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## **Dairy productivity of genetic sources of selection camel stock in the south of Kazakhstan**

For increasing the productivity of camel's milk and meat in Kazakhstan is necessary to expand the area of breeding of native breeds of camels. For improving zootechnical parameters and increasing productivity of Kazakh Bactrian camels and Turkmen Arabian camels is necessary to hold out measures for development selective aspects on breeding of high-productive genotypes of camels with the taking into the account of available gene pool of purebred and hybrid animals. It is necessary to use breeds of camels with the limited gene pool and also breeds which can be met in Kazakhstan for selective reasons. The purpose of this work is detection of features of dairy efficiency of genetic sources of camels of Kazakh population of Arvana and Bactrian camel for development selective aspects of highly productive genotypes of camels taking into the account available gene pool of purebred and hybrid camels of South Kazakhstan and Almaty areas. For establishment the dairy efficiency of camels was carried out monitoring on detection of average daily milking and fatness of milk in specialized camel farms «Syzdykbekov A.», «Usenov N.», «Daulet-Beket» and «Bagdat». In these camel farms was carried out individual account of milking at examined camels. Received data on the carried out researches of milk productivity of camels of the milch herd confirm data on high content of fat in milk of the Kazakh Bactrian, at the same time milking at this breed is at the very low level. In the base farms of milk productivity area genetic sources of camels of different populations on dairy efficiency have their own genetic features. At the same time milking camels of Arvana breed are effective for breeding on the South of Kazakhstan for development of milk industry. It is necessary to maintenance their high variation at increasing the total milking level, because it causes as source for selection. The positive connection between variability of milking and level of productivity allows hoping on significant increasing of diversity at improvement of feeding and storage, which leads to increasing of selective differential and in result it will improve effect of selection. In the presented research work are formed selective and tribal herds of camels of different genotypes by the estimation of their dairy efficiency.

*Key words:* dairy efficiency, camel, Kazakh population, genetic source.

### *Introduction*

Camel husbandry is one of the effective areas of desert, semi-desert and dry steppe zones. Kazakhstan has huge areas of semi-desert, desert and steppe pastures, where camel husbandry is intensively developing [1].

At present, the use of camels as productive animals, from which milk, wool, meat are obtained, is becoming increasingly important [2].

The Republic of Kazakhstan is traditionally one of the world's leading manufacturers of camel milk. One of the urgent problems of productive camel husbandry is sustainable development of dairy camel husbandry, caused by excess of demand for camel milk over the real possibility of its production. The main factor in control the increase in the production of camel milk for complete satisfaction of needs of the domestic and foreign markets is, firstly, low dairy productivity of animals; secondly, small number of specialized dairy type in relation to the total number of heads [3].

Content of individual components in the milk of camels varies depending on the lactation period, the season of the year, feeding, species and breed belonging [4].

Camels are distinguished by quite high dairy productivity. Dairy productivity in camels rises with each subsequent lactation. The highest milk yields in Bactrian camels were recorded on the fourth and fifth lactation. Old camels reduce the intensity of lactation. One-humped camels for dairy productivity are approaching some cultivated breeds of cattle [5]. Dairy productivity also depends on the age of the animal. From the third to the seventh lactation period, milk yielding capacity increases, and from the eighth — decreases [4]. The lactation period in camels lasts 18 months [1; 6].

Bolat-ool Ch.K. and others [4] note that small milk yielding capacity is explained by the fact that selective breeding has not been carried out for a long time in the direction of increasing milk yielding capacity: the main attention was paid to the pack and riding camel qualities.

To increase camel milk and meat production in Kazakhstan, it is necessary to expand the range of breeding domestic camel breeds. A camel breed with a limited gene pool is a group of domestic animals that are rare and do not have analogues in the world, necessary for use in selective breeding purposes and that is in danger of extinction. These include Dromedary camels of Kazakh type: arad, bai-nar, baidara. Local camel breeds are breeds that occur only in one country. These include Kazakh Dromedary camels. To improve zootechnic parameters and increase the productivity of Kazakh Bactrian camels and Turkmen Dromedary camels, it is necessary to conduct measures to develop selective breeding aspects of breeding highly productive camel genotypes, taking into account the available gene pool of purebred and hybrid animals.

