



Molecular Genetic Studies with the Bushuev Breed of Uzbekistan

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Abstract: The article presents the preliminary results of molecular genetic studies of the blood of breeding bulls-producers of the local Bushuy breed of cattle for the purpose of their genetic certification and early prediction of breeding and productive qualities.

Keywords: Bushuev breed, gene pool, molecular genetic studies, DNA markers, genetic passport, breeding.

Introduction

The fundamental problem of increasing the efficiency of the breeding process is the study of the formation of high productivity of agricultural animals. Under absolutely equal conditions of feeding and maintenance, the phenotypic differences (economically useful signs) of the evaluated animals will be largely determined by differences in their molecular genetic level, that is, the best animals in terms of their own productivity in this case will have the best genes, as well as a certain combination of them that determines this productivity. However, the offspring of these animals will not necessarily have the same high productivity, because in the process of gamete formation, a successful combination of genes in them may collapse. In this regard, when selecting animals, it is necessary to evaluate the genetic structure and further calculate the appropriate selection schemes to create the necessary best combinations.

Molecular genetic methods of analysis based on the polymorphic nature of DNA allow the use of certain genes that control the formation of economically significant traits of agricultural animals. Despite the fact that most economically valuable indicators are quantitative signs, for the development and manifestation of which many genes are responsible.

However, to date, several genes have been identified that have a pronounced effect on the phenotype of the animal. Such genes are commonly referred to as target genes and they should be considered as DNA markers in breeding traits of C.x. animals. The introduction of these genetic markers into breeding work allows early prediction of breeding and productive indicators of animals, as well as using this information about the hereditary potential of selected animals, to increase the accuracy of evaluation and efficiency of breeding results.

Polemerase chain reaction (PCR) is an elegant method that mimics the natural replication of DNA in the presence of millions of molecules.

The Relevance of the Topic. The problem of preserving and restoring the genetic diversity of animals has now become a priority and is receiving great attention all over the world. The use of molecular methods and genetic markers in predicting breeding and productive qualities of cattle is undoubtedly the greatest achievement of modern genetics.

The genome of S.H. animals has millions of point mutations. With the help of DNA markers, it is possible to estimate the frequency of preferred alleles for a breed or lines, and with this in mind, conduct animal breeding in order to increase the concentration of the desired allele in the studied population.

DNA markers have a number of advantages:

1. Allows you to uniquely distinguish a homozygous genotype from a heterozygous one.
2. They are not affected by environmental conditions and have a heritability coefficient $h^2 = 1.0$.
3. As a rule, they are determined regardless of age (in embryo cells, in blood samples, animal tissue, etc.).
4. Can be determined in both sexes of the animal.
5. Marking of a trait that can be determined after slaughter.

Currently, there are several dozen types of molecular markers. Microsatellites are repetitive sections of DNA with a length of 2-6 bp. At the same time, different alleles are characterized by a different number of repeats.

Microsatellite DNA markers (short tandem repeats) are widely used as genetic markers in world practice (short tandem repeats, STR), SNP and InDel markers. STR (short tandem repeats) DNA markers are widely used in many aspects of population-genetic research: assessment of purebredness, control of the reliability of origin, determination of the degree of inbreeding, characterization of biodiversity and the degree of genetic differentiation of breeds and intrabreed genetic structures.

The International Society of Animal Genetics (ISAG) has recommended a total of 12 STR loci for routine use in testing and identification of cattle.

Microsatellites are used to determine the degree of heterozygosity of small populations, breeds, lines and groups, to assess the reliability of the origin of agricultural animals.

Microsatellites or SSR (Simple Sequence Repeats) or STR (Simple Tandem Repeats) consist of DNA sections 2-6 nucleotides long (base pairs – P.O., or base pairs – bp) repeated many times by tandem type (for example, CACACACACACACA). They are distributed throughout the eukaryotic genome. Microsatellites are hypervariable; they often have dozens of alleles at one locus, differing from each other in the number of repeats. In order to assess the genetic potential of breeding-significant traits of agricultural animals, studies are conducted to identify informative single nucleotide polymorphisms (SNP).

