Comparative assessment of productive qualities of holsteinized black-and-white cattle by lines

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Abstract. In Sverdlovsk region Holsteinized black-and-white cattle of the Ural type are bred. The herd is represented by large bodied, highly productive animals with a high genetic potential for milk productivity. The aim of the research was to study the productive qualities of Holsteinized black-and-white cattle with a high blood relationship to Holstein breed depending on the line, and correlation between milk yield and live weight of cows. The average milk yield for 305 days of lactation in cows of both lines was almost the same, and the difference between them was insignificant. However, when considering the change in milk yield within the groups, it was found that the group of Reflection Sovering cows featured higher performance indicators – from 8.376 to 14.706 kg of milk. The difference between low productive and high productive cows yield amounted to 6.333 kg or 43.1%. In Vis Back Ideal group of cows the difference was less expressed, and amounted to 5.367 kg or 40.4%. The coefficient of variability in the groups was within the range of 26-28%, which indicates significant fluctuations in milk yield. The yield of nutrients in milk (the amount of milk fat + milk protein) was at the equal level - 783 and 730 kg.

1. Introduction
In Doctrine of the country’s food security, adopted in 2016, special attention is paid to the development of animal breeding, because the food industry is responsible for sustainable supply of high-quality food to the population [1-6].

Milk and dairy products are valuable kinds of food that can be consumed by people of any age, any health status and of any income. That ensures the health of the nation and food security of any country [7-12].

In this regard special attention is paid to development of dairy cattle breeding, since the main share (more than 97% of the total production of milk) is obtained from cattle, while milk is a valuable food product and raw material for the dairy industry. Strict quality requirements are presented for raw milk; therefore, along with increasing the productivity of cattle, the other tasks are set. In particular – it is necessary to improve milk quality indicators [14-17].

For milk production in our country dairy cattle of both domestic and foreign selection are used. The main livestock is represented by the domestic black-and-white breed. For its improvement in recent few decades the genetics of the world’s best dairy breed, the Holstein, has been widely used, and is still used.
Long-term use of breeding Holstein bulls of foreign selection has led to creation of a wide amount of Holsteinized cattle livestock in various climatic and ecological & forage zones of the country. The livestock also differs in economically useful traits and biological characteristics, caused by the breed resources of cattle in the breeding zone and the country of origin of the bulls involved in crossing [18-22].

In Sverdlovsk region the breeding stock of the black-and-white breed of the Ural offspring was inseminated with the seed of servicing bulls of Canadian, Danish and German breeding. As a result, large bodied, highly productive animals with a high genetic potential for milk productivity and well adapted to industrial milk production were obtained. In 2002 the Ural type of black-and-white cattle was officially registered with percentage of Holstein blood relationship equal to 75%. In subsequent years the pure-bred Holstein servicing bulls continued to serve in a herd, and the proportion of Holstein blood relationship in the brood stock increased 91% or more for the Holstein breed [23-25].

As there is not enough data on the productive qualities of modern animals, therefore the research of their milk productivity is relevant and of practical importance.

The aim of the research is study of the productive qualities of Holsteinized black-and-white cattle with a high proportion of blood relationship to the Holstein breed depending on the line of cows, and the correlation between milk yield and live weight of cows.

2. Materials and method

The research was run in one of the breeding farms engaged in breeding of Holsteinized black-and-white cattle of Ural type. The research included cows that completed their lactation period on 01.Oct.2020. The animals were divided to 2 groups, depending on their line of origin. Group 1 consisted of Reflection Sovering cows, and group 2 consisted of Vis Back Ideal cows. For analysis data from the zootecchnical and breeding records of the Selex database were used.

Milk productivity was analyzed by control milking once a month. The following milk quality parameters were measured: mass fraction of fat (MFF) and mass fraction of protein (MFP) in milk for its maximum during lactation. Those parameters were checked monthly per each cow in the dairy laboratory of JSC “Uralplemcenter” of Sverdlovsk region. The coefficient of milk productivity and coefficient of lactation stability were calculated.

3. Results and discussion

The farm is engaged in selecting and breeding of highly productive Holsteinized black-and-white cattle of Ural type with a high proportion of Holstein blood relationship (more than 91%). In 2019 9.677 kg of milk was obtained from 1.400 cows. MFF and MFP in milk were equal to 3.96 and 3.23%, respectively. The live weight of mature (i.e. full-grown) cows is 634 kg.

Figure 1 below shows the milk yield for 305 days of lactation of cows, depending on their lines.

![Figure 1. Milk productivity – milk yield, kg.](image)
The figure above clearly shows that the average milk yield for 305 days of lactation in cows of both lines was almost the same. The difference between them was insignificant. However, when considering the change in milk yield within the groups, it was recorded that the group of Reflection Sovering cows featured higher productivity: from 8,376 to 14,706 kg of milk. The difference between low productive and high productive cows was 6,333 kg or 43.1%. In the group of Vis Back Aydiala cows the difference was less expressed, it amounted to 5,367 kg or 40.4%. The coefficient of variability in the groups was within the range of 26-28%, which shows significant fluctuations in milk yield and the potential of breeding work to select animals in order to improve them further towards increasing their breeding value in terms of milk productivity. Along with the milk yield, great attention is paid to the milk quality indicators, in particular – MFF and MFP in milk (figure 2).

In terms of quality indicators the milk of cows of both lines showed no differences both in terms of average value of indicators and in comparison of minimum and maximum values. The obtained data on milk yield and milk quality indicators allow concluding that the servicing bulls were selected in single uniform type according to the productive qualities of maternal ancestors, which made it possible to obtain animals with uniform indicators of milk yield, of MFF and MFP.

The important indicators in assessing the breeding qualities of cows are the yield of nutrients with milk. In our case this is the yield (amount) of milk fat and milk protein (figure 3).

Since it was established that milk yield for 305 days of lactation in cows of different lines was almost equal, and milk quality indicators – MFF and MFP – did not differ, the yield of nutrients with milk was at equal level – 783 and 730 kg. The coefficient of milk production determines the constitutional
orientation of cows towards certain type of productivity. In our case it turned out that all cows were of dairy production type with a milk production coefficient shown below (figure 4.).

![Figure 4. The coefficient of milk production of cows of different lines.](image)

It was found that Vis Back Ideal cows had lower lactation stability coefficient by 5.2%.

The calculation of the milk yield is based on the correlation ratio between milk yield and live weight of cows and shows the amount of milk produced per 100 kg of live weight of an animal.

The value of correlation coefficient between these parameters is presented below in figure 5.

![Figure 5. Correlation coefficient between milk yield and live weight of cows of different lines.](image)

Positive conjugation was established between live weight and milk yield per lactation. This correlation was low, but in the group of Vis Back Ideal cows it was 0.13 higher than in the group of Reflection Sovering cows. This enables to recommend referring to these indicators when planning and running the selection and breeding work in this farm when breeding animals of Vis Back Ideal line.

Our data on high productivity of Ural type cows of Holsteinized black-and-white cattle are confirmed by numerous studies of many authors by N Bogolyubova, V Korotky, A Zenkin, V Ryzhov, N Buryakov, V Mymrin, O Loretts, O Gorelik, O Lihodeevskaya, N Zezin, M Sevostyanov and O Leshonok.

4. Conclusion

Based on the foregoing it is possible to conclude that the farm uses highly productive Holsteinized black-and-white cattle of Ural type. No significant differences were found in milk yield (productive qualities)
of cows in different lines of Holsteinized black-and-white cattle. Positive correlation was established between milk yield and live weight of cows, which correlation depends on the line origin of the cows.

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