planina (at altitude of 1337.4 m) – the easternmost point of the Zavalsko-Planska Range, and the village of Vlahi (at altitude of 771 m, which, at its highest parts, reaches to over 2000 m) – in the south-western part of the Northern Pirin Mountains.

The farms are distinguished not only with their natural and climatic, but also with their economic conditions. These differences and the geographic isolation are a prerequisite for gradual divergence of the exterior and of the other biological and economic indicators. Thus, during the studies of

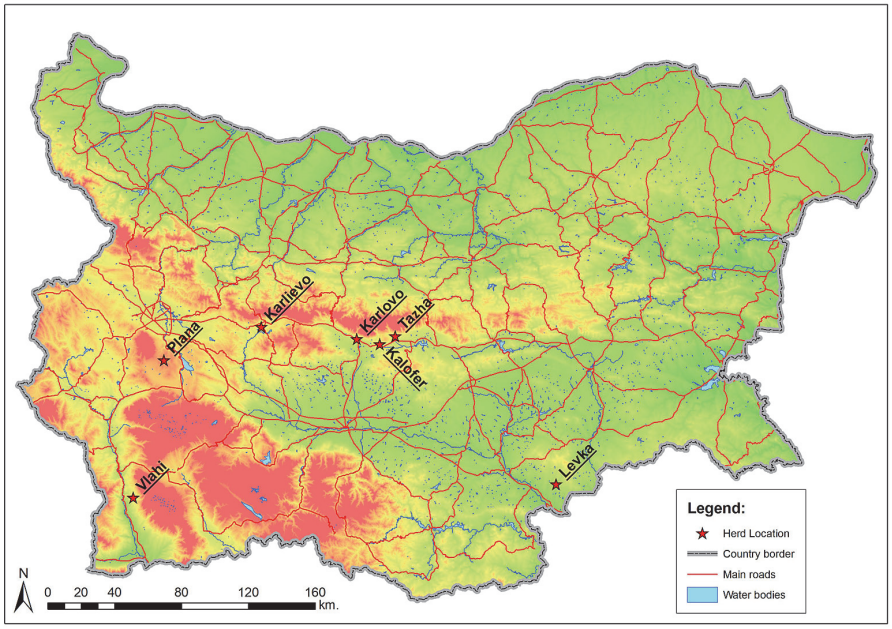

Fig. 1. Location of the herds used in the study (by Pavlin Zhelev)

the D-loop mitochondrial regions of local horses from the Stara Planina, the Rhodopes, and the Rila & Pirin Mountains, Hristov et al. (2017) established a great variety of all the known haplogroups, as the haplogroups A, J, I, O'P and Q were not equally shared between the three populations. Moreover, unlike the Stara Planina and Rhodopi populations, it was established that the horses of the Rila & Pirin Mountains have a 'mixed' profile – the massive genetic introgression of the Asian haplogroup types.

In his studies (1939a,b; 1940; 1941), Petrov noted that Karakachan horse had massive body shapes, excellent pasture condition, and was taller than the other mountain horses. The author established that the height of the withers of male animals was averagely 127 cm, with standard deviation of 3.57 cm and coefficient of variation (CV) of 2.82%, while with females, these measures were, respectively, 125.5 cm, 3.35 cm, and 2.73%. The other seven of all eight average basic body measurements were as follows: height at the back – 126.1 ± 3.0 cm; height at the croup – 125.3 ± 3.42 cm; body length – 129.1 ± 3.94 cm; chest depth – 59.3 ± 2.73 cm; chest width – 34.8±3.65 cm; chest girth – 143.3±5.42 cm, and the cannon girth – 15.62 ± 1.05 cm. The author noted that, as far as it refers to the exterior, Karakachan horse was rather straight at the height of the withers, back, and the croup, the body length, and the head configuration. The greater variation was in connection to the length of the back and the width of the chest.

