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Productive and biological features of Camelus Bactrianus - Camelus Dromedarius in conditions of Kazakhstan

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ABSTRACT

The biological features of fruiting and dairy productivity of camels of the Kazakh Bactrian, the Arvana and the Kazakh dromedary breeds of different genotypes under the conditions of Kazakhstan were studied. It is established that the Kazakh Bactrian fructifies during 419-462 days, Arvana during 380-420 days, the Kazakh dromedary during 380-415 days.

Kazakh Bactrians have a different indicator of annual milk yield from 850.4 kg to 1700.2 kg. The mass fraction of fat in Kazakh Bactrian varies from 5.3% to 5.7%, the fraction of protein varies from 3.8% to 4.0%. Female camels of the Arvana breed produce from 3264.8 kg to 3921.5 kg of milk with a mass fraction of fat in the milk of 3.4-3.8% and protein of 3.2-3.5%. Kazakh dromedary 3384.8 - 3549.1 kg, with a fat content of milk 4.1-4.4% and a protein 3.6-3.7%.

Comparative characteristics of the shubat showed that in 100% of a product a moisture content was 89.0%, fat - 4.6 ± 0.1%, protein - 4.2 ± 0.1%, ash - 0.79 ± 0.07%, calcium - 250 ± 50,0 mg, iron - 1.05 ± 0.21 μg, iodine - 6.8 ± 1.36 μg, copper - 1.03 mg, zinc - 0.83 mg.

In the Kazakh Bactrian, the frequency of aneuploid cells' formation in cultured blood lymphocytes is 11.3-13.4%, polyploid cells - 1.2-1.5%, cells with chromosomal aberrations - 0.7-1.1%. In Arvana dromedaries, the aneuploidy was 14.89-16.5%, the polyploidy - 3.1-3.9%, cells with chromosomal aberrations - 1.1-1.4%. In Kazakh dromedaries, the frequency of cells with chromosomal aberrations was 0.5-0.7%, the polyploidy - 2.7-2.9%, and the aneuploidy - 10.9-11.2%.

Keywords: Kazakh Bactrian, Arvana, fertility, milk yield, shubat, karyotype.

INTRODUCTION

According to FAO (2000), the camel breeding is practiced in 27 countries around the world in the Middle East, North and Central Africa, Mongolia, China and Central Asia (Farm Animal Genetic Resources 2000).

According to Baimukanov D.A., Baimukanova A. (2011), in 2009 the number of camels in the world was 23 million heads, the gene pool of which is represented by 50 breeds of the dromedary and 7 Bactrian breeds. On the African continent, 12 breeds of the dromedary (3,500 heads or 15% of the global livestock) or 21% of camel breeds are bred. In Asia and Oceania, the gene pool of camels is represented by 9 breeds of the dromedary and 5 Bactrian breeds (4,000 heads or 17% of the global livestock) or 25% of camel breeds. In the Middle East, 31 camel breeds are bred, including 29 dromedary breeds and 2 Bactrian breeds (14,500 heads or 63% of the world population), or 54% of camel breeds (Baimukanov 2011).

In the Republic of Kazakhstan, the traditional branch of productive livestock breeding is camel breeding. The sectoral production of camel breeding has an opportunity to occupy a niche of a premium class in the market of ecologically clean products until 2020 (Ali et al. 2015).

Baimukanov D. (2002) believes that a unique breed of double-humped camels and the single-breasted camels, breeding a milk fat content of 4-6% and a protein content of 3.5-4.2%, are bred in Kazakhstan (Baimukanov 2002). No other breed of camels in the world is able to produce milk with an optimal ratio of protein and fat (at least 0.7) as Kazakh Bactrian and Kazakh hybrid camel (*Nar*).

Baimukanov A. (Baimukanov 1989) and Baimukanov A. (Baimukanov 1991) note that the production of camel milk in the Republic of Kazakhstan is carried out mainly from unskilled camels of Kazakh Bactrian breed and in an insignificant amount from high-milk camels of the Arvana breed and the Kazakh hybrid camel (the Kazakh dromedary).

Dromedary camels of the Kazakh type presented by the following genotype are of particular interest to commercial dairy camel breeding (Atigui et al. 2016).

Bayshin is a group of hybrid camels, obtained by absorbing the female hybrids of the first Iner-May generation with the Kazakh dromedary males.

Baykazhy are groups of third-generation hybrid camels, obtained by absorbing crossing hybrids of the second Bayshin generation with the Kazakh Bactrian males.

Ardas is a group of hybrid camels of the third generation, obtained by absorbing crossing female hybrids of the third Baykazhy generation with Turkmen dromedary males (Ayadi et al. 2016).

Sannak is a group of fourth-generation hybrid camels, obtained by absorbing crossing female hybrids of the second Bayshin generation with Kazakh dromedary males.

Aydaramir-arada is a group of hybrid camels, obtained by absorbing crossing female hybrids of the first Nar-May generation with the Kazakh dromedary males (Derar et al. 2017).

Aydaramir-nar is a group of third-generation hybrid camels, obtained by absorbing crossing of the second Aidaramir-arad generation's hybrids with the Kazakh Bactrian males.

Aydaramir-kurt is a group of third-generation hybrid camels, obtained by absorbing cross-breeding the female hybrids of the third Aydaramir-nar generation with Turkmen dromedary males.

Aydaramir is a group of fifth-generation hybrid camels, obtained by absorbing crossing of fourth-generation Aydaramir-kurt female hybrids and Kazakh dromedary males.

