

The relationship of productive qualities of holshteinized black-and-white cattle along the lines

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Abstract. In the Sverdlovsk region, holsteinized black-and-white cattle of the Ural type is bred, which is represented by large, highly productive animals with a high genetic potential for productivity. The purpose of the work is to study the productive qualities of Holsteinized black-and-white cattle with a high proportion of blood relationship in the Holstein breed, depending on the linear affiliation and their relationship. There are no differences in milk yield and milk quality indicators in cows of different lines. All cows were of dairy productivity, as evidenced by the high coefficient of milk production. There was a significant difference between groups of cows of different lines in terms of the lactation stability coefficient, which was higher in the group of cows of the Reflection Sovering line ($P \leq 0.05$). The figure clearly shows that the correlation between milk yield and milk quality indicators – FDM and PDM in milk is negative, that is, with an increase in milk yield, there is a decrease in FDM and PDM in milk. A positive correlation has been established between the phenotypic trait (live weight) and their productive qualities – milk yield and lactation stability coefficient, which makes it possible to recommend selection by live weight.

1 Introduction

The development of dairy cattle breeding is given great importance in the context of the country's Food Security Doctrine adopted in 2016, as an industry responsible for the sustainable supply of high-grade, high-quality food to the population [1-3]. Milk and dairy products are valuable food products that can be consumed by people of any age, health status, and income. This ensures the health of the nation and the food security of any country [4-7]. Cattle produce the main amount of milk, more than 97% of the total production, a valuable food product and raw materials for the dairy industry. Raw milk faces strict requirements for its quality, therefore, along with increasing the cattle productivity, tasks are being set to improve the quality indicators of milk [8-18]. Dairy cattle of both domestic and foreign breeding are used for milk production, the main

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livestock of which is represented by the domestic black-and-white breed. In the last few decades, the gene pool of the world's best dairy breed, the Holstein, has been widely and universally used for its improvement, and continues to be used. Long-term use of the Holstein breed of foreign breeding stud bulls has led to the creation of a large array of Holstein cattle in various natural-climatic and ecological-forage zones of the country, which also differs by economic and biological features, which is due to the breed resources of cattle in the breeding zone and the country of origin of the breeding bulls involved in crossing [19-21]. In the Sverdlovsk region, the breeding stock of the black-and-white breed of the Ural offspring was inseminated with the seed of bulls-producers of Canadian, Danish and German breeding. As a result, large, highly productive animals having high genetic potential for productivity and well adapted to industrial milk production were obtained. In 2002, the Ural type of black-and-white cattle was officially registered with a 75% share of blood relation to the Holstein breed. In subsequent years, the use of pure-bred Holstein stud bulls continued, and the share of blood relation of the breeding stock increased to 91% or more for the Holstein breed [22-27]. There is not enough data on the productive qualities of modern animals, and therefore the study of their milk productivity is relevant and has practical significance.

The purpose of the work is to study the productive qualities of Holsteinized black-and-white cattle with a high proportion of blood relationship in the Holstein breed, depending on the linear affiliation and their relationship.

2 Materials and Methods

The research was carried out in the conditions of one of the stud farms for breeding of holsteinized black-and-white cattle of the Ural type. The study included the cows that completed lactation as on 01.10.2020. 2 groups of animals were identified depending on the linear affiliation. Group 1 - cows of the Reflection Sovering line and group 2 - cows of the Vis Back Ideal line. The data of zootechnical and breeding records of the Selex database were used for the analysis. Milk productivity was taken into account by conducting control milkings once a month, milk quality indicators: fat mass fraction and protein mass fraction in milk, which were checked monthly from each cow in the conditions of the dairy laboratory of the OJSC "Uralplemcenter" of the Sverdlovsk region. The lactation coefficient and the lactation stability coefficient, the amount of milk fat and milk protein were calculated. The indicators of the relationship between productive traits were studied.