Kazakh breed of Bactrian double-humped camels is the main planned breed that specializes in dairy and meat-and-wool production. The main method of increasing the dairy productivity of Kazakh Bactrian camels is pure breeding. According to A. Baimukanov, the most promising are animals corresponding to the following selection parameters: live weight of 600–650 kg, dairy productivity for 12 lactation months of 1000–1200 liters of commercial milk, with a fat content of 5.0–6.0 %. Kazakh Bactrian camels of improved type have commercial milk yield for six lactation months 426.0 kg. Kazakh Bactrian camels of desired type are superior to the improved type by the commercial milk yield by 164.7 kg. According to D.A. Baimukanov, Kazakh Bactrian camels have high frequency of milk yield of 0.84–0.92. Therefore, the first lactation can predict the milk yield of the second and subsequent lactation. Z.M. Mussayev and A. Baimukanov believe that camel husbandry in Kazakhstan should develop due to the increase in the number of purebred Kazakh Bactrian camels, which differ in their conformation and productivity, depending on their belonging to a particular zonal type [6].

The above authors in Kazakh breed of Bactrian camels distinguish the following types: Kyzylorda, Ural-Bukei and South Kazakhstan. The most numerous is Kyzylorda type. A. Baimukanov believes that potential of milk yield of Kazakh Bactrian camels reaches 2200 kg without significant reduction in fat content of 12 % in milk. In connection with this, in the conditions of South Kazakhstan region the number of Kazakh Bactrian camel heads of milk type is increasing annually [6].

To increase genetic similarity of offspring with outstanding ancestors in camel husbandry, a moderate inbreeding is practiced. Kazakh Bactrian camels from moderate inbreeding in the conditions of Suzak district of South Kazakhstan region have commercial milk yield for 12 lactation months in amount of 1367 liters. I.e., genetic potential of milk yield for lactation exceeds 2700 kg. According to D.A. Baimukanov and others, purebred Kazakh Bactrian camels mostly have an average daily milk yield at the third lactation month in amount of 5.0 liters with a milk fat content of 5.6 %. In hybridization in camels, the milk yield for 12 lactation months varies from 19–25 liters in kospak to 45–65 liters in kurt-nar [6].

D.A. Baimukanov and others established the relationship of hypodiploidy with the age of animals and dairy productivity level. The higher the dairy productivity, the higher the physiological hypodiploidy. At that, in camels of the first lactation the physiological diploidy index is significantly lower than in adult camels. D.A. Baimukanov, A. Baimukanov, B.L. Koshshan studying selection-genetic parameters of Kazakh Bactrian camels in the conditions of the Caspian lowland of Mangistau region found that between the live weight and milk yield a negative phenotypic correlation  $r = -0.21$  is observed. Between the average daily milk yield and fat content in milk, a negative correlation  $r = -0.45$  is also observed. Further, the authors note that the maximum milk yields are observed in Kazakh Bactrian camels having a live weight from 540 kg to 590 kg. For 1 kg of the live weight, the above-mentioned camels produce 1.5–1.8 kg of milk. In the conditions of South-Western region of Kazakhstan, Kazakh Bactrian camels have an average daily milk yield at the third lactation month in amount of 6.0 kg with a milk fat content of 5.3 %. B.L. Koshshan, A. Baimukanov, D.A. Baimukanov believe that with purebred breeding of Kazakh Bactrian camels, it is necessary to conduct a strict selection by conformation, birth rate and milk yielding capacity indices. Due to this, it was possible to increase milk yield for 6 lactation months from 720 kg to 918.1 kg in the conditions of LLP «Таушык» of Tupkaragan district of Mangistau region. Ye.T. Turlybayev believes that in the selection of purebred Kazakh Bactrian camels, the attention should be paid to selection. During the year, Bactrian camels give milk in amount of 600–800 kg, and Dromedary camels in amount of 1000–2000 kg and more [6]. In the conditions of Kyzylorda region, Kazakh Bactrian camels are characterized by high dairy productivity, due to the uniformity of milk production during the entire active lactation period.

