ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ

Х А Б А Р Ш Ы С Ы

ВЕСТНИК

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

THE BULLETIN

OF THE NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN

1944 ЖЫЛДАН ШЫҒА БАСТАҒАН
ИЗДАЕТСЯ С 1944 ГОДА
PUBLISHED SINCE 1944

5

АЛМАТЫ
АЛМАТЫ
ALMATY

2016

ҚЫРКҮЙЕК
СЕНТЯБРЬ
SEPTEMBER

«Қазақстан Республикасы Ұлттық ғылым академиясының Хабаршысы».
ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)
Меншіктенуші: «Қазақстан Республикасының Ұлттық ғылым академиясы»РҚБ (Алматы қ.)
Қазақстан республикасының Мәдениет пен ақпарат министрлігінің Ақпарат және мұрағат комитетінде 01.06.2006 ж. берілген **№5551-Ж** мерзімдік басылым тіркеуіне қойылу туралы куәлік

Мерзімділігі: жылына 6 рет.
Тиражы: 2000 дана.

Редакцияның мекенжайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., 220, тел.: 272-13-19, 272-13-18,
www: nauka-nanrk.kz, bulletin-science.kz

Типографияның мекенжайы: «Аруна» ЖК, Алматы қ., Муратбаева көш., 75.

«Вестник Национальной академии наук Республики Казахстан».
ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)
Собственник: РОО «Национальная академия наук Республики Казахстан» (г. Алматы)
Свидетельство о постановке на учет периодического печатного издания в Комитете информации и архивов Министерства культуры и информации Республики Казахстан **№5551-Ж**, выданное 01.06.2006 г.

Периодичность: 6 раз в год
Тираж: 2000 экземпляров

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, ком. 219, 220, тел. 272-13-19, 272-13-18.
www: nauka-nanrk.kz, bulletin-science.kz

Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75

Bulletin of the National Academy of Sciences of the Republic of Kazakhstan.
ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)
Owner: RPA "National Academy of Sciences of the Republic of Kazakhstan" (Almaty)
The certificate of registration of a periodic printed publication in the Committee of Information and Archives of the Ministry of Culture and Information of the Republic of Kazakhstan N 5551-Ж, issued 01.06.2006

Periodicity: 6 times a year
Circulation: 2000 copies

Editorial address: 28, Shevchenko str., of. 219, 220, Almaty, 050010, tel. 272-13-19, 272-13-18,
http://nauka-nanrk.kz /, http://bulletin-science.kz

Address of printing house: ST "Aruna", 75, Muratbayev str, Almaty

BULLETIN OF NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN
ISSN 1991-3494
Volume 5, Number 363 (2016), 14 – 27

UDC 636.295.25

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BREEDING AND GENETIC MONITORING OF DROMEDARY GROUP CAMELS OF SOUTH KAZAKHSTAN POPULATION

Abstract. For the first time the dromedary camels of Kazakhstani population of new genotypes derived by rotational crossbreeding were researched. The genetic productivity potential of dromedary group camels of South Kazakhstan type of new generation was established.

New generation dromedary has a fruiting duration from 398 days to 445 days, including F2 (25% td, 25% kb, 50% kd) – 419,4 ± 4,1 days, F3 (12,5% td, 62, 5% kb, 25% kd) – 428,2 ± 3,9 days, F4 (56,25% td, 31,25% kb, 12,5% kd) – 418,8 ± 4,4 days, F5 (28,1% td, 15,6% kb, 56,2% kd) days.

The results showed that with the increase in the blood share of dromedaries, the fat content in milk proportionally reduces. As the blood share of dromedaries increases, the rate of protein ratio of milk also rises.

It was found that Kazakh dromedary camels (11.2%) and dromedaries of new generation (10,9-13,7%) have lower frequency of the formation of aneuploid cells in comparison with thoroughbred Arvan (15.3%), which is consistent with previously conducted research.

Kazakh dromedary camels have the frequency of the formation of polyploid cells of 2.8% on average; dromedaries of new generation have from 1.8% to 2.9%, which is significantly lower in comparison with thoroughbred Arvan (3.4%).

The frequency of genetically ill-defined cells in dromedary group "BAISHIN" F3 was 8,0±1,1%, "BAYKAZHY" F3 – 5,8±0,81%, "ARDAS" F4 – 8,4 ± 1,4% and "SANNAK" F5 – 7,3 ± 0,95%. The findings prove the high herd status of dromedaries of new generation and the prospects for their extension in South Kazakhstan.

The discussion of the results. Kazakhstan is the center where breeding of Bactrians (two-humped camels) and dromedaries (single-humped dromedaries) is possible; there are various options for crossing in connection with the widespread hybridization between them. Genetic resources of interspecific hybrids in Kazakhstan have been presented by 22 generations. In recent years, breeders bred dromedaries with new genotypes by rotational crossbreeding in Kazakhstan.

To that end, dromedaries of new genotypes derived by rotational crossbreeding became the object of study for the first time.

New generation of dromedaries has a duration of fruiting from 398 days to 445 days, including F2 (25% td, 25% kb, 50% kd) - 419,4 ± 4,1 days, F3 (12,5% td, 62, 5% kb, 25% kd) - 428,2 ± 3,9 days, F4 (56,25% td, 31,25% kb, 12,5% kd) - 418,8 ± 4,4 days, F5 (28,1% td, 15,6% kb, 56,2% kd) days.

It was established that the content of fat in milk varies in dromedaries within 4.2-4.5%, and protein content is 3.5-3.7%. There is great potential for further breeding of dromedary camels with different genotypes on the content of milk fat and protein, due to purposeful selection of camels with a high content of the studied traits. Dromedaries F2 (25% td, 25% kb, 50% kd) have milk yield of 8.13±0.2 during the day, fat content of 4.34±0.04% and protein content of 3.54±0,03%. F3 (12,5% td, 62,5% kb, 25% kd) female camels have, respectively, milk yield of 6,13±0,3 kg with a fat content of 4,49±0,05% and 3,60±0,02% of milk protein. F4 (56,25% td 31,25% kb, 12,5% kd) female camels produce milk for seven months of lactation on average 7,16±0,2 kg with a fat content of 4,16±0,04% and protein content of 3,56 ± 0,02%. It was established that F5 (28,1% td, 15,6% kb, 56,2% kd) female camel produce milk 8,01 ± 0,2 kg on average per day, with a fat content of 4,37±0,06% and protein content of 3,54±0,03%.

Dromedaries with a live weight of 2 rank (525-600 kg) have significantly higher milk yield for 240 days of lactation compared to camels of 1 (600 kg) and 3 rank (less than 525 kg) on body weight (R≤0,01). In general, female camel which have bodyweight of 525-600 kg with various blood share produced commercial milk at least 1528.7 kg, including F2 (25% td, 25% kb, 50% kd) – 1939,1 ± 41,2 kg, F3 (12,5% td, 62,5% kb, 25% kd) – 1528,7 ± 38,5 kg, F4 (56,25% td, 31,25% kb, 12, 5% kd) – 1649,2 ± 33,8 kg, F5 (28,1% td, 15,6% kb, 56,2% kd) – 1861,9 ± 45,4 kg for 240 days of lactation.

