Archives of Razi Institute, Vol. 77, No. 6 (2022) 2273-2279

DOI: 10.22092/ARI.2022.360058.2539

Original Article

A New Intra-Breed Type, "Mamyr-Aktobe," of the Kushum Breed of Horses of the Aktobe Population

Rzabayev, T[1]*, Rzabayev, S[2], Rzabayev, K[3]

1. Candidate of Agricultural Sciences, Senior Researcher "Aktobe Agricultural Experimental Station" LLP, Mir str., K. Nokin v., Aktobe, 030014, the Republic of Kazakhstan, Kazakhstan
2. Candidate of Agricultural Sciences, Senior Scientific Worker, Associate Professor, Laureate of the state prize of the Kazakh SSR, Head of Horse Breeding department, Author of Mugalzhar and Kushum horse breeds "Aktobe Agricultural Experimental Station" LLP, 1 Mir str., K. Nokin v., Aktobe, 030014, the Republic of Kazakhstan, Kazakhstan
3. Senior Researcher of Horse Breeding department "Aktobe Agricultural Experimental Station" LLP,1 Mir str., K. Nokin v., Aktobe, 030014, the Republic of Kazakhstan

Received 18 August 2022; Accepted 25 September 2022
Corresponding Author: rzabaev@mail.ru

Abstract

The Kushum breed is one of the top breeds in the structure of horse breeds in the Aktobe region. In terms of numbers, it ranks third after the Kazakh and Mugalzhar breeds. The Kushum breed in the Aktobe region compares favorably with a number of horse-draft factory breeds in terms of early maturity, fertility, high meat, milk productivity, and economy of keeping. This article describes a new intra-breed type, the "Mamyr-Aktobe" type of the Kushum horse breed of the Aktobe population. The structure of the intra-breed type of Mamyr-Aktobe of the Kushum breed includes three factory lines of stallions: 118 Krepysh 33-64, 116 Grom 98-58, and 137 Samotsvet 77-73 tested in 2010 and 2015 (Samotsvet) and patents No. 187,186 and No. 586were obtained for them. Adult stallions of a new intra-breed type are characterized by high measurements and live weight: 159.7-165.3-202.5-21.0 cm and 626.5 kg and massiveness - 153.8 and exceed the breed standard in live weight by 126.5 kg or by 25.3%, according to the massiveness index by 31.8%, and mares, respectively: 155.2-159.1-187.8-19.8 cm and 531.0 kg and massiveness - 165.2 and also exceed the breed standard in terms of live weight by 71.0 kg or 15.4% and terms of massiveness index by 7.9%.

Keywords: Breed, Selection, Factory line, Measurements

1. Introduction

According to food and agricultural data from the United Nations and the All-Russian Research Institute of Agriculture of the Russian Agricultural Academy organizations (1), modern animal husbandry is characterized by a tendency of loss of genetic resources, agricultural animal species due to climate change, especially for which there is no control by specialists and their characteristics and potential are not known. In connection with climate change, the problem arises of developing methods for preserving, reproducing, and improving local breeds well adapted to specific climatic and economic conditions. They have a limited gene pool, so their loss is irreplaceable (2).

Selection and breeding work in the Aktobe region aims to breed and improve the Kushum horse breed to create new highly productive breeding lines and types, specialized in meat productivity, that meet the realities of a changing climate (3).

The Kushum breed is one of the top breeds in the structure of horse breeds in the Aktobe region. In terms of numbers, it ranks third after the Kazakh and

Mugalzhar breeds. The Kushum breed in the Aktobe region compares favorably with a number of horse-draft factory breeds in terms of early maturity, fertility, high meat and milk productivity, and economy of keeping (4). In terms of meat productivity, they surpass the local Kazakh horses in Kazakhstan (on average by 100 kg per head); have good milk production (14-22 liters for 3 months of lactation); high early maturity of young animals (88-96% of the live weight of mothers at 2.5 years of age); are distinguished by high fertility - 85-90 foals per 100 mares, in the best herds - up to 94. The Kushum breed is resistant to diseases of piroplasmosis and necrobacillosis and is the best producer for the biological industry (3).

