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**“MOLECULAR GENETIC STUDIES OF THE BUSHUEV BREED OF CATTLE
IN UZBEKISTAN”**

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Annotation: Preliminary results of molecular genetic studies of the Bushuev cattle breed, which is on the verge of extinction, are presented as part of the scientific and practical project “Development of molecular panels for genetic certification of unique breeds of animals.”

The project is being carried out with the aim of preserving the valuable gene pool of the Bushuev breed, the only one bred in Uzbekistan, developing molecular panels for genetic certification and early prediction of breeding and productive qualities of animals.

In molecular genetic studies, which are being carried out on cattle for the first time in the republic, microsatellite DNA markers (short tandem repeats (STR), SNP and InDel markers) will be used.

At the first stage, stud bulls of the state breeding enterprise “Uznaslchilik” were selected for research and used for semen selection. Blood samples were taken from animals. Amplification of DNA fragments was carried out using the Rotor-Gene Q software apparatus from QIAGEN Hilden, Germany. Using invitrogen reagents from Thermo Fisher Scientific (USA), DNA from the blood of Bushuev breed bulls was isolated.

Preliminary findings have shown that the higher the level of purebred, the higher the genetic potential of the animals. Final conclusions based on the results of molecular genetic studies will be made after genotyping of animals is completed. Molecular genetic research continues.

Key words: Bushuev breed, gene pool, molecular genetic research, DNA, markers, genetic passport.

INTRODUCTION. The problem of preserving and restoring the genetic diversity of animals, especially endangered breeds, has now become a priority and is receiving great attention all over the world, including in Uzbekistan.

The Bushuev breed of cattle is one of the unique breeds of cattle breed in Uzbekistan. This breed has a number of advantages. Bushuev cattle differ from other breeds with their good adaptation to the hot conditions of the republic and resistance to parasitic blood diseases.

However, unfortunately, the number of this unique breed of cattle in the republic is sharply decreasing, the breed is on the verge of extinction. In the breeding farms of the republic, the number of purebred cows and heifers older than two years of the Bushuev breed today is less than 500 heads. Therefore, it is not for nothing that scientists note that the Bushuev breed was created within 65 years, but for 55 years they left it without attention, only exploited it.

According to S.A. Dankvert, S.K. Okhupkin, I.M. Dunin and others, the most common is the following classification of the quantitative status of breeds: Unreliable status. The number of females is 1000-5000 heads. The number of animals is rapidly declining.

1. Threatening status. The number of females is 100-1000 heads. The population is in danger of extinction; its size is insufficient to compensate for genetic losses. The degree of inbreeding increases and the viability of animals decreases.

2. Critical status. The number of females is less than 100 heads. The population is on the verge of extinction.

RELEVANCE OF THE TOPIC. To preserve the valuable gene pool of the Bushuev breed, it is necessary to conduct molecular genetic research, restore breeding farms for raising replacement heifers, and carry out purebred livestock breeding. In terms of fatty milk content, this breed ranks first among dairy and meat and dairy cattle breeds in Uzbekistan. The milk productivity of some record-breaking cows of this breed in the country's breeding farms previously amounted to 10-10.6 thousand kg per year. Under normal conditions of feeding, housing and selection and breeding work, each Bushuev cow produces an average of 3100-3400 kg of milk per year. It was registered as a breed in 1967.

The use of molecular methods and genetic markers in predicting the breeding and productive qualities of cattle is undoubtedly the greatest achievement of modern genetics.

Molecular genetic analysis methods based on the polymorphic nature of DNA make it possible to use certain genes that control the formation of economically useful traits in farm animals, despite the fact that most economically valuable indicators are quantitative traits, for the development and manifestation of which many genes are responsible. However, to date, a certain number of genes have been identified that have a pronounced effect on the phenotype of the animal. Such genes are usually called target genes, and they should be considered as DNA markers for assessing breeding traits of farm animals.

Using DNA markers, it is possible to estimate the frequency of preferred alleles for a breed or line, and taking this into account, animals are getting selected to increase the concentration of the desired allele in the studied population.

Microsatellite DNA markers (short tandem repeats, STR), SNP and InDel markers are widely used as genetic markers in world practice.

Currently, there are several dozen types of molecular markers. Microsatellites are repeating sections of DNA 2-6 bp-long. Wherein, different alleles are characterized by different numbers of repeats.

According to Getmantsev O.L., Klimenko A.I. and others DNA markers have a number of advantages: they allow one to clearly distinguish a homozygous genotype from a heterozygous one, are not influenced by environmental conditions and have a heritability coefficient $h^2=1,0$. In addition, DNA markers, as a rule, are determined regardless of age (in embryonic cells, in blood samples, animal tissue, etc.) and can be determined in both genders of the animal. Finally, it allows marking of a trait that can be determined after slaughter.

The introduction of these genetic markers into selection and breeding work allows for early prediction of breeding and productive performance of animals, as well as using this information to determine the hereditary potential of the Bushuev breed, increasing the accuracy of assessment and the efficiency of selection results.