However, studies on the fertility and dairy productivity of camels of the main breeds of different genotypes have not been conducted so far (Doshanov et al. 2014).

MATERIALS AND METHODS

The object of the research was camels of the Kazakh Bactrian breed of the Ural-Bukei type and the western population from the "Zhana-Tan" LLP of the Zhylyoi district in the Atyrau Region; Kazakh Bactrians of the South Kazakhstan type from the "Senim" farm of the Suzak district in the South Kazakhstan Region; Kazakh Bactrians of the Mangystau type from the "Taushyk" LLP of the Tupkaragan district in the Mangystau Region; Kazakh Bactrians of

the Kyzylorda type from the "Kulandy" LLP in the Aral district in the Kyzylorda Region; Arvana dromedaries from the "Taushyk" LLP of the Tupkaragan district in the Mangystau Region; Kazakh dromedaries from the "Bagdat" LLP of the Suzak district in the South Kazakhstan Region and the "Taushyk" LLP of the Tupkaragan district in the Mangystau Region (Khalafalla et al. 2015).

Tribal qualities were assessed by the ability to transfer economic useful traits to the progeny: from producers at 2 rates and the output of progeny, the elite + I class; from female camels at 2 rates and the precocity of camel calves.

The assessment of the reproductive ability of camels was carried out by means of a comparative analysis.

Measurements of the body were studied according to the Instructions on the evaluation of camels (2001) (Musayev et al. 2001). The live weight by individual weighing and by calculation. The wool yield was studied during the spring shearing on 20 kg scales, accurate to 0.05 kg, by individually weighing the shorn hair, taking into account molting.

The milk yield was studied during 210 days of lactation, by carrying out control milking of female camels, which bore camel calves, of 12 families for 2 adjacent days (20th and 21st of each month in May or April). At the same time, the content of fat in the milk by the acid method and the protein on the AM-2 milk analyzer was studied (Nagy and Juhasz 2016).

The growth and development of camels are analyzed from the birth until 2.5 years of age with the definition of live weight, height at the withers, oblique length of the trunk, chest girth and girth of the pastern and calculation of body build indexes. The biometric processing was carried out by the method of V.L. Petukhov et al. (Petukhov et al. 1985).

Preparations of metaphase chromosomes stained uniformly with azur eosin were analyzed under the light microscope of the brands "Axioskop 40" and "Axiostar plus" by Carl Zeiss Iena (Germany) according to the method of D.A. Baimukanov et al. (2002) in two ways: visually under a microscope and on the obtained photographic prints of chromosomes (Baimukanov et al. 2002).

The ability of a camel to regulate body temperature in the range from 34°C at night to 42°C at noon allows to reduce the consumption of moisture from the organism: the lower is the temperature of the body, the less water is lost.

Horny cushions on the feet allow the camel to navigate confidently along the sands, without trampling pastures, and calluses on the chest, wrists, elbows and knees protect the skin and sole of the camel's feet from damage and allow it to lie quietly on the hot sand. The split upper lip is adapted to select the delicate parts of plants for grazing, and the inner shell of the cheeks and tongue, provided with hard horny papillae, help when chewing the coarse food mass. In the humps, there are reserves of fat that are used in adverse periods (Salhi 2015).

The universal productivity of a camel allows him to compete with a cow on a milk basis, on a wool yield - with a sheep, on working capacity - with a horse. In areas of mass breeding, the camel is an indispensable vehicle, it can carry packs weighing up to half its weight over a distance of more than 50 kilometers, and under the saddle to go up to 100 kilometers per day. When working in a harness, the camel exhibits a pulling force equal to that of a heavily drawn horse (12.5% of the live weight) and can travel about 20 km. Young camels are well suited for training, so it is in demand in the circus, rent, zoos (Martini et al. 2017).

For one lactation, you can get up to 2000 liters of milk from a camel, from camels of dairy breeds - more than 5000 liters. Camel's milk has strong bactericidal properties. Thus, at a temperature of 10°C, it does not sour until three days. It contains proteins, fats, salts of phosphorus and calcium, vitamins B and C (up to 25 mg/l, three times more than in cow's milk), iron (10 times more than in cow's milk), an insulin-like protein that does not break down in the stomach, and other antibodies that counteract diabetes, tumors, hepatitis, psoriasis, food allergies and other chronic diseases. Fermented milk products (cheese, butter, shubat, chal, cottage cheese, kefir,

chigyan), produced from camel milk, also have nutritional and medicinal properties (Narnaware 2015).

The camel wool has high technological properties and is used in the manufacture of knitted goods and fabrics, curative qualities of camel wool are also widely known, it is used in the treatment of neuritis, neuralgia, osteochondrosis, arthritis, rheumatic pain. Products from it do not cause allergies, do not irritate the skin, very well pass air and repel dust (Tilib et al. 2014).

The camels are cut at the end of spring after the molting is over. The wool yield of adult Bactrian of the Kalmyk breed reaches 13 kg in males and 9 kg in females (in dromedaries - 2-6 kg), in 1939 the Tolga breeder gave 21 kg of wool. The Bactrian wool is thin - 20-23 microns. The yield of pure fiber from the unwashed wool is about 80%. Products made from the Bactrian wool are left unpainted so that the wool does not lose its unique properties.

Now the importance of camel meat productivity increases. The chemical composition and taste of camel are close to beef, but it has a sweetish flavor, which is explained by the presence in it of glycogen. The camel is also characterized by precocity (young growths approach the size of adult camels in height between humpbacks, in depth and breadth of the chest to two years, and along the trunk length - to three years), a good ability to fattening and baiting.