The milk yield depends on species belonging, blood ties of hybrids, pasture and fodder conditions, technology content and other factors.

As the blood ties of Dromedary camel increase, the milk yielding capacity increases, and vice versa, with increase in the blood ties of Bactrian camel, the dairy productivity decreases. In addition, decline in the

dairy productivity in the interval between the 3<sup>rd</sup> and 6<sup>th</sup> lactation months directly depends on pasture conditions and growth of colts.

Introduction of additional evaluation and selection by the milk yielding capacity ratio in the practice of selection breeding of Kazakh Bactrian camel by the milk yielding capacity allows to increase milk production by 15–20 % and live weight by 7.5–10 % in comparison with the traditional method of selection. Using producers of Kazakh Bactrian camel of the western population in crossing with hybrid dams allows to increase the content of milk fat and protein in milk. Three-way crossing is widely used to create a collection stock of hybrid camels. The use of Kazakh Dromedary camels in inter-species crossing allows to increase the absolute fat content in milk by 12 % in comparison with Turkmen Dromedary camels. Therefore, development of hybrids by three-way inter-species crossing is one of the promising directions in the dairy camel husbandry [1].

According to the results of studies of scientists (Mehaia et al., 1995; Aljumaah et al., 2012) one of the main factors determining composition of dairy camel milk is the camel breed [7, 8]. The research data of D.A. Baimukanov and others [9] show that the average daily milk yield of Kalmyk Bactrian camels is 3.4 kg, of Kazakh Bactrian camels is 6.8 kg, of Kazakh type arvans is 13.5 kg, of Kazakh Dromedary camels is 9.9 kg, of hybrid F<sub>1/2</sub> (mother is Kazakh type arvan, father is Kalmyk Bactrian camel) is 8.3 kg, and of hybrid F<sub>1/2</sub> (mother is Kazakh Dromedary camel, father is Kalmyk Bactrian camel) is 9.7 kg. In the inter-species hybridization of Dromedary camel dams with producers of Kalmyk Bactrian camel, intermediate inheritance of the fat content in milk (4.1–4.5 %) is observed. According to the results of this study, D.A. Baimukanov and others recommend to practice in the dairy camel husbandry the pure breeding of arvan of Kazakh interbreed type, Kazakh Dromedary camel, Kazakh Bactrian camel and inter-species hybridization of Kazakh Dromedary camels with Kalmyk Bactrian camels.

Genetic variety of camels with the help of DNA technology is actively studied in many laboratories of the USA, EU, Saudi Arabia, India, South Africa. This situation is due to the fact that breeding of these animals and processing of their products are important economic component of many countries of the world, and molecular genetic monitoring of the state of populations is necessary to maintain the biodiversity [10].

The purpose of this work is to determine specific features of the dairy productivity of genetic resources of camels of Kazakh population arvan and Bactrian camel to develop selection breeding aspects of highly productive camel genotypes, taking into account the available gene pool of purebred and hybrid camels of South Kazakhstan, Zhambyl and Almaty regions.

#### *Materials and research methods*

*Selection of milking camels by genodiagnostics using DNA technology.* The dairy productivity was determined by carrying out periodic control milking operations [5]. To establish the dairy productivity of camels, a monitoring was conducted to determine the average daily milk yield and fat content in specialized camel farms «Syzykbekov A», «Ussenov N», «Daulet-Beket» and «Bagdat». The age of camel dams studied by the dairy productivity is 7–15 years.

The dairy productivity of camels was taken into account individually by the method of control milking operations, twice a month. The monitoring was carried out during 6 months, i.e. from April to September. The milking operation was done twice a day by hand, with the colt's admit: at 7 a.m. and 7 p.m. During the monitoring, the colts were kept apart from the camel dams. For good milk secretion when milking camels the colts were admitted to camels and then they were separated for further milking operation. Then, after completing the milking operation, the colts were admitted to the camels. Information on the number of camels, their breed, number of camel dams, and male-producers studied by the dairy productivity are given in Table 1.