Female camels of 2 rank in live weight have excellent indicators of reproductive capacity and high levels of safety of young camels in the first months of post-embryonic growth and development. Most importantly, they have a higher proportion of camels with the desired shape of the udder.

It was found that Kazakh dromedary camels (11.2%) and dromedaries of new generation (10,9-13,7%) have lower frequency of the formation of aneuploid cells in comparison with thoroughbred Arvan (15.3%), which is consistent with previously conducted research.

Kazakh dromedary camels have the frequency of the formation of polyploid cells of 2.8% on average; dromedaries of new generation have from 1.8% to 2.9%, which is significantly lower in comparison with thoroughbred Arvan (3.4%).

The frequency of genetically ill-defined cells in dromedary group "BAISHIN" F3 was 8,0 ± 1,1%, "BAYKAZHY" F3 – 5,8 ± 0,81%, "Ardas" F4 – 8,4 ± 1,4% and "SANNAK" F5 – 7,3 ± 0,95%. The findings prove the high herd status of dromedaries of new generation and the prospects for their extension in South Kazakhstan.

Conclusion. The novelty of the research is the identification of the genetic potential for milk production and cytogenetic status of dromedaries of new genotypes derived by rotational crossbreeding. The breeding area of "BAISHIN" F3, "BAYKAZHY" F3, "ARDAS" F4 and "SANNAK" F5 dromedary groups will increase the production of camel milk in South Kazakhstan region. In further selection and breeding operation, use of animals with well known karyotypic status will allow predicting the level of cytogenetic variability in their offspring and in populations of dromedaries of different genotypes.

The results of studies are recommended in all camel breeding farms of South Kazakhstan region, specialized in dromedary breeding.

The source of the research funding is Ministry of Agriculture of the Republic of Kazakhstan.

The names of funding organizations – "Kazakh Scientific Research Institute of Animal Breeding and Forage Production" JSC;

Scientific Research Institute "Problems of agriculture and water resources", Auezov South Kazakhstan State University.

Key words: dromedary, genotypes of camels, yield of milk, live weight, fat content, milk protein, fruiting, karyotype.

Introduction. Genetic resources of gene pool of camels breeds farmed in Kazakhstan differ by biological diversity, both in Central Asia and the Eurasian continent [1].

The gene pool of camels is composed of the diversity of genes and alleles that are available in today's population [2, 3]. In particular, in each part of the population of camels, the gene pool is constantly changing from generation to generation. New combinations of genes form the unique camel genotypes that have no analogues in the world.

In camel husbandry, each individual has its value of each [4]. In terms of the evolution of individual camel is a unit of selection, which dies or passes its genome to the next generation [5]. In nature, individuals are aggregated into relatively compact, dense groups, different in size, occupied space and number density. Thoroughbred camels have clearly distinguished uterine family, lines, meruses, micro populations, local populations, environmental populations and geographic populations according to the size of occupied population territories and the degree of coupling between camels [6].

Kazakhstan is the center where breeding of Bactrians (two-humped camels) and dromedaries (dromedaries) is possible, in this regard, the hybridization between them, and options for crossing became widespread [7]. Nowadays, genetic resources of interspecific hybrids comprise 22 generations. The most high-value in terms of the Central Asia and Kazakhstan are transboundary breeds of camels, such as Kazakh Bactrian, Turkmen Bactrian and Kazakh dromedary, as well as the new generation of camels of dromedary group Arad, baynar and Baytur. In recent years, breeders of Kazakhstan paid deliberate attention to the breeding of dromedary by rotational crossbreeding.

Study of dromedary camels of new genotypes, which are bred by rotational crossbreeding, is scientific interest and is the right choice for camel research.

The object of study is camels of dromedary group of South Kazakhstan type of new generation.

The aim of the study. The development of new genotypes of Kazakh dromedary camels by rotational crossbreeding. Productivity increase of the Kazakh dromedary camels potential.

Method and methodology of study. Measurements of camel bodies were studied according to the instructions on valuation of camels (2014) [8]. Live weight was identified by individual weighing and calculated manner. The live weight of camels were determined by weighing on fixed scales and calculation method of the patent of RK demand №15886 (2008) [9].

Wool clip was studied during spring shearing at 20 kg scales, up to 0.05 kg precision by weighing individual shorn wool with molt [10].

Milk yield was studied during 210 days of lactation through control milking of 12 foaled camels of uterine families with 2 adjacent days (20, 21 date of each month from May to April). The content of fat in milk was studied by acid and protein method in the milk analyzer AM-2 and "Laktan".

Growth and development of young camels was analyzed from birth to 2.5 years of age with determination of body weight, height at the withers, body length, chest girth, cannon bone circumference and calculations of body indices. The biometric processing was performed by the method of V.L. Petuhov and others. (1985) [11].

Preparations of metaphase chromosomes colored with azure-eosin, were analyzed under a light microscope of "Axioskop 40" brand and "Axiostar plus" of "Carl Zeiss Iena" company (Germany) according to the method of D.A. Baymukanova and others (2002) in two ways: visually under the microscope and on the basis of obtained prints chromosomes [12].

Karyological chromosome analysis and comprehensive assessment of the karyotype of camels was carried out by the standard method of RK patent 13848 (2006) [13].

Processing of digital data on the frequency of aneuploidy, polyploidy and chromosomal karyotype aberration of camels was carried out according to the method of N.A. Plohinskyi [14].

The outcomes of the study

Duration of the fruiting of dromedary camels of different blood. Having general information on the Bactrian, Arvan camels, and Kazakh dromedary, we began studies on the duration of pre-natal development of dromedary camels of different blood. The obtained findings enabled to determine a variation in the duration of the fruiting of female camels in the context of types and populations. Figure 1-10 shows the launch of a new generation of dromedary camels and corresponding drawings.