Kushum stallions are suitable improvers for local horses in year-round grazing and winter-grazing conditions. The use of stallions of the created highly productive factory type in breeding work increases the live weight of offspring from local mares already in the first generation by an average of 70-80 kg (5).

In the qualitative transformation of herd horse breeding in Kazakhstan, the role of the Kushum breed as the primary improving breed is exceptionally significant. Kushum horses are used along with Mugalzhar and Kazakh horses of the "zhabe" type in breeding work aimed at improving the productive qualities of local herd horses (6).

The genetic potential for the live weight of Kushum mares reaches 665 kg, and stallions - 717 kg. These data show the potential for further improvement of the Kushum breed horses in such an economically useful trait as live weight (7).

In order to meet the growing market requirements, the Kushum horse must constantly improve in the direction of increasing measurements and massiveness, improving the exterior, and increasing breeding and productive qualities, which, when crossed with local Kazakh horses, provide horses of high productivity and adaptability to the harsh herd conditions. In this regard, further improvement of the breeding and productive qualities of the Kushum breed of horses in year-round grazing and winter-grazing conditions has a special meaning (3). To further consolidate the constitutional-productive characteristics of the Kushum horses, selecting animals of a massive, primary type is necessary and creating their highly productive breeding lines and intra-breed types (2).

Due to the increasing demand for horse meat on the international market, many countries are developing meat horse breeding. In the modern world, due to several socio-economic reasons, there is a need for low-energy diets to produce economically profitable, environmentally friendly medical and dietary products of animal husbandry (8).

These products include horse meat and koumiss, which have high nutritional value and biological activity, provided they are low in calories. The ever-increasing demand for meat and dairy products leads to the fact that in the field of animal husbandry, there are alarming changes associated with the problem of purposeful management of biodiversity of genetic resources. In this regard, a large role is given to local horse breeds, highly adapted to local conditions (9).

2. Materials and Methods

Research and development work on the creation of a competitive highly productive intra-breed type "Mamyr-Aktobe" of the Kushum breed of horses was carried out by the method of pure-bred breeding in the conditions of year-round grazing and winter-grazing in "TS-AGRO" LLP, "Mugalzhar zhylkysy" LLP in the suburban area of Aktobe, "Zhan-Kanat-S" peasant farm of the Temir district and "Kazak Asyldary" LLP of the Kobdinsky district of the Aktobe region with total livestock of the product composition n = 318, incl. 18stallions, 300 mares.

The method of work provides for:

- The annual appraisal of the breeding stock and replacement young stock, selection and pickup by a set of traits, and assessment of stallions by the quality of offspring.

- The class assessment and zootechnical characteristics of horses were carried out based on determining the indicators of live weight and body

measurements by weighing and taking four main measurements: height at the withers, oblique body length, chest girth, and pastern girth. The assessment criteria were "Instruction on the appraisal of local horse breeds in Kazakhstan," 2004, 2014.

- The formation of breeding groups was carried out according to the minimum requirements of these breeds, the criterion exceeding the breed standard's live weight by 5-10% for the highly productive animals.

The development of the genealogical structure of the intra-breed type along the lines of the dynamics of the main breeding traits: size, type, exterior, adaptability to the conditions of year-round grazing, meat, and milk productivity, and reproductive abilities of horses were studied.

By analyzing the pedigrees of breeding horses, lines and families were identified. An assessment of their representatives was carried out according to a complex of breeding traits.

Stud stallions were assessed by the ranking method according to the quality of their offspring. The assessment of the severity of economically useful traits in various groups of animals was carried out according to the generally accepted methods of genetic-statistical and zootechnical analysis: the arithmetic means, the value of the mean-square deviation, limits, coefficients of variation, reliability, coefficients of genetic similarity, inbreeding, etc. All basic digital materials were processed by the variation statistics method and the reliability criterion calculation.