Table 1

#### **Monitoring results of peasant farms for camel breeding**

Organization	Number of camels, heads	Camel breed	Number of colts studied by the dairy productivity, heads	Number of male-producers, heads	Number of camel dams, heads
PF «Syzykbekov A»	102	Arvan	50	2	50
PF «Ussenov N»	102	Arvan	50	2	50
LLP «Daulet-Beket»	102	Arvan	50	2	50
PF «Bagdat»	102	Kazakh Bactrian	50	2	50

Note. PF — peasant farm; LLP — limited liability partnership.

In order to establish the dairy productivity level, an individual record of the milk yield was conducted in experimental camel dams of the peasant farms «Syzdykbekov A», «Ussenov N», LLP «Daulet-Beket» and PF «Bagdat» by carrying out the control milking operations (Table 2). At that, we determined the variability of milk yield, fat content in milk of camel dams in the studied peasant farms.

### Results and discussion of results

Data from the studies of the dairy productivity of the milking camel dams confirm the high fat content in the milk of Kazakh Bactrian camels, i.e. it is from  $4.5\pm 0.06\%$  to  $4.7\pm 0.08\%$ , while the fat content of the milk of arvan camels in all three farms shows poor results (Table 2).

Table 2

**Variability of dairy productivity of arvan camel dams of «Syzdykbekov A.» and «Ussenov N.» peasant farms by months ( $n = 50$ )**

Breed	Milk yielding capacity	Months						On the average
		April	May	June	July	August	September	
PF «Syzdykbekov A.» of Arys-Turkestan region								
Arvan	Morning milk yield	5.4±0.07	5.4±0.07	5.9±0.09	5.9±0.09	5.7±0.08	5.9±0.09	5.7±0.05
	Evening milk yield	5.8±0.09	5.9±0.09	6.3±0.07	6.2±0.07	6.0±0.09	6.4±0.06	6.1±0.05
	For a day	11.2±0.1	11.3±0.1	12.2±0.1	12.1±0.08	11.7±0.1	12.3±0.1	11.8±0.07
	For a month	336	339	366	363	351	369	354
	Fat content, %	4.2±0.02	4.2±0.02	4.3±0.02	4.2±0.02	4.1±0.03	4.2±0.02	4.2±0.01
	Cv	13.75	13.05	10.37	9.84	12.82	12.41	12.74
PF «Ussenov N.» of Arys-Turkestan region								
Arvan	Morning milk yield	6.0±0.09	6.5±0.11	6.8±0.08	5.9±0.1	5.7±0.1	6.1±0.09	6.2±0.07
	Evening milk yield	6.5±0.1	7.2±0.1	7.3±0.1	6.4±0.14	6.3±0.15	6.5±0.1	6.7±0.06
	For a day	12.5±0.1	13.7±0.09	14.1±0.1	12.3±0.12	12.0±0.13	12.6±0.1	12.9±0.09
	For a month	375	411	423	369	360	378	387
	Fat content, %	3.9±0.03	4.0±0.03	4.2±0.02	4.0±0.03	3.9±0.03	4.0±0.03	4.0±0.02
	Cv	15.23	14.44	13.15	15.25	15.87	15.23	15.82
LLP «Daulet-Beket» of Pribalkhash zone								
Arvan	Morning milk yield	4.3±0.07	4.4±0.08	4.6±0.08	4.3±0.1	4.5±0.1	4.5±0.12	4.4±0.04
	Evening milk yield	3.9±0.07	4.2±0.07	4.6±0.09	4.1±0.09	4.2±0.09	4.4±0.1	4.3±0.04
	For a day	8.2±0.1	8.6±0.1	9.2±0.2	8.5±0.2	8.6±0.17	8.9±0.22	8.7±0.07
	For a month	246	258	276	255	261	267	261
	Fat content, %	3.9±0.04	4.1±0.04	4.0±0.04	4.1±0.04	3.9±0.04	4.0±0.04	4.0±0.02
	Cv	11.2	11.3	12.4	15.4	14.4	17.6	14.2
PF «Bagdat» of Karatau-Moiynkum region								
Kazakh Bactrian	Morning milk yield	3.2±0.04	3.3±0.05	3.4±0.04	3.3±0.06	3.3±0.05	3.4±0.05	3.3±0.02
	Evening milk yield	3.1±0.05	3.3±0.04	3.3±0.03	3.2±0.05	3.2±0.05	3.2±0.04	3.2±0.02
	For a day	6.3±0.07	6.6±0.08	6.7±0.07	6.4±0.11	6.5±0.1	6.6±0.07	6.5±0.04
	For a month	189	198	201	192	195	198	195
	Fat content, %	4.5±0.06	4.7±0.08	4.4±0.09	4.7±0.08	4.5±0.06	4.7±0.08	4.6±0.03
	Cv	14.8	15.0	12.7	23.2	21.4	15.0	17.1