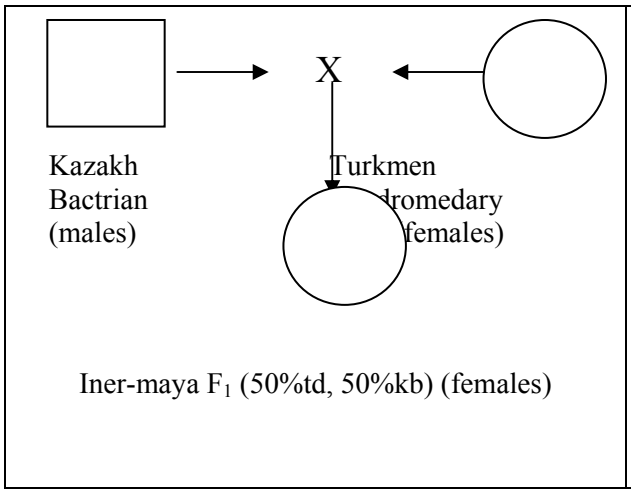

Figure 1 – Breeding scheme of «Iner-maya F_1 (50%td, 50%kb)» hybrids of the first generation

Figure 2 – Hybrid female camel of «Iner-maya» (50%td, 50%kb) first generation

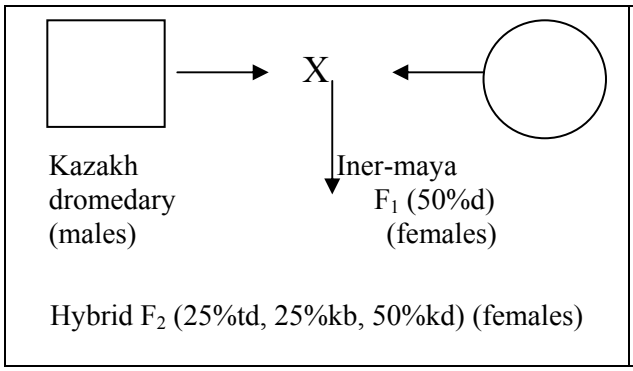

Figure 3 – Breeding scheme of "BAISHIN" F_2 (25%td, 25%kb, 50%kd) Kazakh dromedary of the second generation

Figure 4 – "BAISHIN" F_2 (25%td, 25%kb, 50%kd) female camel

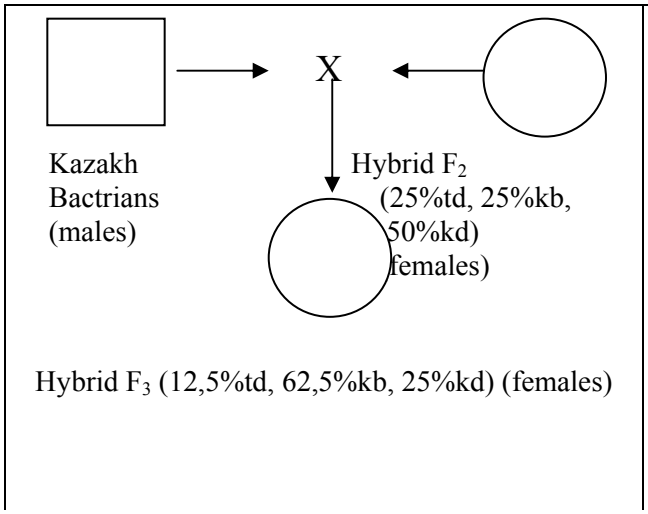

Figure 5 – Breeding scheme of "BAYKAZHY" F_3 (12,5%td, 62,5%kb, 25%kd) Kazakh dromedaries of the third generation

Figure 6 – "BAYKAZHY" F_3 (12,5%td, 62,5%kb, 25%kd) female

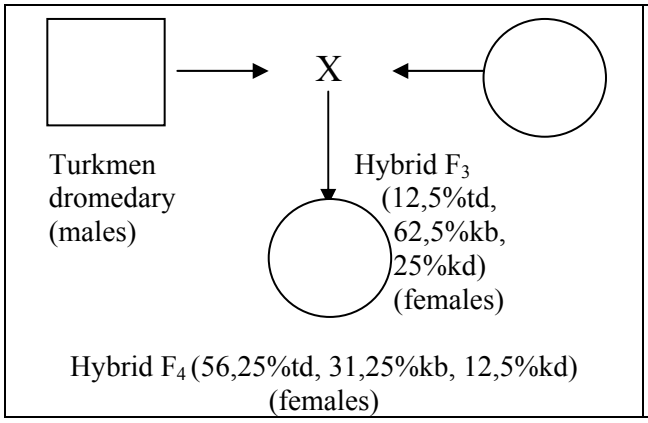

Figure 7 – Breeding scheme of "ARDAS" F_4 (56,25%td, 31,25%kb, 12,5%kd) Kazakh dromedaries of the fourth generation (females)

Figure 8 – "ARDAS" F_4 (56,25%td, 31,25%kb, 12,5%kd) female (females)

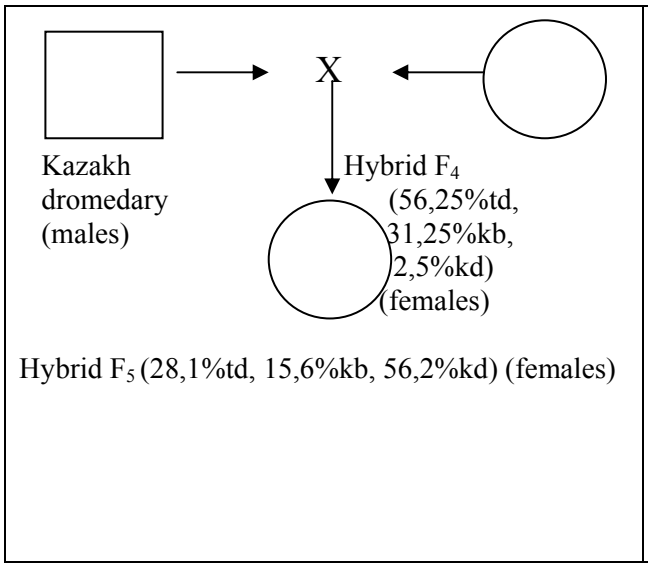

Figure 9 – Breeding scheme of "SANNAK" F_5 (28,1%td, 15,6%kb, 56,2%kd) Kazakh dormedaries of the fifth generation (females)

Figure 10 – "SANNAK" F_5 (28,1%td, 15,6%kb, 56,2%kd) female (females)

Table 1 – Duration of fruiting per diem

Breed	Animal units	$X \pm m_x$	δ	Lim
Kazakh Bactrian	50	443,5±5,1	6,1	425-465
Turkmen dromedary Arvana	20	415,7±2,4	5,5	403-438
Kazakh dromedary	20	405±3,1	4,1	392-433
"BAISHIN" F_2 (25%td, 25%kb, 50%kd)	50	419,4±4,1	4,2	399-435
"BAYKAZHY" F_3 (12,5%td, 62,5%kb, 25%kd)	50	428,2±3,9	3,9	422-445
"ARDAS" F_4 (56,25%td, 31,25%kb, 12,5%kd)	20	418,8±4,4	4,5	409-443
"SANNAK" F_5 (28,1%td, 15,6%kb, 56,2%kd)	20	415,9±3,7	5,1	398-432

Table 1 shows the results of our studies on the duration of fruiting and standard deviations for the female camels of different genotypes.

Kazakh Bactrians have fruiting duration of 425-465 days, an average of 443,5 ± 5,1 days. The average standard deviation (δ) was 6.1 days.

Arvans have fruiting duration from 403 days to 438 days, an average of 415,7 ± 2,4 days. The average standard deviation (δ) was 5.5 days

Kazakh dromedaries characterized by duration of fruiting of 392-433 days, with an average standard deviation of 4.1 days.