- Cultivation and selection of highly productive pedigree young stock of the breed according to a complex of breeding characteristics in order to obtain replacement stallions and fillies well adapted to year-round grazing and winter-grazing with increased meat and dairy productivity;

- drawing up a scientifically grounded plan for the selection of mares for stud stallions of improvers, taking into account the compatibility of linear animals;

- organization of the purposeful use of high-value line stud stallions in the formation and release of shoals of horses of the desired types;

- analysis of the development of the genealogical structure of the created intra-breed type "Mamyr-Aktobe" of the Kushum horse breed.

3. Results

As a result of many years of scientifically grounded selection and breeding work carried out by the horse breeding department of “AktobeAES” LLP to improve the breeding and productive qualities of the Kushum breed horses, a new intra-breed type –“Mamyr-Aktobe” was first created in its structure and 2018 a patent No. 858 with high adaptive qualities.

The intra-breed type of the Mamyr-Aktobe Kushum breed in its structure has three approved breeding lines of stallions 118 Krepysh 33-64 (patent No. 187), 116 Grom 98-58 (patent No. 186), and 137 Samotsvet 77-73 (patent No. 586) and 8 independent breeding families, which corresponds to the Regulation on the approbation of breeding achievements in productive horse breeding (i.e., by the intra-breed type).

The Krepysh 33-64 factory line has been developed for the 5th generation, i.e., great-great-grandchildren. The Krepysh 33-64 line has 3 branches through stallions Credit 76-71, Carbide 362-73, and Kremplin 352-76. Currently, in the production structure of the Kushum breed horses in the primary farms, 1 great-grandson, 10 adult great-great-grandchildren, 2 young great-great-grandsons and 1 great-great-grandson (3.5 years old) of the elite stallion-ancestor Krepysh 33-64 are produced.

In the Krepysh line, three breeding families of mares have been formed: (No. 6, born in 1970, No. 54, born in 1972, and No. 3, born in 1974).

The factory line of the stallion of Grom 98-58 has 3 branches through the stallions of Granat 10-65, Gaz 67-71, and Gromoboy 20-72 (diagram 2). The Grom98-58 line through the branches of stallions of Granat 10-65, Gaz 67-71 developed up to the 5th generation, i.e., to the

great-great-grandchildren, and through the stallion of Gromoboy 20-72 to the 6th generation, i.e., to great-great-great-grandchildren. The production structure of the basic farms produces 2 great-great-grandchildren, 5 adult great-great-great-grandchildren and 2 4.5-year-old great-great-great-grandchildren, and 1 3.5-year-old great-great-great-grandson of the Grom 98-58 factory line (Figure 1).

Figure 1. The successor of the Grom breeding line - the brown stallion Gulmaras 16-06, (159-163-206-20.5 cm and 659 kg at 7 years old)

From the broodstock of the Grom 98-58 breeding line, 2 breeding families are characterized by progressive development: palm-color mare No. 17, born in 1964, and palm-color mare No. 13, born in 1970.

The Samotsvet line has 2 branches and is spread through the stallions of Samal and Saiys. In the production structure of the Kushum breed horses in the basic farms, 8 stallions are produced - the successors of the line, including 1 grandson, 5 adult great-grandsons, and 3 great-grandsons of the stallion of Samotsvet 77-73.

In the factory line of the Samotsvet, 3 breeding families are formed. The breeding family of the black mare 81-81 developed up to the 4th generation, i.e., to great-great-granddaughters, progressive development. Currently, 5 great-granddaughters and 3 great-great-granddaughters are being produced. The breeding family of the palm-color mare 82-81 developed up to 3 generations, i.e., up to great-granddaughters, and the breeding family of the red mare 30-81 developed up to 3 generations, i.e., to great-granddaughters, progressive development (Figure 2).

