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## **MILK PRODUCTIVITY OF BLACK-AND-WHITE COWS AND HER CROSSBREEDS WITH HOLSTEINS**

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### **Annotation**

The article presents the results of milk productivity of purebred heifers of the black-and-white breed and its crossbreeds with holsteins. It was found that for 305 days of lactation, black-and-white cows produce an average of 7910 kg in the herd with a mass fraction of fat in milk of 3.76%. From the first heifers in the first lactation,  $7003 \pm 158.1$  kg are milked with a live weight of  $638 \pm 18.2$  kg. From full-aged cows of the 3rd and subsequent lactation,  $8178 \pm 125.9$  kg are milked with a live weight of  $697 \pm 18.4$  kg. The fat content in milk varies from 3.80% to 3.82%. Cows of the breeding core produce  $9341 \pm 184.2$  kg of milk, of the breeding group  $8921 \pm 97.7$ .

It has been established that the Holstein breed of black-and-white color has a positive effect on increasing milk yields, milk fat and protein yield during lactation, improving the technological and morpho-functional properties of the udder, as well as on the lactation curve, which is more balanced and smooth than that of domestic dairy cows.

The results of the research showed that in the herds of JSC APK "Adal" in black-and-white and Holstein cows, the duration of the service period varied from

149 to 158 days. The intercalving period ranged from 432.6 to 439.4 days, the age of the first calving in black-and-white was 843 days and holsteins were 794 days, the coefficient of reproductive ability was 0.84 and 0.83 units, which meets the requirements of highly productive dairy cattle breeding.

**Keywords:** black-and-white cattle; Holstein; dairy type; milk yield; linear; purebred.

## Introduction

Animal husbandry in the Republic of Kazakhstan is one of the strategic directions of the development of the agro-industrial complex of the country, which accounts for about 43% of the total gross agricultural output.

Dairy cattle breeding occupies a special place among the branches of productive animal husbandry and has been developed in connection with the creation of large arrays of settlements around cities of republican significance and regional centers.

As of today, 11 large-scale dairy farms have been put into operation and are steadily operating in the Republic [1].

It should be noted that the development of dairy cattle breeding, as well as animal husbandry in general, is associated with the level of application of modern resource-saving technologies, the organization of feed production, primarily the quality of harvested, produced and used feed, the efficiency of livestock reproduction and the preservation of cows and offspring [2-8].

At the present stage, the main tasks of the cattle breeder are to increase the volume of milk production, organize the cultivation of repair young cattle, reduce costs, especially feed to scientifically determined feeding standards, as well as increase the productivity of livestock

and the quality parameters of products [9].

Successful breeding and breeding work to increase the productivity of black-and-white cattle is impossible without the organization of distribution and obtaining high milk yields [10].

Of particular importance is the study of the influence of linear affiliation on milk productivity and reproductive qualities of first-heifers and full-aged cows, as well as the determination of the correlation relationship between the main economically useful traits [11, 12, 13].

At the same time, productivity also depends on the technology of directed rearing of young animals [14] and the practiced herd reproduction system [15, 16].

The problem of obtaining daughters from record-keeping cows characterized by the same high productivity and quality of milk has not been solved, and the methods for increasing the duration of use of the most valuable animals are not completely clear [17, 18].

An urgent issue is to identify the causes of early culling of cows from the herd, through comprehensive research.

The linear affiliation of dairy cattle of any breed is one of the main genetic factors that determine the productive longevity of animals and the

maximum manifestation of the genetic potential of productivity [19].

The Holstein-Frisian breed is similar in its appearance and productive qualities to black-and-white cattle and is mainly used to refresh the blood of black-and-white breeds in order to strengthen the constitution, improve the exterior, increase live weight, while preserving the fat content of black-and-white cattle.

Currently, advances in dairy cattle breeding have made it possible to receive from a cow such an amount of milk that is several times higher than the required amount for feeding a calf. Animals of this breed are characterized by a fairly high milk productivity and better meet the requirements of intensive milk production technology

Rational use of breeding resources of cattle breeding both in purebred breeding and crossing is the main direction of solving this problem [20-24].

In dairy cattle breeding in the Republic of Kazakhstan, the black-and-white breed of cattle has become widespread. The main task of breeding work with black-and-white cattle is aimed at increasing the fat content of cows' milk, as well as increasing their milk content, strengthening the constitution with a good exterior and live weight.

In this regard, the study of the milk productivity of black-and-white cows and its crossbreeds with holsteins is relevant.