Currently, more than 2000 microsatellites have been isolated and described in the genome of cattle (INRA database, France) and their number is increasing every day. Molecular genetic studies of the domestic Bushuev breed are the basis for preserving its valuable gene pool, for identification and genotyping at the population level and for further effective breeding work.

Measures Taken. Molecular genetic studies for the purpose of genetic certification of cattle have not yet been conducted in Uzbekistan. In order to preserve and restore the gene pool and rational use of the unique Bushuyevsky cattle breed, scientists of the Research Institute of Animal Husbandry and Poultry Farming have developed a scientific and practical project on the topic “Development of molecular panels for genetic certification of unique animal breeds” (using the example of the unique Bushuyevsky breed).

The Bushuev breed of cattle is one of the unique breeds of cattle bred in Uzbekistan. It was registered as a breed in 1967. It differs from other breeds in its good adaptation to the hot conditions of the republic and resistance to parasitic blood diseases. The milk productivity of some record-breaking cows of this breed in the breeding farms of the country amounted to 10-10,6 thousand kg per year. Under normal conditions of feeding, maintenance and breeding work, an average of 3100-3400 thousand kg of milk per year is produced from Bushuyev cows.

In recent years, in Uzbekistan, due to the import of other highly productive cattle breeds and the reduction of forage crop areas in many farms, the livestock of this breed has sharply decreased. The number of purebred cows of the Bushuyev breed today is less than 500 heads.

Picture 1

Picture 1. Cow and bull producer of the Uzbek Bushuev breed

Based on this, it is possible to judge what threatening status the unique Bushuev breed of cattle has today in the republic. Therefore, it is necessary to take all urgent measures to prevent the reduction of the number of purebred animals of this breed, especially cows and female calves.

The scientific significance of the project lies in the fact that for the first time in the conditions of the Republic of Uzbekistan, the polymorphism of the genes of kappa - casein (CSN3), beta-casein (CSN2), beta-lactoglobulin (BLG), alpha-lactoalbumin (LALBA and others will be studied, the analysis of genotypes, haplotypes and nonequilibrium coupling of LD alleles in cows of Bushuevskaya breeds. 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, a 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 characteristics of its genetic diversity and degree of genetic differentiation.

Preliminary Results and Conclusions

The project has not been funded yet. However, within the framework of the project, scientists of the Scientific Research Institute of Animal Husbandry and Poultry Farming, as well as the Institute of Genetics of Experimental Plant Biology of the Academy of Sciences of the Republic of Uzbekistan conducted the first genetic studies of the blood of bulls-producers of the Bushuev breed grown in the State-owned Enterprise "Iznislchilik" located in the Tashkent region. Blood samples were taken from animals. With the help of invitrogen reagents from Thermo Fisher Scientific (USA), the DNA of the blood of bulls-producers of the Bushuev breed was isolated.

Preliminary Conclusions

Preliminary molecular genetic studies have shown that the higher the breed of animals, the higher their breeding and productive indicators. Molecular genetic research continues.

As a result of the implementation of this project, for the first time in Uzbekistan, molecular panels for the genetic certification of animals will be developed on the example of the unique Bushuev breed of cattle. Taking into account the above, the implementation of this project is of great importance for the preservation and restoration of the gene pool and the rational use of the unique Bushuev cattle breed.

We hope that this project will be funded in the near future, the implementation of which opens up opportunities for the genetic certification of the unique Bushuev breed and the preservation of its valuable gene pool.

Used Literature:

1. [Ashirov M.E.], Ashirov B. M., Yuldashev A.A. "Breeding of Holstein cattle in Uzbekistan" Monograph, Tashkent 2020.

2. Getmantseva O.L., Klimenko A.I. et al. "Molecular genetic studies of farm animals by PCR-PDRF" Study guide. Donskoy GAU, Persianovsky, 2018. - 119 p.
3. Giyasov H.A., Boybulov B.S. "Let's save the Bushuev breed of cattle" Zh. "Animal husbandry and breeding business" Tashkent, 2021, No. 03, pp. 8-11.