Dromedaries of new generation have a duration of fruiting from 398 days to 445 days, including F2 (25% td, 25% kb, 50% kd) - 419,4 ± 4,1 days, F3 (12,5% td, 62, 5% kb, 25% kd) - 428,2 ± 3,9 days, F4 (56,25% td, 31,25% kb, 12,5% kd) - 418,8 ± 4,4 days, F5 (28,1% td, 15,6% kb, 56,2% kd) days.

Milk producing ability of dromedaries of different blood. Milk producing ability is a complex, multi-functional characteristics of camel breeding. During the research, we examined the dynamics of daily milk yield, fat and protein content of milk, milk yield for 240 days of lactation, the average content of fat and protein in milk during 240 days of lactation.

The results showed that with the increase in the blood share of dromedaries proportionally the fat content in milk is reduced.

The dairy industry, the milk with higher protein ratio is highly valued. The results showed that the protein ratio in dromedary milk F2 is 0,82, F3 - 0,80, F4 - 0,86 and F5 0,81. In other words, the more blood share of dromedaries increases, the more the protein ratio of milk raises (Table 2).

Table 2 – Milk producing ability of female camels (n=10, Σn=40)

Months	Traits	Dromedaries of generation			
		«BAISHIN» F_3	«BAYKAZHY» F_3	«ARDAS»F_4	«SANNAK»F_5
April	Daily milk yield, kg	8,6±0,3	6,5±0,2	7,8±0,3	8,7±0,2
	Fat content, %	4,3±0,05	4,5±0,06	4,2±0,06	4,4±0,08
	Protein content, %	3,6±0,08	3,7±0,07	3,6±0,08	3,6±0,06
May	Daily milk yield, kg	8,5±0,2	6,4±0,2	7,7±0,2	8,6±0,2
	Fat content, %	4,4±0,04	4,5±0,05	4,2±0,02	4,3±0,03
	Protein content, %	3,5±0,02	3,7±0,03	3,6±0,04	3,5±0,05
June	Daily milk yield, kg	8,4±0,3	6,3±0,3	7,5±0,3	8,5±0,3
	Fat content, %	4,3±0,08	4,4±0,06	4,2±0,07	4,3±0,07
	Protein content, %	3,5±0,04	3,6±0,05	3,5±0,05	3,5±0,03
July	Daily milk yield, kg	7,8±0,2	6,0±0,2	7,1±0,2	7,3±0,2
	Fat content, %	4,3±0,02	4,5±0,07	4,1±0,07	4,4±0,04
	Protein content, %	3,5±0,03	3,5±0,04	3,5±0,05	3,5±0,02
August	Daily milk yield, kg	7,2±0,2	5,5±0,3	6,5±0,3	7,0±0,3
	Fat content, %	4,4±0,05	4,5±0,07	4,1±0,06	4,4±0,05
	Protein content, %	3,5±0,03	3,5±0,03	3,5±0,03	3,5±0,02
September	Daily milk yield, kg	8,1±0,3	6,2±0,4	6,6±0,2	7,9±0,2
	Fat content, %	4,4±0,02	4,5±0,03	4,1±0,03	4,4±0,04
	Protein content, %	3,6±0,03	3,6±0,03	3,6±0,02	3,6±0,04
October	Daily milk yield, kg	8,3±0,2	6,0±0,2	6,9±0,2	8,1±0,2
	Fat content, %	4,3±0,05	4,5±0,04	4,2±0,05	4,4±0,05
	Protein content, %	3,6±0,03	3,6±0,03	3,6±0,02	3,6±0,03
On average, for 7 months	Daily milk yield, kg	8,13±0,2	6,13±0,3	7,16±0,2	8,01±0,2
	Fat content, %	4,34±0,04	4,49±0,05	4,16±0,04	4,37±0,06
	Protein content, %	3,54±0,03	3,60±0,02	3,56±0,02	3,54±0,03
	Protein coefficient of milk	0,82	0,80	0,86	0,81

It was established that the content of milk fat of dromedaries varies at 4.2 - 4.5%, 3.5-3.7%. There is great potential for further breeding of female dromedary camels of different genotypes on the content of fat and protein in milk due to purposeful selection of camels with a high content of the studied traits.

F2 (25% td, 25% kb, 50% kd) dromedaries have an average milk yield during the day about 8.13 ± 0.2, fat content of 4.34 ± 0. 04% and a milk protein of 3.54 ± 0,03%.

F3 (12,5% td, 62,5% kb, 25% kd) female camels have milk yield of 6,13 ± 0,3 kg with a fat content of 4,49 ± 0,05% and 3,60 ± 0,02 protein content.

F4 (56,25% td 31,25% kb, 12,5% kd) female camels produce milk during seven months of lactation on average 7,16 ± 0,2 kg with a fat content of 4,16 ± 0,04% and 3,56 ± 0,02% protein content.

It was established that F5 (28,1% td, 15,6% kb, 56,2% kd) on average, female camels have milk yield of 8,01 ± 0,2 kg per day, with a fat content of 4,37 ± 0,06% and 3,54 ± 0,03% protein content.

In Table 3, we presented livestock parameters of milk producing ability of dromedaries with different blood. It was found that the dromedaries with a live weight of 2 rank (525-600 kg) have significantly higher milk yield for 240 days of lactation compared to camels of 1 (600 kg) and 3 rank (less than 525 kg) of live weight (R≤0 , 01).

According to the content of fat and protein in the milk, there is no significant differences in dromedary camels in the rank of live weight (R≥0,05).

Table 3 – Livestock parameters of milk producing ability of dromedaries of different blood

Traits	Rank by live weight	Dromedary of generation			
		"BAISHIN" F_3	"BAYKAZHY" F_3	"ARDAS"F_4	"SANNAK"F_5
Milk yield over 240 days of lactation, kg	1(600 ≥)	1683,7±42,4	1422,9±55,3	1562,8±59,4	1576,0±62,8
	2(525-600)	1939,1±41,2	1528,7±38,5	1649,2±33,8	1861,9±45,4
	3(≤ 525)	1490,3±45,6	1372,4±45,8	1468,8±44,8	1380,2±45,5
Fat content in milk, %	1(600 ≥)	4,31±0,03	4,53±0,03	4,13±0,02	4,34±0,04
	2(525-600)	4,33±0,04	4,52±0,05	4,11±0,04	4,32±0,06
	3(≤ 525)	4,34±0,02	4,52±0,03	4,12±0,02	4,33±0,03
Protein content in milk, %	1(600 ≥)	3,51±0,04	3,60±0,03	3,50±0,03	3,52±0,03
	2(525-600	3,52±0,03	3,61±0,02	3,51±0,02	3,52±0,02
	3(≤ 525)	3,52±0,03	3,61±0,03	3,51±0,03	3,52±0,02
The yield of 4% milk	1(600 ≥)	1814,2±53,5	1611,4±41,8	1613,6±58,6	1710,0±52,1
	2(525-600)	2099,1±51,9	1727,4±47,3	1694,6±53,7	2010,9±58,5
	3(≤ 525)	1617,0±47,4	1550,8±45,6	1512,9±50,4	1494,1±57,3

In general, camels, having a live weight of 525-600 kg at different blood share of dromedaries, produce at least 1528.7 kg, including F2 (25% td, 25% kb, 50% kd) - 1939 1 ± 41,2 kg, F3 (12,5% td, 62,5% kb, 25% kd) - 1528,7 ± 38,5 kg, F4 (56,25% td, 31,25% kb, 12,5% kd) - 1649,2 ± 33,8 kg, F5 (28,1% td, 15,6% kb, 56,2% kd) - 1861,9 ± 45,4 kg over 240 days of lactation of milk commodity.