Figure 2. Red mare 5-07 of the factory line of Krepysh of the Kushum breed (160-164-204-20.5 cm and 642 kg)

From the data in table 1, it can be seen that stallions of the new intra-breed type have tremendous growth (159.7 cm), an extended oblique body length (165.3 cm), a deep chest (202.5 cm), bone structure (21.0 cm) and high live weight (626.5 kg) and massive (153.8%). Stallions of the new intra-breed type exceed the breed standard in height at the withers by 5.7 cm, oblique body length by 9.3 cm, chest girth by 19.5 cm, pastern girth by 1.0 cm, live weight by 126.5 kg or by 25.3%, and by the massiveness index by 31.8%.

Mares of the new intra-breed type have an excellent height (155.2 cm), an elongated body (159.1 cm), a deep chest (187.8 cm), bony (19.8 cm), high-weight (531.0 kg), and massive (165.2%) and exceed the breed standard in height at the withers by 5.2 cm, oblique body length by 6.1 cm, chest girth by 9.8 cm, pastern girth by 0.8 cm, in live weight by 71.0 kg or by 15.4% and by the massiveness index by 7.9%.

Table 1. Measurements and live weight of adult elite stallions and mares of the intra-breed type

Indicator	Stud stallions			Mares		
	M±m	breed standard	result, +-	M±m	breed standard	result, +-
Number, animals	18			184		
Height at withers, cm	159.7±0,35	154	+5,7	155,2±0,10	150	+5,2
Oblique body length, cm	165,3±0,24	156	+9,3	159,1±0,21	153	+6,1
Chest girth, cm	202,5±1,24	183	+19,5	187,8±0,28	178	+9,8
Pastern girth, cm	21,0±0,10	20,0	+1,0	19,8±0,03	19,0	+0,8
Live weight, kg	626,5±6,2	500	+126,5	531,0±1,81	460,0	+71,0
Massiveness index	153,8	136,9	+31,8	142,0	157,3	+7,9

Male and female offspring of a new intra-breed type in average measurements live weight and massiveness index, and body type is animals of the harmonious constitution with a pronounced meat form.

The distinctiveness of the type: massive physique, deep chest, elongated body, strong limbs, chubby-hoofed animals, high live weight, high fertility, high growth energy of young animals and adaptability to year-round grazing and winter-grazing, high conditioning stability of horses in winter, the predominant color - red, palm-color and black.

It should be noted here that breeding work with horses of the Kushum breed has been carried out for a relatively long time, but purposeful work on breeding factory lines began in 1975. During this period, specific successes have been achieved in the breeding of horses of the Kushum breed, this can be judged by comparing the average data of measurements and live weight of Kushum stallions and mares of the original genealogical groups and the new intra-breed type "Mamyr-Aktobe" 1975-2018 they most fully characterize the directions and results of selection work with horses of the Kushum breed.

Table 2 shows the changes in the main measurements and live weight of stallions and mares of full-aged horses of the original type and the new intra-breed type "Mamyr-Aktobe" of the Kushum breed.

Table 2. Comparative data of measurements and live weight of full-age horses of the original groups of the Kushum breed and the new intra-breed type "Mamyr-Aktobe" of the Kushum breed

Groups	Years	n	Measurements, cm				Live weight, kg M+m	Massiveness index
			height at the withers M+m	oblique body length M+m	girth of chest M+m	girth of pastern M+m		
Stallions								
Original group for the Kushum breed of WKR	1975	52	160/1+0/35	160/9+0/38	192/2+0/46	20/9+0/05	540/0+4/98	131/5
Incl. for the Aktobe population	1975	6	156/0+1/71	161/3+1/12	182/3+3/12	20/6+0/01	508/3+35/9	133/7
Intra-breed type Mamyr-Aktobe	2018	18	159/7+0/35	165/3+0/24	202/5+1/24	21/0+0/10	626/5+6/2	153/8
Mares								
Original group for the Kushum breed of WKR	1975	10 20	154/1+0/10	156/8+0/11	183/5+0/16	19/3+0/01	492/0+1/86	135/0
Incl. for the Aktobe population	1975	18 3	150/5+0/20	156/4+0/27	178/9+0/39	18/9+0/04	473/0+2/29	140/1
Intra-breed type Mamyr-Aktobe	2018	18 4	155/2+0/10	159/1+0/21	187/8+0/28	19/8+0/03	531/0+1/81	142/0