A karyological analysis of chromosomes and a complex assessment of camels' karyotype was carried out according to the generally accepted procedure "The Patent of RK No. 13848 (2006)" (Baimukanov et al. 2006).

RESULTS AND DISCUSSION

The embryogenesis or fetal embryonic development is the central problem of the modern biology of camels. The embryonic development is carried out under the control of genetic information received by the embryo from the moment of fertilization of the oocyte. As it shown by the research, a variety of natural and fodder conditions in Kazakhstan can change the activity of genes within certain limits, which determines the phenotypic diversity of embryos and the duration of embryonic development of the Kazakh Bactrian, the Arvana dromedary, and the Kazakh hybrid camel.

According to Baimukanov D.A. and Baimukanov A. (2009), the prenatal development of camels can be conditionally divided into four periods (Baimukanov and Baimukanov 2009).

The first period - the oocyte, or preimplantation, begins with the fertilization of the egg with the sperm and ends with its implantation. It lasts for camel females for 20-25 days. During this time, the fertilized egg passes a number of divisions and is implanted in the left horn of the uterus at the blastocyst stage (Ruiz et al. 2015).

The second period - the embryonic one - forms the placenta and begins the laying of organs and tissues. Nutrients mostly come to the embryo from the mother's blood. The duration of the embryonic period in the dromedary is 40 days, in Bactrian, it is 50 days and in interspecific hybrids, it is from 45 to 50 days.

The third period is the prefetal period. For the Dromedary, the duration of this period is 40 days, 45 days for the Bactrian and from 40 to 46 days for interspecies hybrids (Russo et al. 2014).

The fourth - the fetal period - ends with the birth of camels. During the fetal period, the elements of organs and tissues differentiate, and their functioning begins. The embryo grows rapidly and develops. Duration of the fetal period in Bactrians is 315 days, in dromedaries, it is 305, for interspecific hybrids, it is 300-312 days (Sharifiyazdi et al. 2017).

On the basis of many years of research, Baymukanov A., Baymukanov D.A. (2011) have established that in the Kazakh breed of Bactrians breeding is carried out in three directions of productivity: meat-and-wool, meat and dairy, and dairy (Baimukanov and Baimukanov 2011a). Three independent types are formed in the Kazakh breed of Bactrians, caused by the conditions of their formation in certain ecological zones:

The Ural-Bukei type is concentrated in the steppe zone of the West Kazakhstan and Aktobe regions and sandy areas of the Atyrau region. The average live weight of males is 850 kg (the best is 1100 kg), the female is 720 kg. The height at the withers in the male is 198 cm, the female is 192 cm. The annual wool yield of the male is 10 kg, the female is 6.5 kg (Tharwat and Al-Sobayil 2015).

Kyzylorda type is common in Kyzylorda and Karaganda regions. The average live weight of males is 690 kg, females - 620 kg. The height of withers in males is 184 cm, females - 179 cm. The average wool yield of producers is 8,5 kg, female camels - 5,7 kg (Figure 1).

The South Kazakhstan type is common in South Kazakhstan, Zhambyl, Almaty, and Mangystau regions. The average live weight of males is 650 kg, females - 560 kg. The height of the withers in males is 178 cm, females - 170 cm. The average wool yield in males is 12.0 kg, in females - 7.0 kg.

In the conditions of the Caspian lowland, two populations are widespread: Mangystau and Western.

The Mangystau population of the Kazakh Bactrian camel has spread in the conditions of the Mangyshlak Peninsula. The average live weight of males is 640 kg, females - 570 kg. The height of the withers in males is 175 cm, females - 167 cm. The average wool yield in males is 8.5 kg, females - 5.5 kg (Yusof et al. 2015).

The western population of the Kazakh Bactrian is widespread in Zhylyoi, Makhambet and Inder districts of Atyrau region. The average live weight of males is 720 kg, females – 650 kg. The height of the withers in males is 190 cm, females 187 cm. The average wool yield in males is 9.0 kg, females 6.5 kg (Figure 2).

According to Baymukanova D.A., Bayikanova A. (2011) female camels of the Kazakh dromedary have a live weight of 570 kg, a wool yield is 4 kg, a height of the withers is 185 cm, a slanting length of the body is 155 cm, a milk yield for 12 months of lactation is 3200 kg with a fat content of 4.2%. *Lek* are producers of the Kazakh dromedary, they have a live weight of 820 kg, a wool yield of 5 kg, a height of the withers is 195 cm, a slanting length of the trunk is 165 cm. The bulk of the Kazakh dromedary camels is concentrated in the South Kazakhstan, Mangystau and Atyrau regions of the Republic of Kazakhstan (Baimukanov and Baimukanov 2011b).

Baymukanov D.A., Baymukanov A. (2012) distinguish four intraspecific types (Baimukanov and Baimukanov 2012a) in single-horned camels of the Arvana breed:

The Sakarchage meat and meat type. The height of withers in adult camels is 188 cm, a live weight is 720 kg. The yield of females for 12 months of lactation is 3500 liters, with an average fat content of 3.5%;

The Yerbent milk type. The height of withers in adults is 178 cm, a live weight is 610 kg. The yield of females for 12 months of lactation is 4400 kg with a fat content of milk of 3.3%;

The Iranian meat-and-milk intra-breed type. The height of withers in adult males is 185 cm, in females, it is 178 cm. A live weight and wool yield in adult males are 650 kg and 4.0 kg, in females - 550 kg and 2.8 kg. The yield of females for 12 months of lactation is 3200 kg with a fat content of milk of 3.3%;

The Kazakh meat and milk intra-breed type. The height of the withers of adult males is 185 (175-195) cm, females - 180 (170-190) cm. A live weight of males is 750 kg (600-900), females - 580 kg (550-680). By studying a milk production in the Kazakh dromedary Baymukanov D.A., Baymukanov A. (2012) have established that the yield of females for 12 months of lactation is 2800 kg with an average fat content of 3.4-3.8%. Slaughter yield in males is 60%, in females - 57.5% (Baimukanov and Baimukanov 2012b).