"BAISHIN" and "SANNAK" have the best indicators for output of 4% milk out of the four genotypes of Kazakh dromedary of the new generation. The highest output performance of both natural and 4% milk showed camels with a live weight of 525-699 kg in each genotype of Kazakh dromedary.

Female camels with the rank of live weight of 600 kg and above outperform herdmates with a live weight of up to 525 kg. Based on the abovementioned information, we consider it is necessary to strengthen the targeted selection of dromedaries with different blood with the rank of live weight of 525-600 kg in dairy camel breeding.

We consider it is necessary to further increase F5 dromedary population (28,1% td, 15,6% kb, 56,2% kd) as it meets market economy requirements.

Female camels of 2 rank have excellent indicators of reproductive capacity in live weight and high levels of safety of young camels in the first months of post-embryonic growth and development. The most important thing is that they have a higher proportion of camels with the desired shape of the udder (Table 4).

Female camels with calycine shape udder at rank 2 comprise 60.0%, compared with the rank 1 rank (22.5%) and 3 rank (30.0%). The desired length of the dugs is 2.5-5.0 cm and its frequency in female camels was 60.5% grade 2 and grade 1 -20.0% and -30.0% 3 ranks. When forming the breeding herd camels rank 2 increases the number of animals with a uniform development of the udder quarters to 90.0%, compared with -55% grade 1 and grade 3 -70.0%.

Camels of the second 2 rank up to 95.0% have a conical shape of the udder and up to 90.0% are directed straight down. On the basis of research on the morpho-functional characteristics of the udders of camels, we consider that it is necessary to conduct purposeful selection of thoroughbred Turkmen dromedaries in the breeding herd, corresponding to the 2 rank of live weight rating scale. This will enable to greatly speed up the breeding process on increasing milk yields by increasing the selection of the differential between the main herd animals and breeding stock. The distant hybridization of camels, a positive effect of increasing of thoroughbred Turkmen dromedary on the morpho-functional parameters of udder camels was established. The findings will serve to further improve the technology of breeding and selection of dromedary camel in dairy camel breeding in the South Kazakhstan.

Table 4 – Impact of selection according to the rank of live weight to the morpho-functional traits of the udder of "SANNAK" F5 dromedary female camels

Traits	n	Indicators	Rang		
			1	2	3
			(600 ≥)	525-600 kg	up to 525 kg
Shape of the udder, %	20	calycine	22,5	60,0	30,0
	25	subcircular	37,5	30,0	35,0
	30	flat	15,0	10,0	15,0
	40	other	25,0	–	20,0
The length of the dugs, sm	20	up to 2,5	30,0	5,0	20,0
	25	2,5-5,0	20,0	60,5	30,0
	30	5,0-6,0	10,0	24,5	25,0
	40	more than 6,0	40,0	10,0	25,0
Quarters development	75	steady developed	55,0	90,0	70,0
	40	unsteady developed	45,0	10,0	30,0
Shape of the udder	101	conical	65,0	95,0	80,0
	14	pear-shaped	35,0	5,0	20,0
Direction of the udder	95	straight down	55,0	90,0	70,0
	20	directed apart	45,0	10,0	30,0

Cytogenetic traits of dromedaries of different blood. Kazakh bactrian camels, Arvan, Kazakh dromedaries and dromedaries of new generation have a karyotype of 74 chromosomes, 12 of them are metacentric autosomes and 60 acrocentric autosomes, XX (in females) and XY (in males) sex chromosomes – are allosome.

Aneuploidy is the change in the number of chromosomes, aliquant to haploid set. Regarding the number of hypodiploid cells in cultured lymphocytes, we believe that most of them are artifacts caused by technical manipulations. In other words, the true indicator of aneuploidy is the number hyperdiploid cells, which we recommend to take into account durint determination of a genetic indicator of aneuploidy.

Kazakh population camels have significantly higher frequency of hypodiploid (2n <74) cells (Table 5).

Table 5 – The frequency of ill-defined cells, found in blood lymphocytes camels

Breed	Aneuploidy	Poliploidy	Chromosome aberration
Kazakh Bactrian	12,6±0,21	1,5±0,18	0,8±0,05
Dromedary Arvan	15,3±0,12	3,4±0,21	1,1±0,09
Kazakh dromedary	11,2±0,11	2,8±0,17	0,6±0,04
Dromedary of new generation			
"BAISHIN" F_2 (25%td, 25%kb, 50%kd)	11,1±0,16	2,1±0,23	0,9±0,06
"BAYKAZHY" F_3 (12,5%td, 62,5%kb, 25%kd)	12,9±0,17	2,2±0,31	0,8±0,07
"ARDAS" F_4 (56,25%td, 31,25%kb, 12,5%kd)	13,7±0,13	2,9±0,39	1,1±0,05
"SANNAK" F_5 (28,1%td, 15,6%kb, 56,2%kd)	11,3±0,09	1,8±0,24	0,7±0,04
Thoroughbred ("SANNAK")	10,9±0,13	2,9±0,19	0,7±0,03

It is established that the frequency of the formation of aneuploid cells in Kazakh dromedary camels (11.2%) and dromedaries of new generation (10,9-13,7%) is lower in comparison with thoroughbred Arvan (15.3%), which is consistent with previously conducted research.

Polyploidy is a genomic mutation to increase the number of chromosomes, multiple to the haploid set. Camels had triploidy (3n) and tetraploidy (4n). Frequency of formation of polyploid cells in Kazakh dromedary camels was 2.8% on average, dromedaries of new generation have frequency from 1.8% to 2.9%, which is significantly lower in comparison with thoroughbred Arvan (3.4%).

The frequency and type of chromosomal aberration. Individual record of frequency and type of chromosomal aberrations allowed to identify single and paired fragments, acentric rings and gaps in the centromere.

During complex cytogenetic studies we took into account the frequency of chromosomal associations cells. At the same time we considereed cells that are prone to non-disjunction of chromosomes. Camels can have such cells from 3% to 30%, and they are not ill-defined.

However, chromosomal associations (HA) are the source of a particular risk of aneuploid cells and increasing of formation of genetically ill-defined cells. Nature of association is a mutual attraction of heterochromatic regions of acrocentric chromosome groups "B" and "C", which are formed from a single chromocenter interphase nucleus.

During the analysis of chromosomal associations in cultured cells of blood lymphocytes we paid attention to the metaphase plates in which diligence of two or more acrocentric chromosomes is not more than the diameter of the cross-chromosome diameter.

