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FEEDING HOLSTEINIZED BLACK-AND-WHITE DAIRY COWS DURING THE LACTATION PERIOD

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Abstract. This article studies the effect of feeding Holstein black-and-white cows during lactation on milk yield and physiological status. The study developed balanced diets in accordance with the stages of lactation of cows and analyzed their need for energy, protein, minerals and vitamins. The effect of feeding on milk quantity, quality and metabolic processes was evaluated using the example of control and experimental groups. The results showed that full-value and balanced feeding helps to fully reveal the genetic potential of cows, increase milk yield by 15–25% and reduce the risk of metabolic diseases. It was found that diets enriched with energy and protein, especially in the early stages of lactation, provide high efficiency. The results obtained demonstrate the practical importance of introducing modern feeding technologies in dairy farming.
Keywords: Lactation period, Holstein-Fried Black and White, milk yield, feeding ration, metabolic energy, crude protein, minerals, vitamins, BLUP, genomic selection, marker-associated selection, milk quality, cow physiology.

Login. Currently, the steady growth of the world population makes the issue of ensuring food security one of the urgent strategic tasks. In this process, the livestock industry, in particular dairy farming, plays an important role in providing people with complete food products. Milk and dairy products have high biological value and are a source of protein, fat, carbohydrates, vitamins and minerals necessary for the human body. In recent years, scientific research has been intensifying to increase the productivity of dairy cattle, fully reveal their genetic potential and sustainably improve lactation indicators. Along with traditional selection methods, modern methods such as molecular genetic approaches, marker-associated selection (MAS), genomic selection, genetic indices and BLUP (Best Linear Unbiased Prediction)-based evaluation are being widely implemented.

Relevance of the topic. Currently, the annual volume of milk production in the world is very large and is approximately 900-950 million tons per year. This figure changes every year, as climate change, the development of livestock technologies and the demand for milk affect it. The leading countries in milk production are: India produces approximately 220-230 million tons per year, the United States of America produces approximately 100 million tons per year, and the People's Republic of China produces approximately 40-50 million tons of milk per year. In the country of Brazil 35-40 million tons and in the Russian Federation 30-35 million tons produces milk . In this regard, Germany, France and the Netherlands are the leaders in milk production among European countries . Approximately 81% of the milk consumed worldwide is % cow 's milk, 15 % buffalo milk, remaining 4 % i is accounted for by sheep,

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goat, and camel milk. Increasing milk production and reducing the cost of a unit of product on a global scale is one of the main challenges facing livestock farming. Climate change, limited forage resources, and environmental sustainability demands require high productivity from dairy cattle. In developed countries, programs based on genetic selection methods are gaining importance in overcoming these problems.

Main research : A number of scientific research works have been carried out in our republic and foreign countries to increase milk productivity, improve fertility, udder and other characteristics of Holstein cows, improve the breed, and create high-yielding herds, and their results have been recommended for production. The scientific research of our republic and foreign scientists Sh.A. Akmalkhonov, EYKarchevsky, MEAshirov, UNNosirov, I.Maqsudov, BUKHidirov, U.Sh.Ballasov, BMAshirov, KhG'iyosov, LKErnst, AIBich, NIStrekozov, ZHGLoginov, PNPProkhorenko, LZhebrovsky, AVEgiazaryan and others has revealed the effectiveness of improving the Holstein breed and using the potential of this breed in crossbreeding. The results of the research of these scientists show that Holstein cattle are an improving breed, regardless of the breeding region. These data indicate that the use of Holstein cattle in purebred breeding and crossbreeding is of significant practical importance in creating productive breeding farms, improving the productivity characteristics of local breeds, and creating new types and herds of them.

The object of the research is - Holstein-bred black-spotted dairy cattle from the Jamol Ota breeding farm in Yangiyul district of Tashkent region and their milk productivity were selected.

Subject of the study Lactation performance of dairy cows and their relationship to genetic selection methods.