### **Materials and methods**

The main studies were carried out on purebred animals of the black-and-white breed of the domestic cattle population, as well as crossbreeds of

different genotypes in the conditions of JSC "Agro-industrial Company "Adal" of the Enbekshikazakh district of the Almaty region.

Groups of animals were formed according to the principle of analogues, taking into account age, productivity for previous lactation (live weight, milk productivity) and origin.

Feeding in the agro-industrial complex "Adal" of the Enbekshikazakh district of the Almaty region and is based mainly on the production of its own feed.

On a farm of loose content, a complete feed mixture was prepared taking into account the productivity and physiological condition of cows. The main ration feed was practiced on a leash, concentrated feed was distributed taking into account the actual dairy productivity of the cow. The feed mixture was distributed twice a day, with the expectation of constant presence in the feeders.

The obtained results of scientific research were processed by the method of variational statistics described by N.A. Plokhinsky (1969) using the standard statistical analysis package Microsoft Exsel 2007 on a personal computer [25].

### **Results**

In the conditions of JSC agroindustrial Complex "Adal" dairy cattle breeding is the main branch of productive animal husbandry.

The total number of black-and-white cows in the farm is 772 heads, heifers 916 heads. For 305 days of lactation, black-and-white cows produce an average of 7910 kg of milk with a mass fraction of fat in milk of 3.76%.  $7003 \pm 158.1$  kg of milk is

milked from the first heifers in the first lactation with a live weight of  $638 \pm 18.2$  kg. From full-aged cows of the 3rd and subsequent lactation,  $8178 \pm 125.9$  kg of milk is milked with a live weight of  $697 \pm 18.4$  kg. The fat content in milk varies from 3.80% to 3.82%.

Cows of the breeding core produce  $9341 \pm 184.2$  kg of milk, of the breeding group  $8921 \pm 97.7$ .

It has been established that the Holstein breed of black-and-white color has a positive effect on increasing milk yields, milk fat and protein yield during lactation, improving the technological and morpho-functional properties of the udder, as well as on the lactation curve, which is more

balanced and smooth than that of domestic dairy cows.

Holstein cattle of the black-and-white breed are kept on the same farm with animals of the black-and-white and Alatau breeds and have a complete reproduction cycle. The maintenance of animals is year-round stall-walking.

Table 1 shows the parameters of heifers of black-and-white cattle with a milk yield of 6500 -7500 kg of milk by live weight, average daily growth, age at first insemination and height at the withers.

Table 1 – Recommended parameters of live weight of heifers of black-and-white cattle with milk yield of 7000 kg of milk (n=20)

Indicators	Parameters
6 months	$171,2 \pm 3,9$
10 months	$274,5 \pm 5,8$
12 months	$311,9 \pm 8,5$
18 months	$431,2 \pm 14,2$
At the first insemination	$384,7 \pm 18,1$
Age at first insemination, months.	$15,7 \pm 0,11$
The height of the first heifers at the withers, cm	$137,9 \pm 1,5$

So, the live weight of purebred black-and-white heifers at the age of 6 months was 171.2 kg, then at the first insemination it reached 384.7 kg, which corresponds to the breed standard.

It was found that in the herds of JSC APK "Adal" in black-and-white and Holstein cows, the duration of the service period varied from 149 to 158 days. The interbody period ranged from 432.6 to 439.4 days, the age of the first calving in black-and-white was 843 days and holsteins were 794 days, the coefficient of reproductive ability was

0.84 and 0.83 units, which meets the requirements of highly productive dairy cattle breeding.

Assessment of morphological features and functional properties of the udder was carried out on first-calf cows. Of the 59 first-calf cows examined, 94.0% had a tub-shaped udder, 6.0% - cup-shaped, there were no animals with rounded and goat-shaped udders. It has been established that the most productive cows are those with a tub-shaped and cup-shaped udder with a milk yield rate of 1.7-2.0 kg per minute. In the dairy complex

"Adal", the average daily milk yield of 59 first-calf cows during the milking period (1-100 days) was 30.3 kg of milk, the middle of lactation (101-200 days) was 26 kg, the decline in lactation (201-300 days) was 19 kg of milk, in total, an average of 7498 kg of milk for the first lactation and the average speed breast pumps 1.85 kg/min. Therefore, when selecting the first heifers of the black-and-white breed, it is necessary to take into account the shape of the udder, since it is most closely related to dairy productivity. Three-fold milking with appropriate feeding is used for the milking of first-calf cows. The condition of the first-calf cows in the lumbar, pelvic and tail attachment areas was especially monitored by an average of 3.5 points with a 5-point assessment of the condition of the animals.