3 Results and Discussion

The farm is engaged in breeding of highly productive holsteinized cattle of the black-and-white breed of the Ural type with a high proportion of blood for the Holstein breed (more than 91%). In 2019, 9677 kg of milk was received from 1400 cows, FDM and PDM in milk – 3.96 and 3.23%, respectively. The live weight of full-aged cows is 634 kg.

Table 1 presents data on indicators of dairy productivity of cows of different lines.

Table 1. Indicators of milk productivity of cows of different lines

Indicator	Line	
	Reflection Sovering	Vis Back Ideal
Milk yield for 305 days of lactation, kg	10890±359.38	10866±441.03
FDM, %	3.97±0.013	3.96±0.010
PDM, %	3.22±0.04	3.22±0.004
Amount of milk fat, kg	432±4.67	430±4.41

Amount of milk protein, kg	351±14.38	350±1.76
The coefficient of milkiness	1628±56.16	1617±56.98
Lactation stability coefficient	87.2±1.30	82.0±1.92*

From the data in the table it can be seen that there are no differences in milk yield and milk quality indicators in cows of different lines, just as there are no differences in other indicators of productive qualities. Almost the same amount of milk fat and milk protein was obtained from them during lactation. According to the milkiness coefficient, the constitutional orientation of animals towards one or another productivity is judged. It is accepted that with the milkiness coefficient of over 850 cows are classified as a dairy type of productivity. In our case, it was 2 times higher than the generally accepted one, and therefore all cows of both groups can be attributed to the dairy type of productivity. There was a significant difference between groups of cows of different lines in terms of the lactation stability coefficient, which was higher in the group of cows of the Reflection Sovering line ($P \leq 0.05$). This difference can be clearly seen on Figure 1.

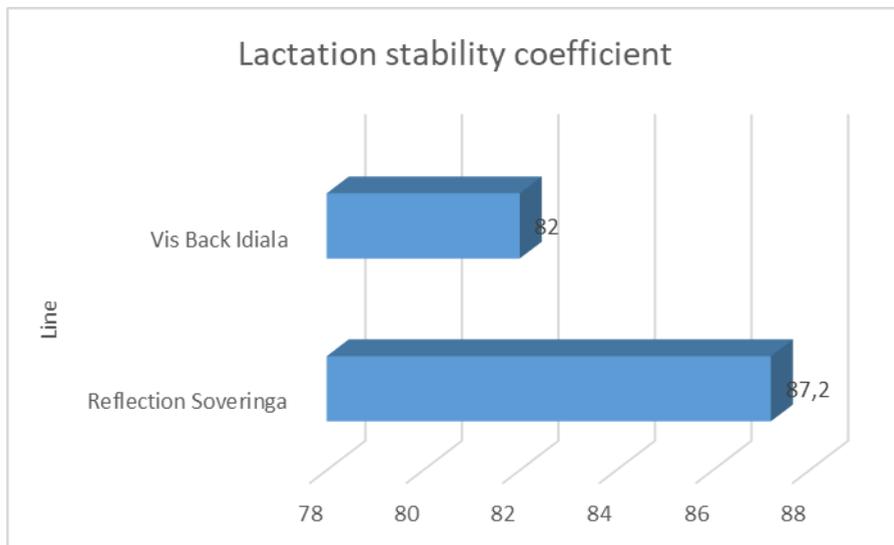


Fig. 1. Lactation stability coefficient, %.

The figure clearly shows that in the group of cows of the Reflection Sovering line, the lactation stability coefficient was higher by 5.2%, which indicates a more stable lactation activity. The coefficient of variability in the groups was in the range of 26-28%, which indicates significant fluctuations in milk yield and the possibility of carrying out breeding work on the selection of animals to further improve them in the direction of increasing their breeding value in terms of productive qualities.

The conjugation of productive traits with each other is of great interest to determine the selection traits when planning breeding work with the herd. Data on the conjugacy of milk yield and quality indicators for groups of cows, depending on the linear affiliation, are presented in Figure 2.