From the data in table 2, it can be seen that stallions of the new intra-breed type "Mamyr-Aktobe" surpass the original group of the Kushum breed WKR (1975) in oblique body length by 4.4 cm, chest girth by 10.3 cm, pastern girth by 0.1 cm, in live weight by 86.5 kg, or by 16.0% and by the index of massiveness by 22.3%, and the initial group of the Aktobe population, respectively: by the height at the withers by 3.7 cm, by oblique body length by 4.0 cm, chest girth by 20.2 cm, pastern girth by 0.4 cm, by live weight by 118.2 kg or by 23.3% and by mass index by 20.1%.

Mares of the new intra-breed type surpass the original group of the Kushum breed (1975) in height at the withers by 1.1 cm, oblique body length by 2.3 cm, chest girth by 4.3 cm, pastern girth by 0.5 cm, in live weight by 39.0 kg or by 7.9%, and by the massiveness index by 7.0%, and the initial group of the Aktobe population, respectively: by 4.7-2.7-8.8-0.9 cm and by live weight by 58.0 kg or by 12.3% and by mass index by 2.0%.

3.1. Meatanddairy Productivity

When slaughtered from 18-month-old stallions (n=5) of the intra-breed type "Mamyr-Aktobe," carcasses weighing 186.1 kg were obtained with a slaughter yield of 55.5%, and in 30-month-old stallions, respectively - 238.0 kg and 57, 6%.

Regarding the absolute weight of carcasses and slaughter yield, both 18 and 30-month-old stallions of the intra-breed type are characterized as animals of high meat productivity.

The milk productivity of mares of the intra-breed type "Mamyr-Aktobe" under grazing conditions for 105 days of lactation is on average 1660.0 + 5.3 liters, and the daily milk yield of mares is 15.8 liters, i.e., according to the assessment of milk productivity, they have 9 points and, thus, exceed the standard of the elite class by 1 point.

Horses of the intra-breed type "Mamyr-Aktobe" of the Kushum breed are distinguished by good adaptability to grazing and winter-grazing; simultaneously, they are resistant to diseases such as piroplasmosis and necrobacillosis, which cause significant damage to horses of factory breeds imported to Kazakhstan.

4. Discussion

As a result of targeted selection and breeding work for 43 years, the breeding and productive qualities of horses of the Kushum breed in the Aktobe region have been significantly improved. The animals have become more massive, while the adaptability to breeding them by herd method is fully preserved and strengthened with the year-round use of semi-desert pastures (10). This was led by rational methods of intra-breed selection aimed at consolidating and strengthening the economically valuable characteristics of the genealogical lines of stallions: Cascade I, 295-47 (Budenovsky 2nd generation), Harpoon 73-43 (pure-bred roaster 2nd generation) and Style 694-55 (dono-roaster-Kazakh) and breeding, on their basis, of new highly productive breeding lines of stallions: Krepysh, Grom and Samotsvet, Aktobe factory type (patent No. 585) and a new intra-breed "Mamyr-Aktobe" of the Kushum breed (3).

It should be emphasized here that the features of effective improvement of breeds lie in the fact that the work is based on intra-breed selection under the conditions of year-round grazing and winter-grazing, aimed at identifying and selecting animals that stand out for their high qualities in the breed and steadily transmit them by inheritance (9). The pairing was based on a rational alternation of inbreeding and outbreeding, considering the compatibility of line animals and the consolidation of horses of new factory lines and types. Thus, selection and breeding work aims to create highly productive meat and dairy production lines and types of Kushum horse breeds and corresponds to the priority direction of applied scientific research on developing a control system for the selection process and its intensification in horse breeding (11).