The conducted researches once again testify the low milk yield of Kazakh Bactrian camels. Studies of the variability of milk yield, milk fat content in the milking camel dams during 6 months of the bred livestock farm specialized in breeding the milking camels, LLP «Daulet-Beket» in Pribalkhash zone, show that these indicators by the studied months increase from  $8.2\pm 0.1$  kg to  $9.2\pm 0.2$  kg on the average daily milk yield and on the fat content from  $3.9\pm 0.04\%$  to  $4.1\pm 0.04\%$ , respectively. At that, the coefficient of variation (Cv) is from 11.2 to 17.6 %. The morning yield for 180 days on the average is  $4.4\pm 0.04$  kg and the evening is  $4.3\pm 0.04$  kg.

In Karatau-Moiynkum region (PF «Bagdat»), Kazakh Bactrian camels (Table 2) show a somewhat lower productivity compared with the relatives of Pribalkhash zone. At that, the average daily yield of the camel dams from the selection breeding stock from April to September is from  $6.7\pm 0.07$  kg to  $6.7\pm 0.07$  kg in the animals of PF «Bagdat», the fat content in the milk is from  $4.4\pm 0.06\%$  to  $4.7\pm 0.08\%$  and the dynamics of the coefficient of variation from April to September is 17.1 %, respectively.

The data show that the milking camel dams of LLP «Daulet-Beket» produced more milk than the animals of PF «Bagdat» by 49.5 %.

The dairy productivity limit in the studied individuals of LLP «Daulet-Beket» is from 6.5 kg to 11.0 kg, this figure for individuals of PF «Bagdat» is from 5.8 kg to 7.5 kg.

Their high variation, with increase in the total milk yield, is important to maintain in the future, as it serves as a source for selection. And this leads to increase in the selection differential and, ultimately, increases the efficiency of selection.

### Conclusion

In the basic farms of the dairy productivity direction, the genetic resources of camels of different populations for the dairy productivity have their own genetic characteristics.

At that, the milking camel dams of arvan breed are effective for breeding in the south of Kazakhstan in the dairy industry development. The average daily yield of the milking camel dams of the selection stock is  $11.8 \pm 0.07$  kg in the animals of PF «Syzdykbekov A.», and  $12.9 \pm 0.09$  kg in the animals of PF «Ussenov N.».

Their high variation, with increase in the total milk yield, is important to maintain in the future, as it serves as a source for selection. The positive relationship between the variability of milk yield and level of productivity allows to hope for a significant increase in diversity of improved feeding content, which leads to increase in the selection differential and ultimately increases the efficiency of selection.

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## Оңтүстік Қазақстандағы өсірілетін түйелердің селекциялық табынындағы генетикалық қорларының сүт өнімділігі

Қазақстанда түйе сүті мен етінің өндірілуін арттыру үшін түйенің отандық тұқымдарын өсіру аймағын кеңейту қажет. Қазақ бактрианы мен түркімен дромедарларының зоотехникалық параметрлерін жанарту және өнімділігін арттыру мақсатында таза тұқымды және гибридтік малдың қолданыстағы гендік қорын ескеру арқылы түйенің өнімділігі жоғары гендік типтерін өсірудің селекциялық негіздерін әзірлеу бойынша іс-шаралар жүргізу қажет. Селекциялық мақсатта гендік қоры шектеулі және тек қана Қазақстанда кездесетін түйе тұқымдарын пайдалану керек. Осы жұмыстың мақсаты Оңтүстік Қазақстан және Алматы облыстарындағы таза тұқымды және гибридтік түйелердің гендік