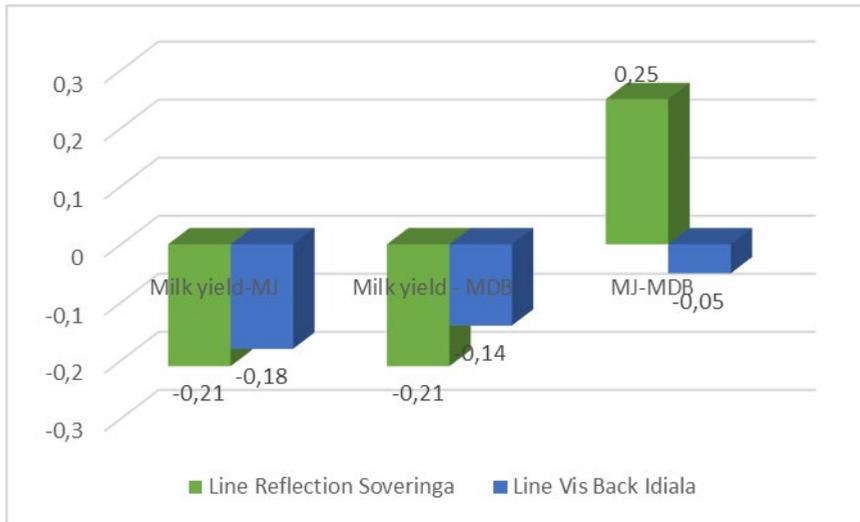


Fig. 2. Conjugation of productivity traits in cows of different lines.

The figure clearly shows that the conjugation between milk yield and milk quality indicators – FDM and PDM in milk is negative, that is, with an increase in milk yield, there is a decrease in FDM and PDM in milk, therefore, when planning breeding work with brood stock in the farm, it is necessary to select stud bulls-improvers on the basis of three traits at once, or neutral in FDM and PDM in the milk of the maternal ancestors of the stud bull. Cows of the Reflection Sovereign line have a positive correlation coefficient between milk quality indicators, which confirms the general pattern of the relationship between the productive characteristics of dairy cattle – an increase in FDM in milk is accompanied by an increase in PDM in milk. In cows of the Vis Back Ideal line, this relationship is low negative, that is, it practically does not significantly affect the change in milk quality indicators when selected for one of the characteristics.

The lactation stability coefficient of 80 percent or more is considered high, less than 60% low and depends on the use of the productivity genetic potential due to the organization of full-fledged feeding and the creation of optimal conditions of maintenance. The calculation of the correlation coefficients between the coefficient of lactation stability and productive indicators showed that they differ from the average positive in cows of the Vis Back Ideal line between the coefficient of lactation resistance and milk yield per lactation to the average negative in cows of the same line between the coefficient of lactation resistance and PDM in milk (Figure 3).