Three-fold milking with appropriate feeding is used for the milking of first-calf cows. The condition of the first-calf cows in the lumbar, pelvic and tail attachment areas was especially monitored by an average of 3.25 points with a 5-point assessment of the condition of the animals.

According to the amount of daily milk yield, they were formed into groups (sections). The main feed of the diet (hay, haylage and silage) was not limited and approximately equal amounts were given to cows of all groups, of these feeds made up the main feed mixture. Taking into account the productivity of the first-calf cows, some concentrates and molasses were added to the mixture by groups. In this way, various feed mixtures were prepared for cows of sections by stages

of lactation and technological groups. The diets were balanced with compound feeds-concentrates, protein-vitamin, mineral supplements and premixes. So that the first-calf cows could eat more concentrates, they were served in granular form. For young cows, as well as for full-aged ones of lower average fatness, feeding rates were increased by 8-10%.

Udder edema, which is more common in first-heifers and highly productive cows, usually decreases after 4-6 days with proper feeding and keeping of animals, and disappears completely after 7-10 days. By the end of the prophylactic period (after 10-14 days), they had normal udders and fairly high productivity. During the milking, cows, in addition to the required amount of feed for actual milk yield, were given an advance to increase it (2-3 ECU per day).

After calving during the first three weeks, feed intake increases by about 2 kg of dry matter per week.

After calving, cows were fed high-quality hay-plenty (5-7 kg), as well as haylage (up to 7-10 kg), root crops (up to 10-15 kg), feed molasses (0.5-1.0 kg) and concentrates of 9 to 4-5 kg). From 4-7 days after calving, in the normal condition of the cow, 0.5-1.0 kg of concentrates are added daily to the main diet to the full norm for highly productive cows (milk yield 30-40 kg), but not more than 15 kg.

Recognizing the fact of a positive connection between the shape of the udder and the nipples with its functional properties, it is possible to visually assess to a certain extent the dignity of dairy cows for suitability for machine milking.

It has been established that cows with a strong constitution at high daily milk yields are characterized by a relatively constant lactation curve. Under the same conditions of feeding and maintenance, the nature of the constancy of lactation depends more on the individual characteristics of the animals. The high and stable lactation curve reflects the cow's ability to withstand a large physiological load for a long time, which indicates its constitutional strength.

The normal functioning of the animal's body, growth and formation at a young age, and then in adulthood are associated with the presence of an immune system, which is a complex complex of organs and tissues that produce humoral cellular immunity factors. According to the requirements of the standard, the milk yield of full-aged cows should be 5000-5500 kg of milk and live weight 600-650 kg.

The annual increase in dairy productivity of cows largely depends on the level of breeding work carried out. Currently, up to 40% of the increase in milk yield is due to the improvement of the genotype of the Alatau brown breed of cattle, while the remaining 60% is due to an increase in the level and quality of feeding and the improvement of traditional maintenance technology.

In the conditions of JSC Agro-industrial Complex "Adal" of the Enbekshikazakh district of the Almaty region over the past 18 years, a number of measures, both structural and scientific and technological, have been carried out to further develop and improve breeding programs in the Alatau brown breed.

Identification and registration of animals, evaluation of dairy productivity, evaluation of breeding qualities of animals, development of artificial insemination and embryo transplantation programs have been put on a high level.

The design capacity of the complex is 20 tons of dairy products per day.

In other farms of the Almaty region, the live weight of heifers for calving is only 450-500 kg with a norm of 580-620 kg. It is impractical to grow such heifers - it is impossible to get a lot of milk from them. In most farms of the Almaty region, the average age of calving heifers exceeds 30 months. As our observations have shown, the delay in insemination is usually associated with a low live weight of heifers.

The main reasons for this are: the use of all heifers for herd repair without proper selection and breeding work, the lack of starter feed; unbalanced feeding rations; poor conditions of maintenance; non-compliance of microclimate parameters with veterinary requirements. Low average daily gains, late entry of heifers into the herd - all this directly affects the profitability of milk production.

Thus, the purpose of raising repair young should be to obtain a highly productive cow, and not extensive production of problem animals.

In studies to determine the effectiveness of various methods of raising black-and-white cattle heifers, a comparison of the results of the age of their first insemination and the first calving was carried out. Ten calves corresponding to the breed and dairy

cattle standard were selected for comparative analysis (Table 2).