The average height at the withers of the animals we studied is 130.22±0.81 cm. The variation is within 122 – 137 cm, but the CV is low – 2.77%. Sabeva (2009) stated of values of the height of the withers of the Karakachan horse, which are higher than ours – 131.08 cm, as she explained the greater size of the animals with the settled way of life of Karakachans in the past 60 or 70 years, and the relatively limited use of mares for work.

Horses in different regions of breeding differentiate in the height of withers, but the influence of the factor is unreliable (Table 1). The horses of the stud in the town of Kalofer are the shortest, and the tallest ones are from the village of Karlievo (Figure 2). The breed closest to the typical Karakachan horse in the breeding programme of the breed (Sabeva, 2009) is the average height of the animals from the stud in the village of Tazha. However, in five out of the seven studs, the average height at the withers is lower and practically equal – from 129,25 cm in Kalofer to 129,58 in Vlahi.

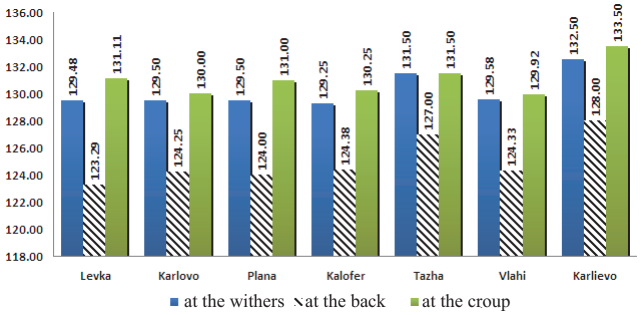

Fig. 2. Heights of the body of Karakachan horses from different regions of the country, cm

The data we collected clearly shows the increased height of the horses (with more than 2 cm) in comparison to that of the population studied in the 1940s (Petrov, 1939a, b; 1940; 1941). The difference is even more significant for the height at the croup, which also changes the proportions of the build from slightly uphill, at the beginning of the past century, to downhill build. The Karakachan horses we studied are slightly downhill built, as the average difference in the height of the withers and at the croup of the total number of the measured animals, is around 1 cm.

Table 1

Effect of the populated area, sex of the horse and sex of the horse in the populated area on the basic body measurements in horses from the Karakachan breed, F-criterion and degree of statistical significance

N	Exterior measurements	Populated area	Sex	Sex of the horse in the populated area
	df	6	1	3
1	Height at the withers	0.283	0.035	1.173
2	Height at the back	0.677	0.009	1.256
3	Height at the croup	0.297	0.006	1.072
4	Chest width	0.299	1.665	3.846*
5	Chest depth	0.476	0.161	1.016
6	Chest girth	0.397	0.491	0.158
7	Body length	1.133	0.027	0.521
8	Cannon girth	2.915*	14.750***	4.389*

***P< 0.001; **P<0.01; *P<0.05

The downhill built conformation is characteristic for all the studs we studied, except the one in the village of Tazha, as the average difference between the height at the croup and at the withers is 1-2 cm. This comes to show that the downhill built conformation can be defined as breed trait of the Karakachan horse and is not a result of infantilism due to the worse conditions of breeding in the mountains. The highest downhill built is observed with the horses in the village of Plana and the village of Levka – 1.5 cm and 1.63 cm on average, respectively, and the lowest one is at the village of Vlahi – 0.34 cm on average.

The height at the back is 125.01±0.77 cm on average, as some horses are with values of 116 to 126 cm. The variation in the height of the measured animals is 2.83% on average. The difference between the height at the back and at the withers is 5.21 cm on average, and between the height at the back and the croup is 6.16 cm on average. The sway back is more typical with the horses from the village of Levka, and the straighter one is with the studs in the village of Tazha and Karlievo.

As a whole, a conclusion could be made that the horses of the Karakachan breed are relatively equal regarding the heights of the body.

The horses from the Karakachan breed are relatively long (Figure 3). The average body length is 140.57±1.34 cm, with variation of 129 to 140 cm, as the received data is similar to the one stated by Sabeva (2009). The shortest animals are from the stud of the village of Vlahi, with average values of body length of 137.42±2.83 cm, and the highest ones are in the village of Tazha – 145.50±4.39 cm on average. As a whole, the horses of the modern population are significantly longer than those from the beginning of the last century, and the average value of the latter is the minimum lower margin of the modern population. On the background of the smaller differences in the heights, the horses from the modern population are with longer bodies.