It was found that the most commonly observed association of two chromosomes; however, there are cases of group associations of 3, 4 or more chromosomes. Indicator of chromosomal association in dromedaries of new generation was from 5.7% to 7.2% (Table 6).

Table 6 – Cytogenetic characterization of dromedaries of a new generation

Cytogenetic traits	Dormedaries of generation			
	"BAISHIN" F_3	"BAYKAZHY" F_3	"ARDAS" F_4	"SANNAK" F_5
Study of metaphase plates	1000	1000	1000	1000
Modal number of chromosomes (2n=74) expected	85,9±	84,1±	82,3±	86,2±
Modal number of chromosomes (2n=74) in fact	86,8±	84,1±	82,3±	86,9±
Aneuploidy: total	11,1±0,16	12,9±0,17	13,7±0,13	11,3±0,09
Hypodiploidy cells (2n<74)	8,6±0,08	11,5±0,11	11,5±0,08	8,9±0,07
Hypodiploidy cells (2n>74)	2,5±0,06	1,4±0,05	2,2±0,06	2,4±0,04
Chromosomal aberrations	0,9±0,06	0,8±0,07	1,1±0,05	0,7±0,04
Polyploidy	2,1±0,23	2,2±0,31	2,9±0,39	1,8±0,24
Heteroploidy	13,2±0,72	15,1±0,58	16,6±0,87	13,1±0,65
Chromosomal associations	6,3±0,07	7,2±0,05	6,8±0,06	5,7±0,08
Genetic aneuploidy	5,0±0,12	2,8±0,09	4,4±0,11	4,8±0,10
Physiological aneuploidy	6,1±0,32	10,1±0,38	9,3±0,29	6,5±0,18
Genetically ill-defined cells	8,0±1,1	5,8±0,81	8,4±1,4	7,3±0,95
The genetic risk of ill-defined cells, theoretically	20,4±3,5	23,1±2,7	24,5±2,9	19,5±3,2
The genetic risk of ill-defined cells, in fact	14,1±2,6	15,9±1,7	17,7±1,5	13,8±2,3

High associative capacity was found in metaphase cells cultured blood lymphocytes with normal diploid set of chromosomes (2n = 74).

The true measure of aneuploidy is a genetic aneuploidy, which is twice number of hyperdiploid cells. "BAISHIN" F3 5,0 ± 0,12% dromedary group's genetic aneuploidy was higher, which was significantly higher in comparison with the "BAYKAZHY" F3 2,8 ± 0,09%.

The frequency of formation of genetically ill-defined cells was in "BAISHIN" F3 8,0 ± 1,1%, "BAYKAZHY" F3 5,8 ± 0,81%, "ARDAS" F4 8,4 ± 1,4% and "SANNAK" F5 7,3 ± 0,95% dromedary groups. The findings prove the high herd status of dromedaries of new generation and the prospects for its extension in the South Kazakhstan. The actual value of cells with modal number of chromosomes in new generation dromedaries was expected.

The difference in expected and actual indicator of the modal number of chromosomes in dromedaries "BAISHIN" F3 and "SANNAK" F5 confirms the need to enhance the purposeful selection and selection of animals by cytogenetic status.

The high frequency of polyploid cells in lactating cows of 3.3% black-motley type, compared with 1.3% cattle brown type was due to high milk yield.

On the basis of this research, we can say that the becoming of polyploid cells and cells with chromosomal aberrations is due primarily to the reduction processes, regeneration, functional activity of organs and tissues during lactation period. In further selection and breeding operation, use of animals with well known karyotypic status will allow predicting the level of cytogenetic variability in their offspring and in populations of dromedaries of different genotypes.

The discussion of the results. Kazakhstan is the center where breeding of Bactrians (two-humped camels) and dromedaries (single-humped dromedaries) is possible; there are various options for crossing in connection with the widespread hybridization between them. Genetic resources of interspecific hybrids in Kazakhstan have been presented by 22 generations. In recent years, breeders bred dromedaries with new genotypes by rotational crossbreeding in Kazakhstan.

To that end, dromedaries of new genotypes derived by rotational crossbreeding became the object of study for the first time.

New generation of dromedaries has a duration of fruiting from 398 days to 445 days, including F2 (25% td, 25% kb, 50% kd) - 419,4 ± 4,1 days, F3 (12,5% td, 62, 5% kb, 25% kd) - 428,2 ± 3,9 days, F4 (56,25% td, 31,25% kb, 12,5% kd) - 418,8 ± 4,4 days, F5 (28,1% td, 15,6% kb, 56,2% kd) days.

It was established that the content of fat in milk varies in dromedary within 4.2 - 4.5%, and protein content is 3.5-3.7%. There is great potential for further breeding of dromedary camels with different genotypes on the content of milk fat and protein, due to purposeful selection of camels with a high content of the studied traits. Dromedaries F2 (25% td, 25% kb, 50% kd) have milk yield of 8.13 ± 0.2 during the day, fat content of 4.34 ± 0.04% and protein content of 3.54 ± 0,03%. F3 (12,5% td, 62,5% kb, 25% kd) female camels have, respectively, milk yield of 6,13 ± 0,3 kg with a fat content of 4,49 ± 0,05% and 3,60 ± 0,02% of milk protein. F4 (56,25% td 31,25% kb, 12,5% kd) female camels produce milk for seven months of lactation on average 7,16 ± 0,2 kg with a fat content of 4,16 ± 0,04% and protein content of 3,56 ± 0,02%. It was established that F5 (28,1% td, 15,6% kb, 56,2% kd) female camel produce milk 8,01 ± 0,2 kg on average per day, with a fat content of 4,37 ± 0,06% and protein content of 3,54 ± 0,03%.

Dromedaries with a live weight of 2 rank (525-600 kg), the milk yield for 240 days of lactation was significantly higher compared to camels of 1 (600 kg) and 3 rank (less than 525 kg) on body weight ($R \leq 0,01$). In general, female camel which have bodyweight of 525-600 kg with various blood fractions produced commercial milk least 1528.7 kg, including F2 (25% td, 25% kb, 50% kd) – 1939,1 ± 41,2 kg, F3 (12,5% td, 62,5% kb, 25% kd) – 1528,7 ± 38,5 kg, F4 (56,25% td, 31,25% kb, 12, 5% kd) – 1649,2 ± 33,8 kg, F5 (28,1% td, 15,6% kb, 56,2% kd) – 1861,9 ± 45,4 kg for 240 days of lactation.

Female camels of 2 rank in live weight have excellent indicators of reproductive capacity and high levels of safety of young camels in the first months post-embryonic growth and development. Most importantly, they have a higher proportion of camels with the desired shape of the udder.

It was found that Kazakh dromedary camels (11.2%) and dromedaries of new generation (10,9-13,7%) have lower frequency of the formation of aneuploid cells in comparison with thoroughbred Arvan (15.3%), which is consistent with previously conducted research.