Table 2 – Comparative evaluation of various methods of raising calves in JSC Agroindustrial Complex "Adal"

Indicators	According to the accepted technology of the dairy complex, n = 10	Intensive n = 10
Age of the first insemination, months.	14,6 month.	11,9+ month.
Age of the first calving, months.	24,7 month.	22,0 month.
Average daily weight gain, g	700	900
Costs, tenge/day	921,6	1011
All costs, tenge	692 160	675 520
Additionally for the 1st lactation, kg	-	+770
Additionally for milk, tenge	-	57 600
Total for 1 goal.	692 160	617 920
Income from intensive cultivation, per 1 head.		+74 240 tenge

The results obtained indicate that with the adopted technology of growing black-and-white heifers on the farm, heifers came to hunt for insemination at an average age of 14.6 months, and with intensive cultivation with the creation of maintenance and feeding conditions at the age of 11.9 months, which contributed to the production of offspring at the age of 22 months.

The economic efficiency of dairy cattle breeding is mainly determined by the level of its productivity. This level is mainly determined by the average milk yield per feed cow (Table 3).

Table 3 - Economic efficiency of milk production on average per cow

Indicator	Group
	Black - and - white cattle
Milk yield per 1 cow, kg	7490
Fat content of milk, %	4.0
Basic fat content 3.6%, kg	8322
Production costs, tenge.	624 150
The cost of 1 ts. milk, tenge.	7500,0
The selling price of 1 ts. milk, tenge.	14000,0
Revenue from the sale of milk, tenge.	11650 800,0
Commercial expenses, tenge	116508,0

Return on sales profit/revenue, %	28,45
*- a constant coefficient of reduction of the result associated with additional costs for surplus products of 0.75.	

The calculation of the economic efficiency of the production of whole milk by cows of experimental groups showed that the profitability of milk production was 28.45% in JSC Agroindustrial Complex "Adal".

Analysis of the economic situation in the farms of JSC Agroindustrial Complex "Adal" for dairy cattle breeding in recent years shows that the cost of herd repairs currently amounts to 16% to 23% of the total costs of the enterprise for milk production, ranking second after feed costs. When heifers are introduced in the amount of 22-32% of the main herd, as a rule, about 10% of the first heifers remain on the farm. They can be used for sale and to generate additional income.

### Discussion

Analyzing the literature data, it can be noted that with the creation of large settlements around cities of republican significance and regional centers, 11 large-commodity dairy farms have been put into operation and are steadily operating, where in recent years a black-and-white breed of dairy productivity has become widespread.

The agro-industrial company "Adal", where scientific research has been conducted to study the milk productivity of black-and-white cows and its crossbreeds with holsteins, is one of the largest producers of milk and dairy products in the republic.

The livestock workshop consists of a dairy farm and farms for raising young animals with more than 2.5 thousand heads of cattle and milk production up to 20 tons daily.

According to the data obtained by us during the period of research in the dairy complex "Adal", the average daily milk yield of 59 first-calf cows during the milking period (1-100 days) was 30.3 kg of milk, in the middle of lactation (101-200 days) - 26 kg, at the end of lactation (201-300 days) – 19 kg of milk. In general, in the complex, an

average of 7910 kg of milk was produced from each cow of the black-and-white breed per year, 7003 kg from the first heifers in the first lactation, 8178 kg from the sex-aged cows of the third and subsequent lactation, and 9341 kg per year from the cows of the breeding core.

When assessing the morphological features and functional properties of 59 examined first-calf cows, 94% had a tub-shaped udder, 6% - cup-shaped, cows with a rounded and goat-shaped udder were not available.

The results of the study showed that the Holstein breed has a positive effect on increasing milk yields, milk fat and protein yield during lactation.

It should be noted that the live weight of purebred black-and-white heifers at the age of 6 months was 171.2 kg, and at 18 months – 431.2 kg, by the time of insemination – 384.7 kg. Thus, the growth and development of young black-and-white breed meets the standards of dairy cattle.

In general, the profitability of milk production in the agro-industrial complex "Adal" was 28.45%.



Based on the conducted scientific research on the study of dairy productivity of black-and-white cows

### Conclusion

1 The milk productivity of one black-and-white breed cow for 305 days of lactation averages 7910 kg per year, the first heifers in the first lactation - 7003 kg per year, the sex and age cows of the third and subsequent lactation - 8178 kg, the cows of the breeding core – 9341 kg per year. The fat content in milk ranges from 3.80% to 3.82%.

2 In the herds of the agro-industrial complex "Adal", repair heifers are inseminated at the age of 15-17 months with a live weight of 390-420 kg, which corresponds to the

and their crossbreeds with holsteins, it can be noted that they have a fairly high milk productivity and live weight.

standard of a black-and-white breed of dairy productivity.