Having generalized information on the Kazakh Bactrian, Arvana, and the Kazakh hybrid camels, studies on the duration of intrauterine development of camels began. The obtained data made it possible to reveal variations in fruiting duration in female camels within the breed in the context of the formed types and population. Table 1 shows the results of our own studies on the duration of fruiting and

standard deviations for camels of different genotypes.

A fruiting duration of the Kazakh Bactrians is 419-462 days, including the South Kazakhstan type - 427 ± 3.2 days, the Kyzylorda type - 432 ± 2.5 days, the western population - 428 ± 1.3 days, the Ural-Bukei type - 435 ± 1,4 days and the Mangystau population - 432 ± 2.1 days. The average standard deviation (δ) was 4.7-6.9 days.

The Arvana camels had a bearing duration from 380 days to 420 days, including the Yerbent type - 390 ± 2.9 days, the Kazakh type - 395 ± 2.6 days and the Sakarchage type - 405 ± 2.4 days. The average standard deviation (δ) was 2.9-3.6 days (Figure 3).

The Kazakh dromedaries are characterized by a fruiting duration of 380-415 days, with an average standard deviation of 2.1-3.2 days. The Kazakh dromedary of Kurt IV type had, on average, a bearing duration of 387 ± 2.7 days, and Dostik type - 395 ± 3.1 days.

TABLE 1
The bearing duration of female camels, in days

Breed	Number of heads	$X \pm m_x$	δ	Lim
The Kazakh Bactrian of South-Kazakhstani type	100	427±3,2	4,8	419-455
The Kazakh Bactrian of Kyzylorda type	100	432±2,5	6,5	422-462
The Kazakh Bactrian of western population	50	428±1,3	5,2	419-453
The Kazakh Bactrian, the Ural-Bukei type	50	435±1,4	6,9	420-462
The Kazakh Bactrian of Mangystau population	100	432±2,1	4,7	422-460
The Arvana dromedary of Yerbent type	100	390±2,9	3,6	385-420
The Arvana dromedary of Sakarchaga type	50	405±2,4	2,9	390-420
The Arvana dromedary of Kazakh type	50	395±2,6	3,1	380-425
The Kazakh dromedary of Kurt IV	50	387±2,7	2,1	380-405
The Kazakh dromedary of Dostik type	50	395±3,1	3,2	385-415
«Aidaramir - arada» F_2 (25%td, 25%kb, 50%kd)	12	422,5±3,5	3,6	405-445
«Aidaramir - nar» F_3 (12,5%td, 62,5%kb, 25%kd)	12	426,4±3,2	3,9	411-445
«Aidaramir - kurt» F_4 (56,25%td, 31,25%kb, 12,5%kd)	12	421,1±4,2	4,5	402-442
«Aidaramir» F_5 (28,1%td, 15,6%kb, 56,2%kd)	12	419,3±3,4	5,1	400-436
«Bayshin» F_2 (25%td, 25%kb, 50%kd)	12	421,5±3,9	4,1	402-438
«Baykazhy» F_3 (12,5%td, 62,5%kb, 25%kd)	15	427,7±3,3	4,2	417-442
«Ardas» F_4(56,25%td, 31,25%kb, 12,5%kd)	12	420,3±4,1	4,3	407-443
«Sannak» F_5 (28,1%td, 15,6%kb, 56,2%kd)	20	417,2±3,9	4,9	401-436

Dairy Productivity

Kazakh Bactrians produce milk with a high-fat content in comparison with Arvana and Kazakh dromedaries. According to the data of A. Baymukanov, Kazakh Bactrians produce 1750 kg of milk during the year with a mass fraction of fat in milk of 6.0% and protein of 3.8%, Turkmen dromedaries, respectively, 4000 kg - 4.0% - 3.5%, the

Kazakh dromedary - 3500 kg - 4.0% - -3.3% (Baimukanov 1991).

The results of the studies showed that Kazakh Bactrians have a different indicator of annual milk yield from 850.4 kg to 1700.2 kg (Table 2) and a protein from 3.8% to 4.0%. Arvana breeders produce milk from 3264.8 kg to 3921.5 kg with a mass fraction of fat in the milk of 3.4-3.8% and a protein of 3.2-3.5%. Kazakh dromedaries produce 3384.8 - 3549.1 kg, with a fat content of milk of 4.1-4.4% and a protein of 3.6-3.7% (Figure 4).

Milk sugar, or lactose, under the influence of lactic acid bacteria splits, form lactic acid, which promotes the absorption of calcium and phosphorus, necessary for growing animals for the formation of bones. The content of lactose in milk is more constant in comparison with the content of fat and protein.