The new intra-breed type "Mamyr-Aktobe" of the Aktobe population of pedigree horses of the Kushum breed is characterized by increased meat and dairy productivity compared to the average for the breed. The

average live weight of adult stallions of the intra-breed type "Mamyr-Aktobe" exceed the breed standard by 126.5 kg or 25.3%, and elite adult mares of the Kushum breed, respectively, by 71.0 kg (15.4%).

Pedigree horses of the type can be recommended as improvers on commercial meat farms in Kazakhstan and neighboring regions of the Russian Federation.

The positive research results are being introduced into the practice of horse breeding farms in the region and the republic, aimed at improving the productivity and breeding qualities of local productive horse breeds.

Authors' Contribution

Study concept and design: S. R.
Acquisition of data: T. R.
Analysis and interpretation of data: T. R. and S. R.
Drafting of the manuscript: K. R.
Critical revision of the manuscript for important intellectual content: T. R., S. R. and K. R.
Statistical analysis: S. R.
Administrative, technical, and material support: T. R., S. R. and K. R.

Ethics

The study protocol was approved by the animal ethics committee of the Republic of Kazakhstan, Kazakhstan.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

1. Rischkowsky B, Pilling D. The state of the world's animal genetic resources for food and agriculture: FAO. 2007.
2. Kargayeva M, Baimukanov D, Karynbayev A, Alikhanov O, Zhunusov A. Productive-biological features of aday breed kazakh horses. Eurasia J Biosci. 2020;14(1):329-35.
3. Rzabayev TS, Assanbayev TS, Rzabayev S, Bazargaliyev A, Rzabayev KS. Linebreeding as a system of stock breeding to improve the productive qualities of horses of the Kushum breed. Reprod Domest Anim. 2022.
4. Koveshnikov VS, Slotina EV. Optimization of herd structure as an important reserve for increasing the efficiency of horse breeding. Current Problems and Ways of Industry Development: Equipment and Technologies: Springer; 2021. p. 890-6.
5. Voronkova V, Nikolaeva E, Piskunov A, Babayan O, Takasu M, Tozaki T, et al. Assessment of Genetic Diversity and Structure of Russian and Mongolian Autochthonous Horse Breeds Using Nuclear and Mitochondrial DNA Markers. Russ J Genet. 2022;58(8):927-43.
6. Baimukanov D, Baimukanov A, Alikhanov O, Doshanov D, Iskhan KZ, Sarsenbai D. Genetics of the productive profile of camels of different genotypes of the Kazakhstan population. Bull Natl Acad Sci Repub Kazakhstan. 2018;1(371):6-22.
7. Nguyen TB, Paul RC, Okuda Y, Le TN, Pham PT, Kaissar KJ, et al. Genetic characterization of Kushum horses in Kazakhstan based on haplotypes of mtDNA and Y chromosome, and genes associated with important traits of the horses. J Equine Sci. 2020;31(3):35-43.
8. Khadka R. Global horse population with respect to breeds and risk status. 2015.
9. Vdovina N, Yuryeva I. Monitoring for the genetic structure of Mezen breed of horses in terms of DNA microsatellites. Vavilov J Gen Breed. 2021;25(2):202.
10. Cosgrove EJ, Sadeghi R, Schlamp F, Holl HM, Moradi-Shahrbabak M, Miraei-Ashtiani SR, et al. Genome diversity and the origin of the Arabian horse. Sci Rep. 2020;10(1):1-13.
11. Yuldashbaev YA, Chylbak-ool S, Erokhin A, Karasev E, Abdulmuslimov A, Salaev B. Impact of Feeding Behavior on Biological and Productive Properties of Tuva Ram Lambs. Russ Agric Sci. 2021;47(3):304-9.