Kazakh dromedary camels have the frequency of the formation of polyploid cells of 2.8% on average; dromedaries of new generation have from 1.8% to 2.9%, which is significantly lower in comparison with thoroughbred Arvan (3.4%).

The frequency of genetically ill-defined cells in dromedary group "BAISHIN" F3 was 8,0 ± 1,1%, "BAYKAZHY" F3 – 5,8 ± 0,81%, "ARDAS" F4 – 8,4 ± 1,4% and "SANNAK" F5 – 7,3 ± 0,95%. The findings prove the high herd status of dromedaries of new generation and the prospects for their extension in South Kazakhstan.

Conclusion. The novelty of the research is the identification of the genetic potential for milk production and cytogenetic status of dromedaries of new genotypes derived by rotational crossbreeding. The breeding area of "BAISHIN" F3, "BAYKAZHY" F3, "ARDAS" F4 and "SANNAK" F5 dromedary groups will increase the production of camel milk in South Kazakhstan region. In further selection and breeding operation, use of animals with well known karyotypic status will allow predicting the level of cytogenetic variability in their offspring and in populations of dromedaries of different genotypes.

The results of studies are recommended in all camel breeding farms of South Kazakhstan region, specialized in dromedary breeding.

The source of the research funding is the Ministry of Agriculture of the Republic of Kazakhstan.

The names of funding organizations – "Kazakh Scientific Research Institute of Animal Breeding and Forage Production" JSC;

Scientific Research Institute "Problems of agriculture and water resources", Auezov South Kazakhstan State University.

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ОҢТҮСТІК–ҚАЗАҚСТАНДЫҚ ПОПУЛЯЦИЯНЫҢ ДРОМЕДАР ТОБЫНА ЖАТАТЫН ТҮЙЕЛЕРДІҢ СЕЛЕКЦИЯЛЫҚ- ГЕНЕТИКАЛЫҚ МОНИТОРИНГ НӘТИЖЕЛЕРІ

Аннотация. Ротациялық жұптау арқылы шығарылған дромедардың қазақстандық популяциясының жаңа генотиптері алғаш рет зерттелді. Оңтүстік қазақстандық дромедар тобы түйелерінің жаңа генерациясының генетикалық басымдылығы анықталды.

Жаңа генерациядағы дромедар түйелерінің жемістену ұзақтығы 398 күннен 445 күнге дейін, оның ішінде F_2 (25%td, 25%kb, 50%kd) – 419,4±4,1 күн, F_3 (12,5%td, 62,5%kb, 25%kd) – 428,2±3,9 күн, F_4 (56,25%td, 31,25%kb, 12,5%kd) – 418,8±4,4 күн, F_5 (28,1%td, 15,6%kb, 56,2%kd) күн.

Зерттеу нәтижелері дромедар қаны басымдылығы артқан сайын, бұған пропорционалды сүт құрамындағы май көлемінің кеми бастайтындығын көрсетті. Бұған керісінше, дромедар қанының үлесі артқан сайын, сүт құрамындағы ақуыз коэффициенті көрсеткіші арта бастайды.

Анеуплоидты жасушаларының түзілу жиілігі қазақ дромедары (11,2%) мен дромедардың жаңа генерациясында (10,9-13,7%) таза тұқымды Аруанамен (15,3%) салыстырғанда төмен келетіні анықталды, бұл өз кезегінде бұрынғы зерттеулер нәтижелеріне сәйкес келеді.

Қазақ дромедары түйелеріндегі полиплоидты жасушалары түзілуінің орташа жиілігі 2,8%, дромедардың жаңа генерациясында 1,8% - ден 2,9% дейін құрады және бұл таза тұқымды Аруаналармен салыстырғанда (3,4%) нақты түрде төмен болды.

«БАЙШИН» тобындағы дромедарлардағы генетикалық ауытқулы (аномальды) жасушаларының түзілу жиілігі F_3 8,0±1,1%, «БАЙҚАЖЫ» F_3 5,8±0,81%, «АРДАС» F_4 8,4±1,4% және «САННАҚ» F_5 7,3±0,95% құрады. Тәжірибе барысында алынған нәтижелер, дромедардың жаңа генерациясының асыл тұқымдық құндылығының жоғары екендігін, сондықтан оны Қазақстанның оңтүстік өңірінде таралу болашағының зор екендігін көрсетеді.

Нәтижені талқылау. Қазақстан асыл тұқымды бактриандар (бір өркешті түйелер) және дромедар (екі өркешті түйелер) тұқымдас өсіруіне мүмкіндік беретін орталығы болып табылады, сондықтан олардың арасында будандастыру кең таралған, яғни будандаудың түрлі нұсқалары.

Осы кезге дейін Қазақстандағы түйелердің түр аралық будандарының генетикалық қоры 22 генерация еді. Соңғы жылдары алмастыра (ротация) будандастыру әдісін қолдану арқылы Қазақстандық селекционерлер тарапынан дромедардың жаңа генотиптері шығарылды.

Сол себепті алғаш рет зерттеу нысаны ретінде алмастыра (ротация) будандастыру әдісін қолдана отырып шығарылған дромедардың жаңа генотиптері таңдап алынды.

Жаңа генерациядағы дромедар түйелерінің буаздық мерзімінің ұзақтығы 398 күннен 445 күнге дейін созылады, оның ішінде F_2 (25%td, 25%kb, 50%kd) - 419,4±4,1 күн, F_3 (12,5%td, 62,5%kb, 25%kd) - 428,2±3,9 күн, F_4 (56,25%td, 31,25%kb, 12,5%kd) - 418,8±4,4 күн, F_5 (28,1%td, 15,6%kb, 56,2%kd) күн.

Дромедар сүті құрамындағы май мөлшері 4,2-4,5%, ал ақуыз 3,5-3,7% ауытқитындығы анықталды. Сондықтан, әр түрлі генерациядағы дромедар түйелері аналықтарының сүті құрамындағы май мен ақуыз көлемін арттыру бағытында бағытты түрде сұрыптау жұмыстарын жүргізуге зор мүмкіндіктер бар. Дромедар аналықтары F_2 (25%td, 25%kb, 50%kd) орта есеппен тәулігіне 8,13±0,2 кг сүт берсе, сүт құрамындағы май мен ақуыз мөлшерлері тиісінше 4,34±0,04% және 3,54±0,03% деңгейінде болады. Өз кезегінде аналықтарының F_3 (12,5%td, 62,5%kb, 25%kd) сүт өнімділігі 6,13±0,3 кг, май мөлшері 4,49±0,05%, ал ақуыздылығы 3,60±0,02% құрайды. F_4 буындағы (56,25%td 31,25%kb, 12,5%kd) аналықтары 7 ай бойына орта есеппен майлылығы 4,16±0,04% және ақуызы 3,56±0,02% құрайтын 7,16±0,2 кг көлеміндегі сүт береді. F_5 буынындағы (28,1%td, 15,6%kb, 56,2%kd) сауын түйелерінің тәулігіне орта есеппен 8,01±0,2 кг сүт беретіні, ал оның майлылығы 4,37±0,06%, ақуыздылығы 3,54±0,03% құрайтыны анықталды.