Research methods. This study used general methods used in general zootechnics. In studying the research questions, general zootechnical methods were used: keeping and feeding dairy cows, milk productivity and its quality. Milk quality indicators were determined at the beginning, middle and end of the experiments: fat content, density, dry matter, skimmed milk solids, sugar content in the milk of 10 cows of the groups in the laboratory, based on the standard requirements for nutrient analysis, in the laboratory of “Zamona Ra'no”, “NANOGEN LAB” LLC and in the milk analyzer “Laktan” using the generally accepted methods of PT Lebedev, ATUsovich (1976), VA Petukhova et al. (1981); morphological and biochemical indicators of the blood of cows at the beginning and end of the experiment were determined by counting the formed elements in the Goryaev chamber, hemoglobin by the Sali method, sugar content by the Hagedron-Jensen method, protein by measurements in a refractometer, calcium by the de-Vaard method, phosphorus by the R.Ch. Yudelevich method, statistical processing of the indicators: arithmetic mean and its error, reliability level of the difference between groups (YKMerkureva, 1970, NAPlakhinsky. 1969) and economic (total costs, cost of 1 s of product, purchase price, net profit, efficiency level) methods were used. The study uses a comprehensive set of modern genetic selection methods to assess lactation indicators of dairy cows. In particular, marker-associated selection (MAS), genomic selection and BLUP methods are considered the main methodological approaches.

Marker-associated selection (MAS) is a method based on the identification of genes and genetic markers associated with milk production and their use in the selection process. This method allows the selection of high-yielding genotypes at an early age, without waiting for the full manifestation of phenotypic indicators of animals.

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In genomic selection, thousands of DNA markers are analyzed across the entire genome to determine a genomic evaluation value (GEBV). This method significantly increases the accuracy of selection and reduces the generation interval.

The BLUP (Best Linear Unbiased Prediction) method allows for the estimation of the genetic value of dairy cows based on a statistical model. This method takes into account the individual productivity of the animal, the indicators of its ancestors and relatives, and minimizes the influence of environmental factors.

The feeding of cows in the experimental groups was organized taking into account their live weight, milk yield, and physiological condition, and their housing conditions were the same.

In the studies, the milk yield of cows was determined by conducting control milking. The fat and protein content of milk was determined using methods generally accepted in zootechnics.

Milk fat and protein yield, 4% milk yield, and milk yield coefficient were determined using generally accepted methods in zootechnics.

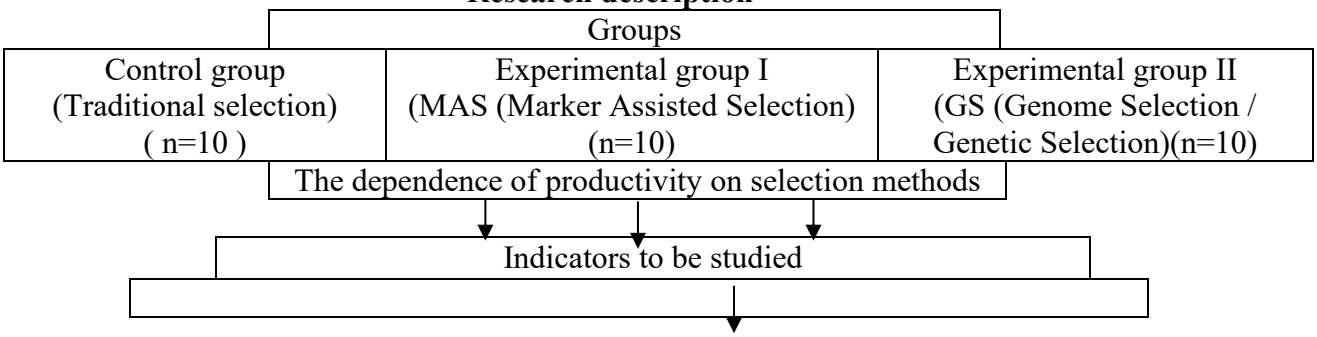
Dry matter and skimmed milk solids in milk were determined by the method of NV Barabanshikov (1986).

