ANNOTATION

Dissertation work the «Productive and technological features of Holstein cows in conditions of the Northern Kazakhstan» Kazhiyakbarova Aigerim, presented for the degree of Doctor of Philosophy (PhD) in the educational program 8D08201 – Technology of livestock production

Relevance of the research topic. In the current context of implementing the state program «Strategy Kazakhstan-2050» – a new political course for an established state, special attention is paid to improving the efficiency of the agro-industrial complex and developing dairy cattle breeding as a key area for ensuring the country's food security. The growth of milk production and improvement of its quality directly depend on the introduction of scientifically based technologies, targeted breeding and selection work, ensuring veterinary welfare, and the rational use of highly productive livestock breeds.

One of the key areas of development in the industry is the use of the Holstein breed, which has high genetic potential for milk production and is suitable for industrial milk production. Currently, the Holstein breed occupies a leading position in the structure of Kazakhstan's dairy livestock, especially in the northern regions of the country, where high-tech dairy complexes are actively developing. However, despite all the advantages of this breed, the question of the manifestation of genetic potential within the breed remains unresolved.

The development of the dairy cattle industry worldwide is characterized by the intensification of breeding processes. In order to increase the profitability of milk production, linear and genomic selection, improved methods of breeding evaluation, and various breeding programs are widely used. In this regard, the relevance of these studies is determined by the need to apply scientifically based approaches to the evaluation and selection of Holstein cattle in Northern Kazakhstan, taking into account not only milk productivity but also technological qualities. Of particular importance in studying the productive qualities of dairy cattle is the method of genomic selection, based on DNA (genotype) analysis for accurate determination of breeding value and acceleration of selection. As studies by many scientists show, linear and marker selection provides more sustainable and greater genetic progress in animal breeding and productivity.

Purpose of the work: Comprehensive study and evaluation of the productive and technological qualities of Holstein cattle of various linear affiliation in the conditions of Northern Kazakhstan.

Research objectives:

- to analyze the genealogical structure of the brood herd;
- to study the milk productivity and quality of first-calf Holstein cows in terms of lineage;
- to determine the relationship between the growth hormone gene association and milk productivity;
- conduct a linear evaluation, study the exterior and constitutional characteristics of first-calf heifers;

- study the technological qualities of cows at first calving;

- study the effect of vitamin and mineral nutrition on animal health indicators;

- calculate the economic efficiency of milk production.

Research Methods

The study was conducted at LLP «Bek+» in the Fedorovsky District of Kostanay Region on first-lactation Holstein cows of various lineages. Experimental groups were formed taking into account the origin, age, body weight, and physiological condition of the animals, ensuring the comparability of the studied groups.

Standard zootechnical, selection-genetic, and biochemical methods were applied during the research. The productive qualities of the animals were assessed based on milk yield indicators (lactation yield, fat and protein content in milk) as well as changes in body weight. Exterior and constitutional traits were studied using a linear evaluation method, including measurements of major body parts and visual assessment.

Biochemical blood parameters were determined at the Laboratory of the Research Institute of Animal Husbandry using modern automated analyzers, which allowed an objective assessment of the metabolic level and physiological condition of the animals. Blood sampling was carried out in the morning while adhering to veterinary and sanitary requirements.

The obtained experimental data were processed using variational statistical methods with computer programs, calculating mean values, standard deviations, and the level of reliability of differences.

Main points to be defended:

- Milk productivity and milk quality;

- The influence of the growth hormone gene genotype on the milk productivity indicators of cows;

- The results of linear evaluation and the exterior and constitutional characteristics of first-calf heifers;

- The morphofunctional characteristics of the udders of first-calf heifers and their relationship to productivity indicators;

- The economic efficiency of using Holstein cows.

Description of the main results of the work.

The main findings and conclusions of the dissertation have undergone thorough testing and have been published in 13 scientific papers.

The key research results were publicly presented at international scientific and practical conferences:

- in the materials of the international scientific and practical conference «Baitursynov Readings - 2019», ISBN 978-601-7985-38-7, April 26, 2019, Kostanay;

- in the materials of the II International Scientific and Practical Conference «Modern Problems of Animal Husbandry,» dedicated to the memory of Doctor of Agricultural Sciences Professor Bakytzhan Muslimovich Muslimov, November 14, 2019, Kostanay;

- in the materials of the international scientific and practical conference «Baitursynov Readings - 2020» ISBN 978-601-7597-76-4 on the topic: «The teachings of the great figures of the great steppe and new opportunities for the modernization of Kazakhstani society: education, science, and spirituality in the context of globalization,» April 24, 2020, Kostanay;

- in the materials of the international scientific and practical conference «Prospects for the Development of Livestock Breeding,» dedicated to the celebration of the 80th anniversary of Doctor of Agricultural Sciences, Professor Naimanov Doskali Kurmashevich ISBN 978-601-7640-53-8, October 9, 2020, Kostanay.