TABLE 2
Milk productivity of female camels

Breed	Number of heads	Annual milk yield, kg	Fat	Protein
The Kazakh Bactrian of South-Kazakhstani type	50	1700,2±17,8	5,3±0,2	4,0±0,2
The Kazakh Bactrian of Kyzylorda type	50	1462,3±22,1	5,5±0,1	3,9±0,2
The Kazakh Bactrian of western population	30	1228±19,3	5,6±0,2	3,8±0,2
The Kazakh Bactrian of Ural-Bukei type	30	850,4±25,9	5,7±0,1	3,8±0,1
The Kazakh Bactrian of Mangystau population	50	916,4±16,3	5,6±0,2	3,9±0,1
The Arvana dromedary of Yerbent type	50	3921,5±11,2	3,4±0,2	3,2±0,2
The Arvana dromedary of Sakarchaga type	30	3264,8±25,1	3,6±0,2	3,3±0,1
The Arvana dromedary of Kazakh type	30	3678,1±23,9	3,8±0,1	3,5±0,1
The Kazakh dromedary of Kurt IV type	30	3549,1±18,3	4,4±0,1	3,7±0,1
The Kazakh dromedary of Dostik type	30	3384,8±26,5	4,1±0,1	3,6±0,1
«Aidaramir - arada» F_2 (25%td, 25%kb, 50%kd)	12	2789,4±25,8	4,30±0,05	3,52±0,04
«Aidaramir - nar» F_3 (12,5%td, 62,5%kb, 25%kd)	12	2369,8±22,3	4,32±0,05	3,51±0,05
«Aidaramir - kurt» F_4 (56,25%td, 31,25%kb, 12,5%kd)	12	2691,6±28,4	4,28±0,06	3,52±0,04
«Aidaramir» F_5 (28,1%td, 15,6%kb, 56,2%kd)	12	2927,9±21,3	4,29±0,07	3,52±0,04
«Bayshin» F_2 (25%td, 25%kb, 50%kd)	12	2585,8±26,7	4,32±0,06	3,53±0,04
«Baykazhy» F_3 (12,5%td, 62,5%kb, 25%kd)	15	2251,2±19,6	4,36±0,06	3,51±0,04
«Ardas» F_4(56,25%td, 31,25%kb, 12,5%kd)	12	2450,8±18,2	4,23±0,05	3,47±0,03
«Sannak» F_5 (28,1%td, 15,6%kb, 56,2%kd)	20	2650,7±21,3	4,32±0,06	3,52±0,03

The ash content in camel milk varies from 0.75% to 0.95%. Calcium oxide in the ashes of camel milk contains 25-28%. The acidity of fresh new milk is 190T with fluctuations from 180T to 220T. The density of camel's averaged 1.030 with fluctuations

from 1.025 to 1.033. In the last portions of milk from the udder, it is 1,026. The density of milk depends on its composition and, first of all, on fat content. The higher is the fat content of milk, the lower is its density.

Camel's milk, unlike the milk of other farm animals, can be stored for a long time in the fresh form. The increased bactericidal properties of milk slow down the increase in acidity. At +100˚C, the initial acidity lasts three days in camel milk, while in cow's milk it increases continuously. At +300 °C, camel's milk is stored for 24 hours, and cow's milk is coagulated after 6 hours. The increased bactericidal activity of female camels' milk is a valuable quality of practical importance. It allows prolonging the terms of its transportation, storage, and processing (Figure 5).

Tokhanov M.T and other (2013) note that the shubat, a dairy product, is being prepared from camel milk in Kazakhstan (Tokhanov et al. et al. 2013). According to Tokhanov M.T. and other (2009), Innovative Patent RK No. 20925 (2009), there are domestic technologies for the production of shubat from camel milk (Tokhanov et al. 2009; Baimukanov et al. 2009), Innovative Patent RK No. 20927 (2009), balkaymak and shalap (The innovative patent 2009). In the above materials, there is no data on the amino acid composition of the shubat. In this regard, we conducted research on shubat prepared according to the Innovative Patent of the Republic of Kazakhstan No. 20925 (2009).

The mass fraction of fat in Kazakh Bactrian varies from 5.3% to 5.7%,

The comparative characteristics of the shubat showed a moisture content of 89.0%, a fat content of 4.6 ± 0.1%, a protein of 4.2 ± 0.1%, an ash of 0.79 ± 0.07%, a titratable acidity after cooling to storage of 95°T, the titrated acidity on the 7th day after storage of 105°T. The energy value of 100 g of product is 64 kcal or 268 kJ.

The calcium content was 250 ± 50.0 mg, iron - 1.05 ± 0.21 μg, iodine - 6.8 ± 1.36 μg, copper - 1.03 mg, zinc - 0.83 mg.

The amino acid composition of the shubat was studied. It was found that 100 mg of the product contained (mg): aspartic acid - 0.238, glutamic acid - 0.598, serine - 0.261, histidine - 0.038, glycine - 0.025, threonine - 0.187, arginine - 0.192, alanine - 0.138, tyrosine - 0.104, cysteine - 0.022, valine - 0.344, methionine - 0.160, phenylalanine - 0.168, leucine - 0.555, isoleucine - 0.303, lysine - 0.399, tryptophan - 0.061, proline - 0.303, total - 4,096.

Table 3 shows the average live weight and body measurements of female camels of different genotypes, and Table 4 shows the average performance indicators.