Тірілей салмақтары бойынша 2 рангты (525-600 кг) дромедарлардың 240 күн сүттену кезеңіндегі сүт өнімділігі 1 рангты (600 кг астам) және 3 рангты (525 кг төмен) аналықтарға қарағанда шынайы түрде ($P \leq 0,01$) басым келеді. Жалпы алғанда салмағы 524-600 кг келетін әр түрлі қандылықтардағы дромедар

түйелері 240 күндік сүттену мерзімдерінде 1528,7 кг кем емес тауарлы сүт бере алады, оның ішінде F_2 (25%td, 25%kb, 50%kd) - 1939,1±41,2 кг, F_3 (12,5%td, 62,5%kb, 25%kd) - 1528,7±38,5 кг, F_4 (56,25%td, 31,25%kb, 12,5%kd) - 1649,2±33,8 кг, F_5 (28,1%td, 15,6%kb, 56,2%kd) - 1861,9±45,4 кг.

Салмағы бойынша 2 рангқа кіретін аналық түйелері өте жақсы көбею қабілеттілігіне ие келеді және олардан алынған боталар өз тіршілігінің бастапқы кезеңдерінде өлім-жітімге аз ұшырайды. Ең бастысы бұлардың ішінде қажетті желін пішінділерінің үлесі басым.

Анеуплоидты жасушаларының пайда болу жиілігі қазақ дромедары (11,2%) мен дромедардың жаңа генерациясында (10,9-13,7%) таза қанды Аруаналарға (15,3%) қарағанда төмендеу келеді және бұл нәтижелер бұрынғы жүргізілген зерттеулердегі мәліметтерімен сәйкес келеді.

Полиплоидты жасушаларының пайда болу жиілігі қазақ дромедарында орта есеппен 2,8%, дромедардың жаңа генерациясында 1,8% ден 2,9% аралығында кездеседі және бұл таза қанды Аруаналарға 3,4% қарағанда дәлелді түрде төмендеу келеді.

Генетикалық ауытқулы жасушаларының (ГенАЖ) түзілу жиілігі «БАЙШИН» тобындағы дромедарлардағы F_3 8,0±1,1%, «БАЙҚАЖЫ» F_3 5,8±0,81%, «АРДАС» F_4 8,4±1,4% және «САННАҚ» F_5 7,3±0,95% құрады. Тәжірибе барысында алынған нәтижелер, дромедардың жаңа генерациясының асыл тұқымдық құндылығының жоғары екендігін, сондықтан оны Қазақстанның оңтүстік өңірінде таралу болашағының зор екендігін көрсетеді.

Қортынды. Зерттеудің негізгі жаңалығы алмастыра шағылыстыру арқылы шығарылған дромедардың жаңа генотипінің сүт өнімділігінің басым мүмкіндігі және цитогенетикалық статусы анықталды. «БАЙШИН» F_3, «БАЙҚАЖЫ» F_3, «АРДАС» F_4 және «САННАҚ» F_5 дромедар тобының өсіру аймағының кеңеюі, Оңтүстік Қазақстан облысында өндірілетін түйе сүті өндірісінің артуына мүмкіндік береді. Селекциялық асылдандыру жұмыстарында каритиптік статусы белгілі жануарларды пайдалану, олардың ұрпақтарында және жалпы алғанда әр түрлі генотиптегі популяцияларда жүретін цитогенетикалық өзгерістер деңгейін белгілі бір дәрежеде болжауға мүмкіндік береді.

Зерттеу нәтижесінде алынған мәліметтерді Оңтүстік Қазақстан облысындағы дромедар түйелерін өсірумен айналысатын барлық шаруашылықтарда пайдалануға ұсынылады.

Зерттеу жұмыстарын қаржыландыру көзі. Қазақстан республикасы ауыл шаруашылығы министрлігі.

Қаржыландыру мекемесінің аты. ЖШС «Қазақ мал шаруашылығы және мал азығы ғылыми-зерттеу институты»;

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Түйін сөздер: дромедар, түйелер генотиптері, сүт шығымы, тірі салмағы, сүт майлылығы, ақуыз сүттілігі, жемістену, кариотип.

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СЕЛЕКЦИОННО-ГЕНЕТИЧЕСКИЙ МОНИТОРИНГ ВЕРБЛЮДОВ ГРУППЫ ДРОМЕДАР ЮЖНО-КАЗАХСТАНСКОЙ ПОПУЛЯЦИИ

Аннотация. Впервые изучены верблюды дромедары казахстанской популяции новых генотипов, выведенные методом ротационного скрещивания. Установлены генетический потенциал продуктивности верблюдов группы дромедар южно – казахстанского типа новой генерации.

Дромедары новой генерации имеют продолжительность плодоношения от 398 дней до 445 дней, в том числе F_2 (25%td, 25%kb, 50%kd) - 419,4±4,1 дней, F_3 (12,5%td, 62,5%kb, 25%kd) - 428,2±3,9 дней, F_4 (56,25%td, 31,25%kb, 12,5%kd) - 418,8±4,4 дней, F_5 (28,1%td, 15,6%kb, 56,2%kd) дней.

Результаты исследования показали, что с увеличением доли кровности дромедаров пропорционально уменьшается содержание жира в молоке. По мере увеличения доли кровности дромедаров повышается показатель белкового коэффициента молока.

Установлено, что частота образования анеуплоидных клеток у верблюдов породы казахский дромедар (11,2%) и дромедаров новой генерации (10,9-13,7%) ниже в сравнении с чистопородными Арвана (15,3%), что согласуется с ранее проведенными исследованиями.

Частота образования полиплоидных клеток у верблюдов породы казахский дромедар в среднем составил 2,8%, дромедаров новой генерации от 1,8% до 2,9%, что достоверно ниже в сравнении с чистопородными Арвана (3,4%).

Частота образования генетически аномальных клеток (ГенАК) составила у дромедаров группы «БАЙШИН» F_3 8,0±1,1%, «БАЙКАЖЫ» F_3 5,8±0,81%, «АРДАС» F_4 8,4±1,4% и «САННАК» F_5 7,3±0,95%. Полученные данные свидетельствуют о высоком племенном статусе дромедаров новой генерации и перспективах его распространения на юге Казахстана.

Ключевые слова: дромедар, генотипы верблюдов, удой молока, живая масса, жирномолочность, белковомолочность. плодоношение, кариотип.

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ISSN 2518-1467 (Online), ISSN 1991-3494 (Print)

http://www.bulletin-science.kz/index.php/ru/

Редакторы *М. С. Ахметова, Д. С. Аленов, Т. М. Апендиев*
Верстка на компьютере *Д. Н. Калкабековой*

Подписано в печать 11.10.2016.
Формат 60x881/8. Бумага офсетная. Печать – ризограф.
17,9 п.л. Тираж 2000. Заказ 5.