In order to preserve the valuable gene pool, genetic certification and rational use of the unique Bushuev breed of cattle, scientists from the Uzbek Research Institute of Livestock and Poultry Breeding developed a scientific and practical project on the topic "Development of molecular panels for genetic certification of unique breeds of animals" (using the example of the Bushuev breed).

THE SCIENTIFIC SIGNIFICANCE OF THE PROJECT lies in the fact that for the first time in the conditions of the Republic of Uzbekistan, a genetic passport of the Bushuev breed

will be developed, polymorphisms of the kappa-casein (CSN3), beta-casein (CSN2), beta-lactoglobulin (BLG), alpha-lacto albumin (LALBA and others, an analysis of genotypes, haplotypes and linkage disequilibrium of LD alleles in Bushuev breed cows will be carried out. The association of polymorphism of these genes with indicators of milk productivity and milk quality will be investigated.

Also, for the first time in the conditions of the Republic of Uzbekistan, an STR analysis will be carried out for the purpose of molecular genetic identification and creation of a DNA passport of the Bushuev breed, as well as characterization of its genetic diversity and the degree of genetic differentiation.

OBJECT AND METHODS OF RESEARCH. On the farms of the Syrdarya region, three groups of experimental animals of the Bushuev breed (cows and stud bulls) were formed on the principle of analogues.

At the first stage, the object of research was breeding bulls used in semen selection at the State Breeding Enterprise "Uznaslchilik", located in the Tashkent region. Blood samples were taken from animals in accordance with the established procedure. The DNA of Bushuev breed bulls was isolated using invitrogen reagents and using molecular genetic methods on a device from Thermo Fisher Scientific USA.



Figure 1. Cow and bull of the Bushuev breed.

The reaction and amplification of DNA fragments were studied on a German-made Rotor-Gene Q QIAGEN Hilden software apparatus.

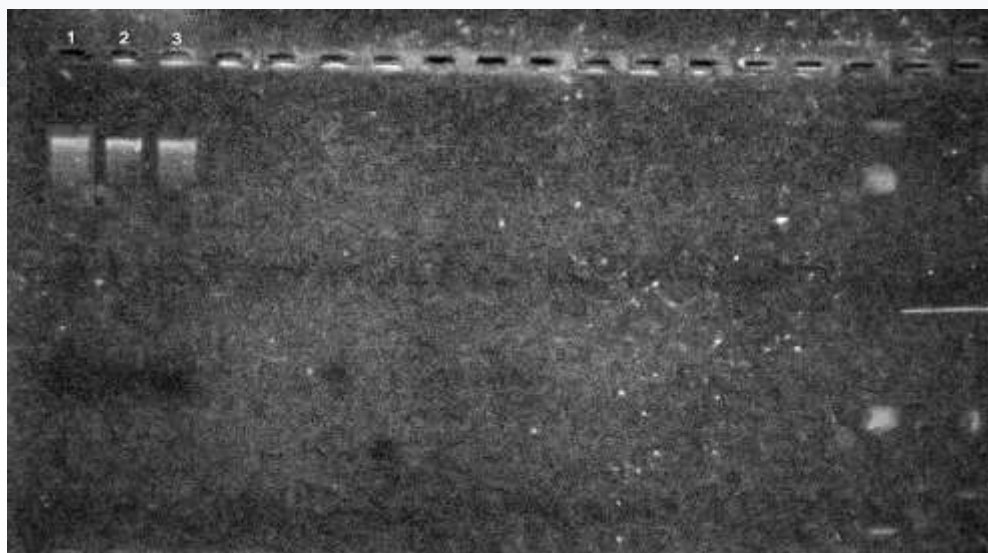


Figure 2. Electropherogram of the blood of bulls of the Bushuev breed of cattle.

PRELIMINARY RESULTS. As part of the project, scientists from the Research Institute of Livestock and Poultry Breeding, as well as the Institute of Genetics of Experimental Plant Biology of the Academy of Sciences of the Republic of Uzbekistan, took blood samples from bulls of the Bushuev breed used in the State Breeding Enterprise "Uznaslichilik", located in the Tashkent region, and carried out the first genetic research. Using invitrogen reagents from Thermo Fisher Scientific (USA), DNA from the blood of Bushuev breed bulls was isolated (Fig. 2).

CONCLUSIONS. Preliminary findings have shown that the higher the level of purebred, the higher the genetic potential of the animals.

Final conclusions based on the results of molecular genetic research of the Bushuev breed in Uzbekistan will be made after the completion of genetic analyzes of the animals.

As a result of the implementation of this project, for the first time in Uzbekistan, molecular panels for genetic certification of animals will be developed using the example of the unique Bushuev breed of cattle. A genetic data bank of biomaterials of the unique Bushuev breed will be created.

Molecular genetic research of the domestic Bushuev breed is the basis for preserving its valuable gene pool, for identification and genotyping at the population level and for further effective selection and breeding work. Molecular genetic research and experiments continue.

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