The research results are reflected in five printed works, four of which are in publications recommended by KOKSONVO MNVO RK, one article in journals reviewed in the Russian Science Citation Index system, one article in the journal Archives Animal Breeding, which is included in the Web of Science and Scopus databases (Impact factor 2023 1.8, quartile Q2, percentile 34), and one article in the journal Ecology. Environment and Conservation Paper, which is included in the Scopus database.

1 utility model patent No. 5284 «Biologically active feed additive for increasing the productive longevity of dairy cattle.» Authors: Musaeva G.K., Shaykamal G.I., Papusha N.V., Aitzhanova I.N., Kazhiyakbarova A.T.; 1 certificate of entry of information into the state register of rights to copyrighted objects No. 6365 dated November 11, 2019. «The effect of the length of the service period on the productive longevity of Holstein cows.» Authors: Musaeva G.K., Shaykamal G.I., Aitzhanova I.N., Kazhiyakbarova A.T., Papusha N.V.

The results of the doctoral dissertation have been incorporated into the educational process based on the decision of the Department of Food Security and Biotechnology, protocol No. 5 dated May 21, 2025. The main outcome of this implementation is the breeding program “Program for the Improvement of the Holstein Breed of Cattle in Kazakhstan for 2021–2025,” which was approved and recommended for publication by the Educational and Methodological Council of A. Baitursynov Kostanay State University on May 13, 2020, protocol No. 5.

The results of the conducted research have also been implemented in the activities of the LLP and are applied both in the practical work of the farm specialists and in the theoretical and methodological support of production processes, contributing to the improvement of the efficiency of dairy cattle farming.

Justification of the originality and practical significance of the results obtained.

Scientific novelty of the research. As a result of the research, a comprehensive characterization of first-calf heifers was carried out based on a combination of phenotypic and technological traits in conjunction with bGH and bIGF-1 markers, which provides a more accurate interpretation of genetic predisposition to milk production. For the first time, a selection scheme combining linear selection with marker selection (bIGF-1 AA; bGH LV) has been proposed for the brood herd.

Practical and theoretical significance of the work. The results of the study have direct application in dairy cattle breeding and selection. When selecting semen from breeding bulls, taking into account the genotype of animals based on the polymorphism of the bGH-AluI^{LV} gene will allow breeders to select animals with an optimal combination of productive and technological qualities. Including individuals with optimal variants of this gene in the breeding program will make it possible to: increase the genetic potential of the herd; improve milk quality by increasing protein and dry matter content; increase the economic efficiency of milk production by increasing milk yield and reducing production costs.

The results of the study will contribute to:

- improving the system of selection and recruitment of animals in the selection of the brood herd;
- the formation of technologically uniform herds suitable for industrial milking;
- the increase in the realization of genetic potential for milk productivity;
- the reduction of production losses associated with udder and limb diseases;
- the increase in the economic efficiency of dairy farming in the region.

Compliance with the directions of science development or state programs.

The dissertation was carried out within the framework of program-targeted financing by the Ministry of Agriculture of the Republic of Kazakhstan under project BR06249373 «Improving the Efficiency of Selection Methods in Animal Husbandry» project No. 2 «Development of Effective Selection Methods in the Dairy Cattle Industry» 2018–2021, as well as within the framework of contractual research works.

Compliance of the dissertation with state programs:

The work was carried out under the scientific and technical program BR06249373 «Improving the Efficiency of Breeding Methods in Cattle Husbandry» within the framework of the program-targeted funding of Budget Program 267 «Enhancing the Accessibility of Knowledge and Scientific Research» of the Ministry of Agriculture of the Republic of Kazakhstan, under Subprogram 101 «Program-Targeted Funding of Scientific Research and Activities», within Expenditure Category 156 «Payment for Consulting Services and Research», as part of Project No. 2 «Development of Efficient Breeding Methods in the Dairy Cattle Industry», according to Contract No. 15 dated September 26, 2018.

Contribution of the Doctoral Candidate to the Preparation of Each Publication

The doctoral candidate actively participated in all stages of the dissertation research. The author personally carried out the collection of primary zootechnical data, recorded productivity, assessed exterior and constitutional traits, and collected biological material for laboratory studies. The main contribution of the doctoral candidate also included obtaining, analyzing, and summarizing experimental data, preparing and formatting scientific publications, and presenting the research results; the co-authors' participation was of a consultative nature.

Scope and structure of the dissertation. The dissertation is presented in 110 pages of computer-typed text. It consists of an introduction, a literature review, materials and results of the author's own research, and a conclusion. The work includes 157 references, 21 tables, 9 figures, and 6 appendices.