The obtained data is processed using biometric and statistical methods, and the reliability of the results is assessed using variance analysis, correlation, and regression methods.

The diet of cows in the control and experimental groups was adjusted for macro- and microelements according to the standards recommended by AP Kalashnikov (1985). The morphological and functional characteristics of the udder of cows in the experimental groups were studied in the third month of lactation according to the methodological manual "Assessment of udder and milk production of dairy and meat-producing cows" (M., 1970).

Procedure for conducting experiments: Scientific research was conducted on Holstein-bred cows at the "Jamol ota chorva nasl" breeding farm in Yangiyul district of Tashkent region during 2023-2025. Based on the requirements for similarity traits, 3 groups of 10 heads each were selected for the experiment, taking into account the origin, age, live weight, and milk productivity of their mothers. The research was carried out according to the following diagram (picture).

Research description



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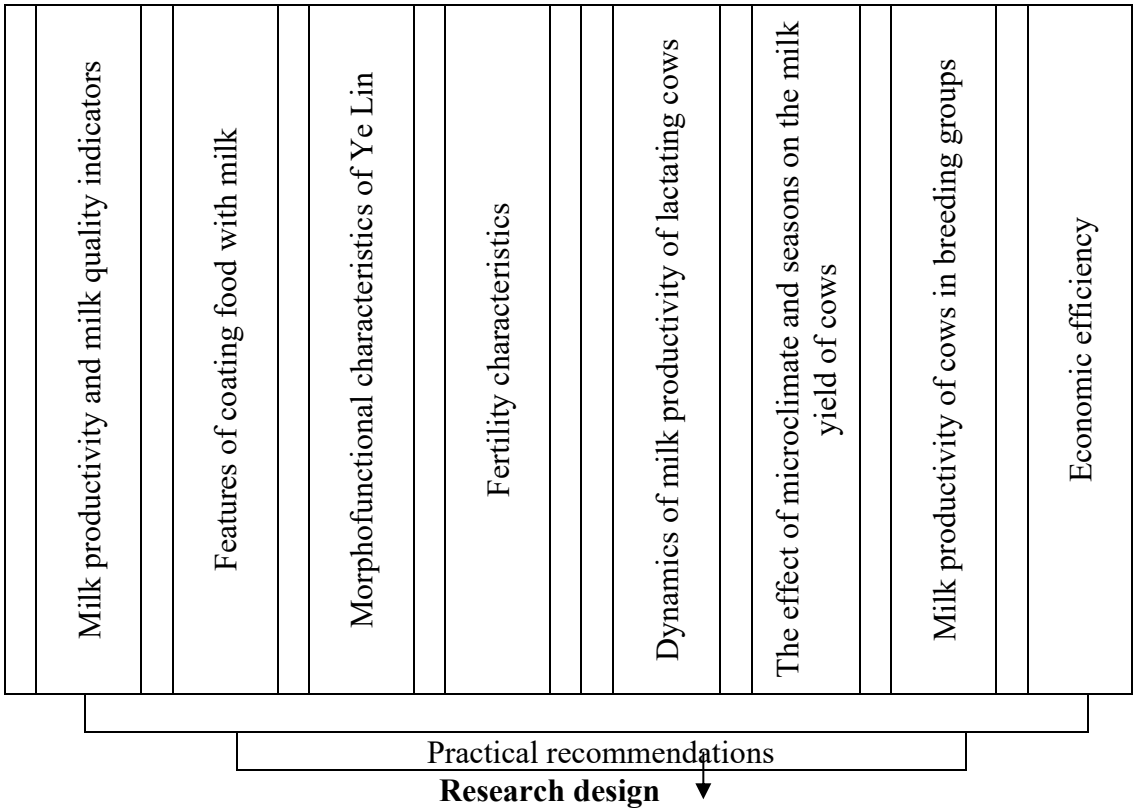

Group name	Structure	Number of cows
Control group	Traditional selection	n = 10
Experimental group I	MAS (Marker Assisted Selection)	n = 10
Experimental group II	GS (Genome Selection / Genetic Selection)	n = 10

Feeding Holsteinized Black-and-White Dairy Cows During the Lactation Period

Lactation is the most metabolically intensive stage for cows. Especially high-yielding Holstein cows require a lot of energy and nutrients. Properly balanced nutrition during lactation plays an important role in maintaining health, achieving maximum milk yield and ensuring long-term productivity.