қорын ескеру арқылы өнімділігі жоғары гендік типті түйелерді өсірудің селекциялық негіздерін әзірлеу үшін аруана және бактриан қазақ популяциясы түйелерінің генетикалық ресурстарындағы сүт өнімділігінің ерекшеліктерін анықтау болып табылады. Түйелердің сүт өнімділігін анықтау үшін «Сыздықбеков А.», «Усенов Н.», «Даулет-Бекет» және «Бағдат» түйе өсіретін мамандандырылған шаруа қожалықтарында сүттің орташа тәуліктік сауымын және оның майлығын анықтау бойынша мониторинг жүргізілді. Сауын табынындағы түйелердің сүт өнімділігін зерттеулері қазақ бактрианының сүт құрамында майдың мөлшері жоғары екендігін дәлелдеді, сонымен қатар сүт сауымы өте төмен болды. Өнімділіктің сүт бағытындағы осындай шаруа қожалықтарында сүт өнімділігі бойынша әртүрлі популяциядағы түйелердің генетикалық ресурстарында өзіндік өзгешеліктері бар. Сонымен бірге сүт индустриясын дамытуда сауынды аруана тұқымының түйелерін Қазақстанның оңтүстігінде өсіруде тиімді болып саналады. Жалпы сауынды арттыруда олардың осындай жоғары вариациясын ілгеріде қалыпты ұстау қажет, себебі ол іріктеудің көзі болып табылады. Сауынның өзгеруі мен өнімділік деңгейі арасындағы оң байланыс, азықтандыру мен бағуды жақсартудың түрлерін көбейтуге сенім арттырылады, нәтижесінде селекциялық дифференциал жоғарылап, ақырында, іріктеу нәтижелігі өседі. Осы зерттеу жұмыста сүт өнімділігін бағалау арқылы әртүрлі гендік типтегі түйелердің селекциялық және тұқымдық табындары қалыптастырылды.

*Кілт сөздер:* сүт өнімділігі, түйе, қазақ популяциясы, генетикалық қорлар, өнімдік деңгейі.

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### Молочная продуктивность генетических ресурсов верблюдов селекционного стада на юге Казахстана

Для увеличения производства верблюжьего молока и мяса в Казахстане необходимо расширение ареала разведения отечественных пород верблюдов. В целях совершенствования зоотехнологических параметров и повышения продуктивности казахских бактрианов и туркменских дромедаров необходимо проведение мероприятий по разработке селекционных аспектов выведения высокопродуктивных генотипов верблюдов с учетом имеющегося генофонда чистопородных и гибридных животных. В селекционных целях необходимо использовать породы верблюдов с ограниченным генофондом и те породы, которые встречаются только в Казахстане. Целью данной работы является определение особенностей молочной продуктивности генетических ресурсов верблюдов казахской популяции арвана и бактриан для разработки селекционных аспектов выведения высокопродуктивных генотипов верблюдов с учетом имеющегося генофонда чистопородных и гибридных верблюдов Южно-Казахстанской, Жамбылской и Алматинской областей. Для установления молочной продуктивности верблюдов был проведен мониторинг по определению среднесуточного удоя и жирности молока в специализированных верблюдоводческих крестьянских хозяйствах «Сыздықбеков А», «Усенов Н», «Даулет-Бекет» и «Бағдат», для чего был проведен индивидуальный учет удоя молока у подопытных верблюдиц. Данные исследования молочной продуктивности верблюдиц дойного стада свидетельствуют о высоком содержании жира в молоке казахского бактриана, вместе с тем удой молока у данной породы является очень низким. В базовых хозяйствах молочного направления генетические ресурсы верблюдов разных популяций по молочной продуктивности имеют свои генетические особенности. При этом дойные верблюдицы породы арвана являются эффективными для разведения на юге Казахстана в развитии молочной индустрии. Положительная связь изменчивости удоя и уровня продуктивности позволяет надеяться на значительное увеличение разнообразия при улучшении кормления. В данной исследовательской работе сформированы селекционные и племенные стада верблюдов разных генотипов путем оценки молочной продуктивности.

*Ключевые слова:* молочная продуктивность, верблюд, казахская популяция, генетический ресурс, уровень продуктивности.

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