TABLE 3
Live weight and body measurements of female camels of different genotypes

№	Breed, kind of camels	Number of heads	Live weight, kg	Measurements, in cm			
				Height at withers	Slanting length of trunk	Chest girth	Girth of metacarpus
1	2	3	4	5	6	7	8
1	The Kazakh Bactrian	30	618	178	153	226	21,5
2	The Kalmyk Bactrian	12	670	192	171	235	23,0
3	The Kazakh Kalmyk Bactrian (F_1)	20	632	185	164	230	22,5
4	The Kazakh Kalmyk Bactrian (F_2)	15	635	185	165	232	22,5
5	The Arvana dromedary	30	535	183	162	217	22,0

6	The Kazakh dromedary	25	576	180	160	225	21,5
7.1	Nar-May (F_1b)	20	640	190	162	240	23,0
7.2	Iner-may (F_1d)	20	630	195	160	235	22,5
7.3	Kospak I (F_2 b)	20	625	180	155	235	20,0
7.4	Kospak 2 (F_3 b)	20	610	180	152	240	21,0
7.5	Kospak 3 (F_4 b)	20	620	180	150	240	21,5
7.6	Kez-nar 1 F_3	20	630	185	158	234	21,5
7.7	Kez-nar 2 F_4	20	647	190	160	238	21,5
7.8	Kez-nar 3 F_5	20	655	195	164	242	22,0
7.9	Baydara F_3	20	642	187	165	250	22,5
7.10	Bay-nar F_3	20	650	190	168	255	22,0
7.11	Arada	30	600	188	160	232	22,0
7.12	Bereket-kospak F_3	20	645	190	160	260	23,5
7.13	Bereket-nar	15	680	197	166	264	24,0
7.14	Iner-may (F_1d)	20	615	188	160	230	22,5
7.15	Kurt-nar ($_3$ d)	20	607	182	155	224	20,0
7.16	Kurt-1 (F_2 d)	20	560	183	154	225	19,5
7.17	Kurt-nar (F_4 d)	20	620	185	152	221	20,5
7.18	Hybrid (F_4 d)	12	640	187	167	235	22,0
7.19	Baydasek	20	620	188	161	225	21,5
7.20	Baytur	20	650	185	165	230	21,0
7.21	Bekdas – nar	20	610	192	164	217,0	21,0
7.22	Bayshin F_2	20	584,1	185	158	212	20.0
7.23	Baykazhy F_3	20	612,4	188	156	214	19,5
7.24	Ardas F_4	20	579,7	182	156	207	20,0
7.25	Sannak F_5	20	552,5	185	155	205	19,5
7.26	Aidaramir-arada F_2	20	613,4	190	160	209	20,0
7.27	Aidaramir-nar - нар F_3	20	628,2	192	158	211	19,5
7.28	Aidaramir-kurt F_4	20	584,5	187	156	210	19,5
7.29	Aidaramir F_5	20	548,9	186	153	208	19,5

TABLE 4
The productivity of female camels of different genotypes

№	Breed, kind of camels	Number of heads	Wool yield, kg	Average daily milk yield, kg	Fat, %	Protein, %	Fertility index, %	Limit of annual milk yield, kg
1	2	3	4	5	6	7	8	9
1	The Kazakh Bactrian	30	6,0	5,7	5,5	3,5	39	950-1950
2	The Kalmyk Bactrian	10	6,5	3,0	5,2	3,2	37	350-720
3	The Kazakh Kalmyk Bactrian (F_1)	25	6,3	3,5	5,4	3,3	40	540-920

4	The Kazakh Kalmyk Bactrian (F_2)	15	6,4	4,2	5,4	3,4	42	640-1100
5	The Arvana dromedary	30	3,1	12,5	3,3	3,1	45	1950-4800
6	The Kazakh dromedary	20	4,0	11,5	4,5	3,5	46	2150-4000
7.1	Nar - Maya (F_1b)	20	4,5	10,2	4,5	3,5	48	1585-3200
7.2	Iner – Maya (F_1d)	20	3,7	11,1	4,2	3,2	47	1890-3700
7.3	Kospak I (F_2 b)	20	4,2	5,5	4,7	3,5	41	1200-2400
7.4	Kospak 2 (F_3 b)	20	4,8	6,0	4,5	3,8	41	1180-2150
7.5	Kospak 3 (F_4 b)	20	4,7	5,8	4,6	3,7	41	1020-1980
7.6	Kez-nar 1 F_3	20	4,5	7,2	3,8	3,5	40	1320-2650
7.7	Kez-nar 2 F_4	20	4,5	7,5	4,0	3,5	43	1290-2800
7.7	Kez-nar 3 F_5	20	4,6	8,0	4,5	3,5	43	1400-3000
7.9	Baydara F_3	10	3,5	8,5	4,7	3,2	45	1650-3500
7.10	Bay-nar F_3	20	3,0	9,5	4,3	3,3	46	1930-3700
7.11	Arada	30	4,0	10,1	4,2	3,6	48	2000-4000
7.12	Bereket-kospak F_3	20	4,5	4,0	4,6	3,4	39	720-1400
7.13	Bereket-nar	20	3,7	7,0	4,5	3,5	45	980-2500
7.14	Iner-maya (F_1d)	20	3,4	11,0	3,8	3,4	47	1800-3500
7.15	Kurt-nar (F_3d)	20	3,5	8,7	4,1	3,6	46	1740-3200
7.16	Kurt-1 (F_2d)	20	3,0	7,5	4,2	3,5	45	1500-3000
7.17	Kurt-nar (F_4d)	20	3,4	11,0	4,1	3,5	46	2000-3700
7.18	Hybrid (F_4d)	20	3,7	9,3	4,2	3,6	46	1400-3400
7.19	Baydasbek	20	4,0	10,0	4,2	3,8	46	2100--3700
7.20	Baytur	20	4,2	10,0	4,4	3,8	46	1850-3800
7.21	Bekdas-nar	20	4,0	11,0	4,3	3,9	46	2200-4000
7.22	Bayshin F_2	20	3,2	7,6	4,3	3,5	47	1800 2700
7.23	Baykazhy F_3	20	3,3	6,4	4,5	3,5	46	1480-2500
7.24	Ardas F_4	20	4,3	8,2	4,2	3,5	45	1630-2800
7.25	Sannak F_5	20	3,7	8,3	4,3	3,5	46	1840-3200
7.26	Aidaramir-arada F_2	20	3,6	8,9	4,3	3,5	47	1950-3000
7.27	Aidaramir-nar F_3	20	3,8	7,3	4,3	3,5	46	1620-2710
7.28	Aidaramir-kurt F_4	20	4,2	8,9	4,2	3,5	45	1680-3150
7.29	Aidaramir F_5	20	4,0	9,2	4,3	3,5	46	1960-3500