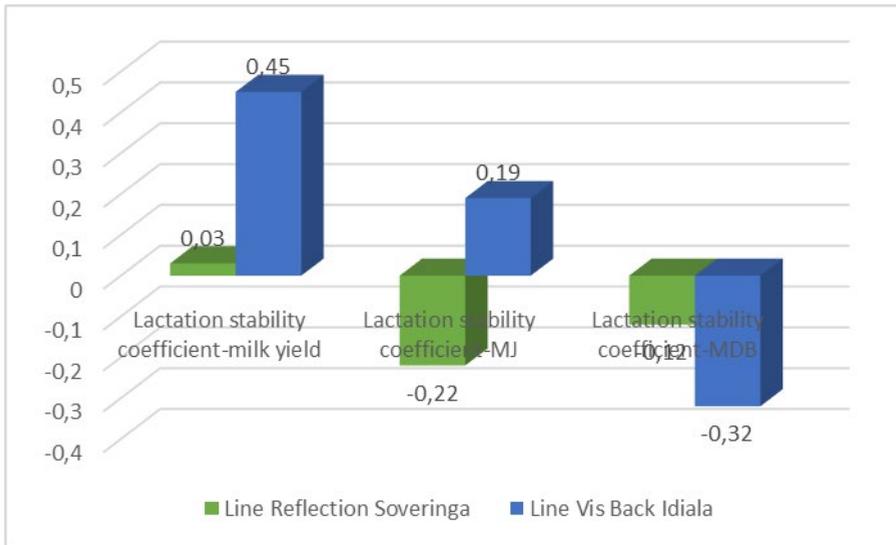


Fig. 3. The relationship between the coefficient of lactation stability and productivity indicators.

The significant variability of the correlation coefficients between the coefficient of lactation stability and the productive indicators of cows does not allow them to be used during selection and matching, as well as planning further work on improving Holsteinized black-and-white cattle of the Ural type in this herd.

It is known that there is a certain relationship between the live weight and the productive qualities of cows (Figure 4.).

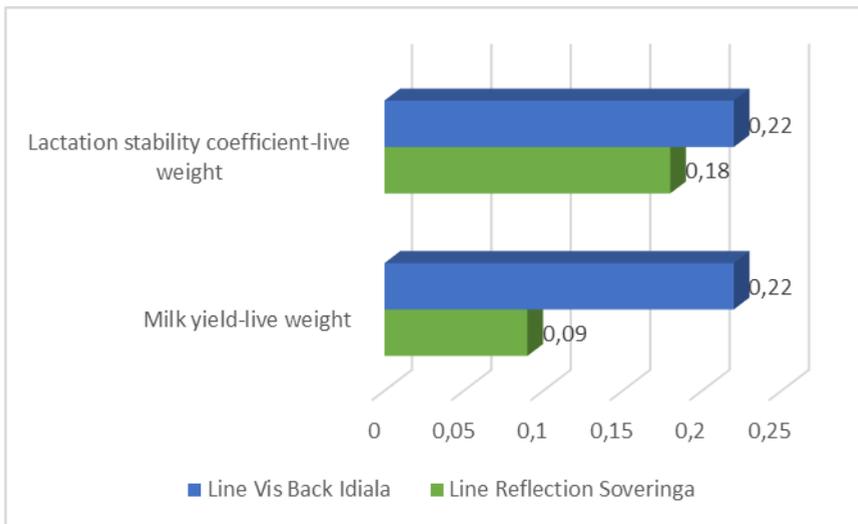


Fig. 4. The relationship between live weight and productivity indicators.

A positive correlation has been established between the phenotypic trait (live weight) and their productive qualities – milk yield and lactation stability coefficient, which makes it possible to recommend selection by live weight. Its increase will increase the milk yield per lactation.

A positive conjugacy of signs has been established between the live weight and milk yield per lactation. This relationship was low, but in the group of cows of the Vis Back

Ideal line it was higher than in cows of the Reflection Sovereign line by 0.13. This allows to recommend using these indicators when planning and conducting breeding work in this farm when breeding animals of the Vis Back Ideal line.

Our data on the high productivity of cows of the Ural type of Holsteinized black-and-white cattle are confirmed by the studies of many authors: N.V. Bogolyubova, V.P. Korotky, A.S. Zenkin, V.A. Ryzhov, N.P. Buryakov [23,24], Mymrin V and Loretts O [21], O V Gorelik, O E Lihodeevskaya, N N Zezin, M Ya Sevostyanov and O I Leshonok [25-27].

4 Conclusion

Based on the above, it can be concluded that the farm uses highly productive Holsteinized black-and-white cattle of the Ural type. There are no significant differences in the productive qualities of cows of different lines of Holsteinized black-and-white cattle. A positive conjugacy between milk yield and live weight of cows has been established, which varies depending on the linear affiliation of cows.

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