3 It was found that in black-and-white cows and its crossbreeds with holsteins, the duration of the service period varied from 149 to 158 days. The interbody period ranged from 432.6 to 439.4 days, the age of the first calving in black-and-white cows is 843 days, and in holstein - 794 days, the coefficient of reproductive ability is 0.84 and 0.83 units, which meets the requirements of highly productive dairy cattle breeding.

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## **ҚАРА-АЛА ТҮСТІ СИЫРЛАРДЫҢ ЖӘНЕ ОЛАРДЫҢ ГОЛЬШТЕЙН ТҰҚЫМЫ БУДАНДАРЫНЫҢ СҮТ ӨНІМДІЛІГІ**

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### **Түйін**

Мақалада қара-ала түсті тұқымды асыл тұқымды сиырлардың және оның гольштейнмен будандарының сүт өнімділігінің нәтижелері келтірілген. Лактацияның 305 күнінде қара-ала түсті тұқымды сиырлар сүттегі майдың мөлшер үлесі 3,76% болатын орта есеппен 7910 кг табын өндіретіні анықталды. Бірінші лактациядағы алғашқы төлдерден  $638 \pm 18,2$  кг тірі салмақта  $7003 \pm 158,1$  кг сауылады. толық жастағы сиырлардан 3 және одан кейінгі лактациядан  $697 \pm 18,4$  кг тірі салмақта  $8178 \pm 125,9$  кг сауылады. Сүттегі майдың мөлшері 3,80%-дан 3,82%-ға дейін өзгереді. Асыл тұқымды сиырлардан  $9341 \pm 184,2$  кг сүт өндіреді, селекциялық топтан  $8921 \pm 97,7$ .

Қара түсті Гольштейн тұқымы сүттің өсуіне, сүт майы мен ақуыздың лактацияға шығуына, желіннің технологиялық және морфо-функционалдық қасиеттерін жақсартуға, сондай-ақ отандық сүт тұқымдарының сиырларына қарағанда теңдестірілген және тегіс лактация қисығына оң әсер ететіні анықталды.

Зерттеулер нәтижесінде «Адал» АӨК АҚ табындарында қара-ала түсті және Гольштейн сиырларында қызмет көрсету кезеңінің ұзақтығы 149-дан 158 күнге дейін өзгергені анықталды. Туым аралық кезең  $432,6$ -дан  $439,4$  күнге дейін, қара-ала түсті алғашқы төлдеу жасы 843 күн және гольштейндер 794 күн, өнімділігі жоғары сүтті мал шаруашылығының талаптарына сәйкес келетін 0,84 және 0,83 бірлік өнімділік коэффициенті болды.

**Кілт сөздер:** қара- ала мал; гольштейн тұқымы; сүттің түрі; сауын сүті; сызықтық; асыл тұқымды.

## **МОЛОЧНАЯ ПРОДУКТИВНОСТЬ КОРОВ ЧЕРНО-ПЕСТРОЙ ПОРОДЫ И ЕЁ ПОМЕСЕЙ С ГОЛШТИНАМИ**

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### **Аннотация**

В статье приводятся результаты молочной продуктивности чистопородных телок черно-пестрой породы и её помесей с голштинами. Установлено, что за 305 дней лактации коровы черно-пестрой породы продуцируют в среднем по стаду 7910 кг с массовой долей жира в молоке 3,76%. От первотелок в первой лактации надаивают 7003±158,1 кг при живой массе 638±18,2 кг. От полновозрастных коров 3-ей и последующей лактации надаивают 8178±125,9 кг при живой массе 697±18,4 кг. Содержание жира в молоке варьирует от 3,80% до 3,82%. Коровы племенного ядра продуцируют 9341±184,2 кг молока, селекционной группы 8921±97,7.

Установлено, что голштинская порода черно – пестрой масти оказывает положительное влияние на повышение удоев, выхода молочного жира и белка за лактацию, совершенствованию технологических и морфо – функциональных свойств вымени, а также на лактационную кривую, которая является более уравненной и плавной, чем у коров отечественных молочных пород.

Результаты исследований показали, что в стадах АО АПК «Адал» у черно-пестрых и голштинских коров продолжительность сервис-периода варьировала в пределах от 149 до 158 дней. Межотельный период колебался от 432,6 до 439,4 дней, возраст первого отела у черно-пестрых- 843 дня и голштинны 794 дня, коэффициент воспроизводительной способности 0,84 и 0,83 единиц, что отвечает требованиям высокопродуктивного молочного скотоводства.

**Ключевые слова:** черно-пестрый скот; голштинизация; молочный тип; удой молока; линейная; чистопородный.