TABLE 5
Frequency of formation of the abnormal cells of cultured blood lymphocytes

Breed	Aneuploidy	Polyploidy	Chromosomal aberrations
The Kazakh Bactrian of South Kazakhstan type	12,6±0,21	1,5±0,18	0,8±0,05
The Kazakh Bactrian of Kyzylorda type	12,1±0,16	1,4±0,12	1,0±0,08
The Kazakh Bactrian of western population	11,3±0,18	1,2±0,13	0,7±0,06

The Kazakh Bactrian of Ural-Bukei type	13,4±0,25	1,3±0,14	1,1±0,09
The Kazakh Bactrian of Mangystau population	14,2±0,17	1,5±0,21	0,9±0,07
The Arvana dromedary of Yerbent type	16,5±0,11	3,9±0,3	1,4±0,11
The Arvana dromedary of Sakarchaga type	14,8±0,14	3,1±0,2	1,2±0,10
The Arvana dromedary of Kazakh type	15,3±0,12	3,4±0,21	1,1±0,09
The Kazakh dromedary of Kurt IV type	11,2±0,10	2,7±0,16	0,5±0,02
The Kazakh dromedary of Dostik type	10,9±0,13	2,9±0,19	0,7±0,03
«Aidaramir - arada» F_2 (25%td, 25%kb, 50%kd)	12,1±0,11	2,7±0,21	2,5±0,08
«Aidaramir - nar» F_3 (12,5%td, 62,5%kb, 25%kd)	12,2±0,16	2,5±0,31	2,4±0,07
«Aidaramir - kurt» F_4 (56,25%td, 31,25%kb, 12,5%kd)	12,7±0,18	2,9±0,39	2,8±0,05
«Aidaramir» F_5 (28,1%td, 15,6%kb, 56,2%kd)	12,5±0,11	3,1±0,36	2,2±0,04
«Bayshin» F_2 (25%td, 25%kb, 50%kd)	11,4±0,15	2,1±0,26	1,2±0,08
«Baykazhy» F_3 (12,5%td, 62,5%kb, 25%kd)	12,5±0,13	2,4±0,34	1,1±0,06
«Ardas» F_4(56,25%td, 31,25%kb, 12,5%kd)	13,2±0,16	3,1±0,35	1,4±0,07
«Sannak» F_5 (28,1%td, 15,6%kb, 56,2%kd)	11,2±0,11	2,1±0,31	0,9±0,08

In Kazakh Bactrians, the frequency for the formation of aneuploid cells in cultured blood lymphocytes is 11.3-13.4%, polyploid cells - 1.2-1.5%, cells with chromosomal aberrations - 0.7-1.1%. In Arvana dromedaries, the aneuploidy was 14.89-16.5%, polyploidy - 3.1-3.9%, cells with chromosomal aberrations - 1.1-1.4%. In Kazakh dromedaries, the frequency of cells with chromosomal aberrations was 0.5-0.7%, polyploidy - 2.7-2.9%, and aneuploidy - 10.9-11.2%.

Polyploidy is a genomic mutation, consisting of an increase in the number of chromosomes, a multiple of the haploid set. Triploidy (3n) and tetraploidy (4n) were registered in camels.

The frequency and types of chromosomal aberration. An individual accounting of the frequency and type of chromosome aberrations, cultured blood leukocytes of different genotypes allowed to reliably identify single and paired fragments, acentric rings and ruptures in the centromere.

CONCLUSION

In camels of the Kazakh Bactrian, Arvana, and Kazakh dromedary, the karyotype is represented by 74 chromosomes, 12 of them are metacentric autosomes, 60 are acrocentric autosomes, XX (in females) and XY (in males) sex chromosomes - gonosomes.

In the karyotype of camels, two groups of chromosomes are clearly distinguished on the basis of chromosome sizes and the position of the centromeres: 30 pairs of autosomes represent a gradually decreasing in size series of acrocentrics of different sizes and 6 pairs of autosomes are small metacentric chromosomes.

In the karyotype of females, the largest pair of metacentrics was recognized as the sex X chromosome, while in males the

largest unpaired metacentric chromosome is also an X chromosome, and the smallest (apparently metacentric) is the Y chromosome.

The formula of a karyotype of a domestic camel can be represented as follows:

12M + 60A + XY (XX) = 74 (NF = 88),

Where M - metacentric chromosomes, A - acrocentric chromosomes, NF - the main

Taking into account the chromosome distribution by size and position of the centromere, we propose the following classification of camel chromosomes:

Group "A" - Large acrocentrics - 6 pairs. Well expressed in all pairs of short arms. The relative sizes are 6.32-4.0%.