Because Holstein-Friesian cows have a relatively large body size, their basal metabolic energy requirements are also high. Energy deficits are particularly common during the first 100 days of lactation (first lactation), leading to a negative energy balance.

Metabolic energy requirement: Daily metabolic energy requirement for Holstein black-and-white cows during lactation may range from 40–65 MJ, depending on the cow's body weight, stage of lactation, and milk yield.

Crude protein content: A quality lactation diet should have a crude protein content of around 15 - 18%. Low protein feeds cause tissue catabolism in the body.

Holstein-Friesian cows generally respond well to a mixed diet, which means a balanced supply of quality hay, silage, and strong concentrates.

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Silage and forage: At least 40% of the lactation diet should be forage (silage, hay, forage) . This ensures healthy fermentation and prevents acidity.

Concentrates: To ensure healthy lactation, an average of 300-350 g of concentrates is required per 1 liter of milk. That is, if a cow produces 25 liters of milk per day, 7.5 - 8.5 kg of concentrates are required.

Holstein-bred black-and-white cows have a sharp increase in their need for minerals such as calcium, phosphorus, sodium, and magnesium during lactation. Calcium deficiency, especially at the beginning of lactation, can lead to hypocalcemia.

The ratio of calcium to phosphorus in the diet should be around 2:1.

Vitamins: Vitamins A, D, and E are important for strengthening the immune system. Vitamin E and selenium serve as natural protection against inflammation of the mammary glands (mastitis).

As a result of numerous scientific studies, it has been found that by providing optimal nutrition to Holstein-Friesian cows during lactation, it is possible to achieve a 15-25% higher milk yield. Especially when balanced mineral premixes, high-quality protein feeds (for example, soybean meal, kunjara) and glucogenic additives such as propylene glycol are used in feeding, the peak of lactation is maintained for a longer time. Cows need a large amount of calcium, phosphorus, magnesium, sodium and microelements during lactation. Mineral substances contained in Vilofos cover this need and create the necessary conditions for milk production. The fat content of milk increases by 0.1-0.2% , and the protein content by 0.05-0.1% . Due to the balance of minerals, the activity of the mammary glands improves, protein synthesis increases. **Prevents metabolic diseases** ketosis, mineral deficiency is reduced. Cow's **immunity increases ,** postpartum diseases decrease. Vitamin E and Selenium support the reproductive system, which leads to **faster recovery** If supplemented at the beginning of lactation, the cow will recover faster and **milk production will quickly reach a higher level.** And in the middle of lactation **Milk production will be stable.** When given in the last period, it ensures that **the milk volume does not decrease sharply.**

Table 1

Feeding ration of Holstein-bred black-and-white cows in the experimental period of lactation, kg

Food	Basic ration for 90 days	Basic ration for 305 days
Alfalfa hay	3, 5	3, 8
Wheat straw	5, 5	5, 7
Alfalfa hay	10, 7	1 4 , 2
Corn silage	20, 2	2 2 , 8
Beetroot	3, 2	
Corn kernels	1.1	2 .0
Barley cereal	1, 5	1, 9
Wheat bran	1, 9	1, 9
Cotton candy	1, 2	1, 3
TOTAL, kg	4 7 , 3	5 3 ,6
EOB, kg	20, 4 6	2 3 , 36
Food, kg	13.17	14.11
Exchangeable energy, Mj	1317	1411