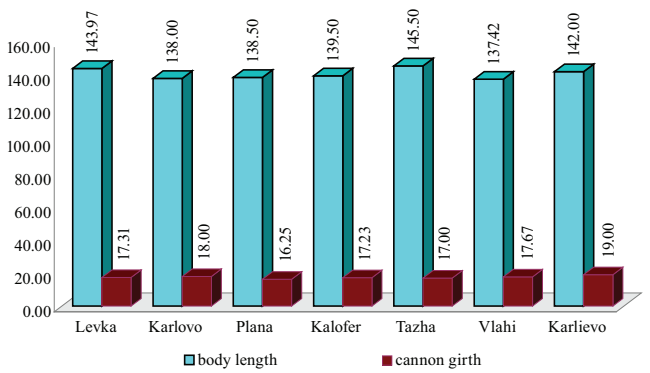

Fig. 3. Body length and cannon girth of Karakachan horses from different regions of the country, cm

The greatest variation regarding the body length is reported in the studs of the village of Tazha – 5.35%, as some of the individuals have values from 140 cm to 151 cm and in the village of Levka – 4.92%, as some of the individuals have values from 129 cm to 153 cm. The stud of the village of Plana has the most equal length.

The chests of the Karakachan horses breed are relatively deep and wide (Figure 4), with regularly developed and well-shaped, deep and wide chest, typical for the horses of the breeds for loads and work. The variation is within a wide range for all the indicators, as the most significant one regards the chest width. The width of the chest of the measured animals is 35.23±0.61 cm on average, with variation of 8.60%. The horses from the stud in the village of Tazha have the widest chest – 36.50±2.02 cm, with variation of 11.83%, and the narrowest belongs to the horses in the village of Plana – 33.75±1.43 cm, with variation of 7.41%. The chest width is the most variable indicator among all the studied ones; generally, it is the most dynamic indicator of the body measurements, as it is most influenced by the condition.

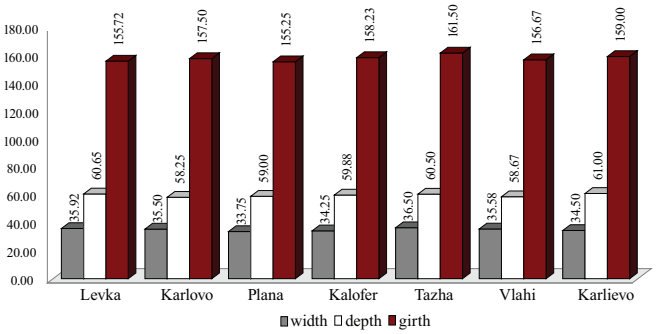

Fig. 4. Measurements of the chests of Karakachan horses from different regions of the country, cm

The average chest depth of the measured animals is 59.68±0.5 cm, and the individual variation is 5.14%. The highest value of this indicator – 61.00±2.28 cm is in the village of Karlievo, with variation of 4.61%. The horses of the town of Karlovo have the shallowest chest – 58.25±1.96 cm, and this is the place with the widest variation of this indicator – 11.18%. The depth of the chest takes an average of 45.83% of the height of the withers.

The girth of the chest is an indicator of the overall development of the thorax. The average girth of the chest of the Karakachan horse breed is 157.51±1.54 cm, with coefficient of variation of 4.26%. The horses of the village of

Tazha have the widest girth of the chest – 161.50±5.06 cm on average.

The width of the croup at the point of the hip of the horses is significantly greater than the length.

Karakachan horses are generally characterized with short and strong legs, and well-developed tendons.

Judging from the girth of the cannons, the Karakachan breed horses are with relatively well-developed bones. The average cannon girth is 17.67±0.14 cm, as there are some individuals with a girth from 16 to 21 cm.