Group "B" - Large-medium acrocentrics - 9 pairs. Short arms are visible only in some large acrocentrics. Relative sizes - 4,16-2,40 %.

Group "C" - Medium-small acrocentrics - 15 pairs. Short arms of chromosomes are not found in all couples. Relative sizes - 2,43-0,54%.

Group "M" - Metacentrics - 6 pairs. The relative sizes are 3.07-1.01%.

A group of sex chromosomes - X and Y.

Sex chromosomes of camels are identified in males: their two chromosomes do not have homologs, while one of them is identical to the two homologs of the female chromosomes.

number of chromosome arms of the diploid set (females).

In some large acrocentrics, short arms were well expressed, but in the majority of autosomes of this type, centromeres are located almost terminal. Acrocentric chromosomes in their size form a series of gradually diminishing quantities, and therefore, their individual identification using conventional color methods is not always possible.

Aneuploidy is a change in the number of chromosomes, non-multiple in relation to the haploid set. Aneuploidy is the addition or loss of one or two chromosomes of a diploid set.

The principal mechanism for the occurrence of aneuploidy is non-dissociation and loss of individual chromosomes in mitosis and meiosis. Regarding the number of hypodiploid cells, we believe that most of them are artifacts caused by technical manipulation. That is, the true indicator of aneuploidy is the number of hyperdiploid cells, which we recommend to consider when determining the index of genetic aneuploidy. In agricultural animals, the frequency of hypodiploid cells is usually higher than hyperdiploid cells. It has been established that the frequency of the aneuploid cells formation in the Kazakh dromedary camels is lower in comparison with the purebred Kazakh Bactrians and Arvana dromedaries, which is consistent with previous studies.

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TABLE OF FIGURES

Figure 1. ***A metaphase plate of camel female, normal, 2n = 74 (culture of blood lymphocytes). A) Kazakh dromedary, b) Kazakh Bactrian of the Mangystau population.***

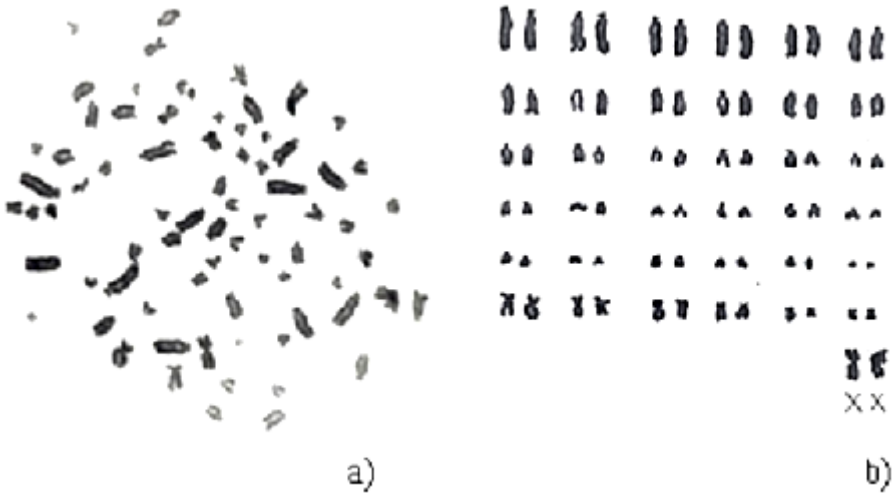

Figure 2. ***A metaphase plate of chromosomes (a) and karyotype (b) of cultured blood lymphocytes of the Kazakh Bactrian female of the western population, normal, 2n = 74.***

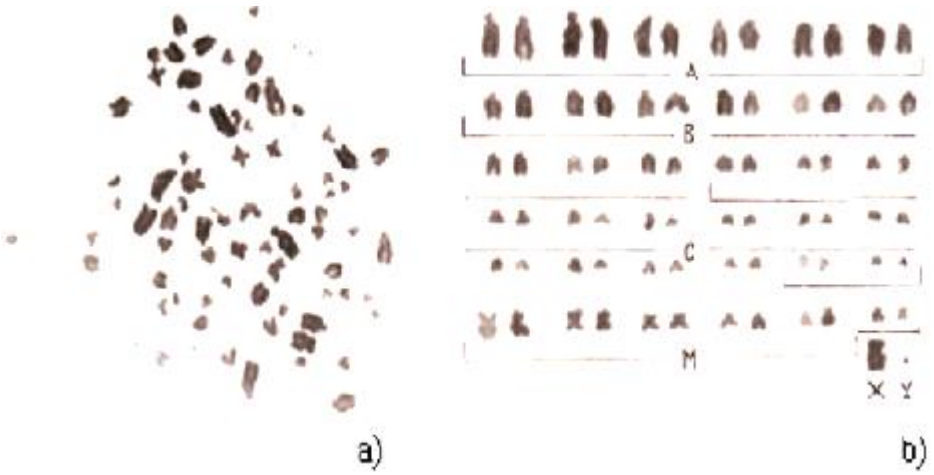

Figure 3. ***A) A metaphase plate of chromosomes of Turkmen dromedary male camel, normal, 2n = 74. B) A karyotype of Turkmen dromedary male camel, normal, 2n = 74***

Figure 4. ***A metaphase plate of chromosomes of the Turkmen dromedary female. A) aneuploid - hypodiploid, 2n <74 (2n = 72). B) aneuploid - hypodiploid, 2n <74 (2n = 73)***

Figure 5. ***A metaphase plate of Kazakh Bactrian female of South Kazakhstan type, polyploid - tetraploid (4n = 148).***