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Dry matter, g	2250	2320
Crude protein, g	3040	3180
Digestible protein, g	2580	2671
Indigestible protein, g	390	410
Raw fiber, g	6120	6340
Digestible fiber, g	1840	1900
Sugar, g	770	800
Crude oil, g	7290	7620
C a, g	170	180
P , g	65	65
Monocalcium phosphate, g	75	75
Bentonite clay , g	65	65
Vitamin e-selenium 7 mg once a month	7	7

To increase the milk yield of cows, it is necessary to pay special attention to their nutrition, health, genetics and living conditions . The main factor that directly affects milk yield is the cow's feed ration. The ration should be rich in energy (for example, corn), high in protein (soybean meal, legumes). Vitamins and minerals, namely calcium, phosphorus, sodium, magnesium and trace elements, strengthen the health of the cow and increase the amount of milk. In addition, fibrous feeds, hay, silage and other fibrous feeds, improve the functioning of the cow's stomach. Water Cows should be provided with 50-100 liters of clean water per day, because lack of water reduces milk production.

Cows with high genetic potential have the potential to produce over 1,000 kg of milk per 100 kg of live weight during lactation.

During one lactation, a cow with a milk yield of 6,000 kg produces approximately 15,000 MJ of energy, more than 760 kg of dry matter, including 200-210 kg of protein, 210-230 kg of milk fat, 270-290 kg of lactose, and more than 35 kg of minerals.

Cattle use about 32% of the nitrogen or protein in their feed for a cow producing 4,000 kg of milk, and up to 40% or more of the nitrogen or protein for cows producing 4,000 kg or more of milk.

The feeding of dairy cows depends mainly on the total energy level and the need for dry matter digestible protein and digestible fiber, as well as minerals and vitamins. Dairy cows are fed according to their basic live weight and daily milk yield.

Additional factors include lactation period, milk fat, age, fat content, and housing conditions. In practice, the reference values given in the literature will need to be adjusted to account for the effects of these factors .

The need for feed units of dairy cows can be calculated as follows:

EOB are required per 100 kg of live weight of dairy cows ;

Effective feeding : for every 1 kg of milk - 0.5 -0.65 EOB;

After the end of the calving period, the milk yield of cows increases by an average of 2-3 EOB , and in the 1st month of lactation by 3-4 EOB . In the 2nd period of lactation, 2-3 EOB are fed, and in the 3rd month of lactation - 1-2 EOB. In the 9th and 10th months of the 1st lactation, in the last third of pregnancy, the norm for body weight gain due to intensive fetal growth increases by 0.5-1 EOB;

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Milk fat content As mentioned above, feeding standards in reference books are based on 3.8-4.0% milk fat; when milk fat content decreases by 0.5%, the feeding rate decreases by 0.5 (EOB) per 10 kg of daily milk, and if it increases, it also increases.

Providing cows in the experimental group with complete nutrition is an important factor in maximizing their productivity.

We used the same feeding regimen for dairy cows in the experimental groups. Table 3.2.2 shows the feed intake and nutritional value of the cows in the experimental groups during the 90-day lactation period.

Nutrition is crucial in fully realizing the genetic potential of cows in terms of milk production.

[4; p. 20-22] It is noted that during the 90-day lactation period, metabolic processes in the body of cows are accelerated, and as a result of these processes, milk is formed from the nutrients of the feed. Therefore, it is necessary to provide cows with full-fledged nutrition during this period, taking into account milk productivity. The fact that the diet of cows is coordinated, and the composition of the feed, along with nutrients, is provided with biologically active substances, vitamins, macro and microelements, is of particular practical importance in the wide use of their genetic potential for productivity.

Table 2.

Feed consumption of Holstein-bred black-and-white cows in the experiment at 90 and 305 days, kg

Food	Basic ration for 90 days	Basic ration 305 daily
Alfalfa hay	40 6	4 2 5
This is a beggar . straw	6 76	716
Alfalfa hay	10 94	11 34
Corn silage	2532	2649
Beetroot	912	954
Corn kernels	111	116
Barley porridge	155	162
Wheat bran	282	295
Cotton candy	164	171
TOTAL	6284	6573

Thus, the cows were fed the same grain diet throughout the experiment.

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