The horses bred in different regions reliably differentiated in the girth of the cannon (Figure 3). The greatest cannon girth is found at the horses of the village of Karlievo – 19.00±0.46 cm on average, and the finest bones are the ones of the horses of the village of Plana – 16.25±0.32 cm, as the difference is almost 3 cm. According to the breeding programme of the breed the average value of this indicator is 17.69 cm. The reason for this high value could be the difference in the conditions of breeding. The conditions in the village of Karlievo (at altitude of 596 m) are more favourable than those in the mountains and suppose better growth within the reaction range.

Not only the region, but also the sex has reliable influence on the cannon girth (Table 1). Although sexual dimorphism is not that strongly expressed with horses as it is with the other farm animals, sexual differences in the exterior have been established by other authors as well (Sabeva, 2012; Cilek, 2012; Pinto et al., 2008; Pretorius et al., 2004).

The cannon girth of the stallions (18.67±0.25 cm) is 1.5 cm greater than the one of the mares (17.09±0.17 cm). The mares from the village of Plana have the thinnest bones (16.25±0.32 cm), and the thickest ones belong to those in the town of Karlovo (18.00±0.65 cm). The stallions with the thinnest skeletal system, closest to the average values of the requirements of the breed are those from the village of Levka (17.67±0.37 cm), and the stallions with the thickest cannons are the ones from the village of Karlievo (21.00±0.65 cm).

In general, the horses from the modern population of the Karakachan horse breed are bigger compared to the ones from the beginning of the last century (Figure 5). They are taller, with more prolonged profile resulting from the significant growth of the length compared to the height of the body. The chest is larger and the bones are more massive. Judging from the changes of the exterior profile, two new indicators are found – slightly downhill body conformation and sway back, which are not typical for the beginning of the last century.

The reason for the enlargement of the breed can really be sought in the settled way of life (Sabeva, 2009), the reduced difficulty of the job, the improved conditions of breeding,

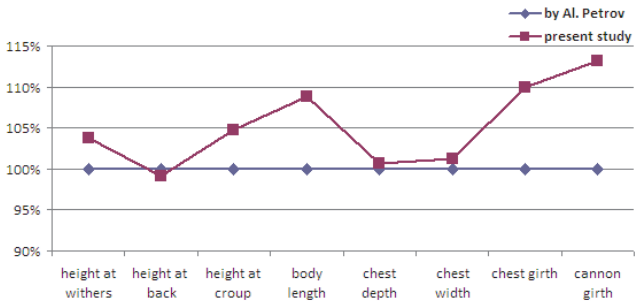

Fig. 5. Exterior profile of the horses from the modern population of Karakachan breed compared to the population from the beginning of the last century (by Al. Petrov)

and the food base. Any influence of other breeds is practically excluded as the data for the exterior of the modern populations of breeds in our country, like the Pleven horse (Vasilev and Tsankov (1997), the Purebred Arabian and Shagya horses (Popova, 2017), the Thoroughbred (Vlaeva, 2015), Trotter horses (Lukanova, 2016) etc., is significantly contrasting to the data we acquired.

Conclusion

The horses from the Karakachan breed are characterized with prolonged, deep and slightly downhill body conformation; relatively wide and deep chest, well-developed bones. The average height at the withers is 130.22±0.81 cm, the body length is 140.57±1.34 cm, the chest girth is 157.51±1.54 cm, and the cannon girth is 17.67±0.14 cm. The basic measurements vary in relatively narrow range, as the CV is from 0.9% regarding the height at the withers and reaches to 14.35% regarding the chest width. The animals bred in the different regions differed reliably ($P<0.05$) only in the cannon girth. For this indicator, the differences between the stallions and mares are reliable as well ($P<0.001$). The sex within the region is a reliable source of chest width variation, too ($P<0.05$).

The horses of the modern population of the Karakachan horse breed are bigger compared to those from the beginning of the last century. They are taller, with prolonged profile, the chest is larger, and the bones are more massive. The animals are slightly downhill built and with sway back, which is not characteristic for the Karakachan horses of the last century.

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Received January, 10, 2018; accepted for printing February, 26, 2018