The influence of origin on milk productivity of cows

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Abstract. Holsteinized black-and-white cattle are used for milk production. The genealogical structure of the herd is represented by animals from the following genealogical lines: Vis Back Ideal 1013485, Reflection Sovering 198998, Montwick Cheiftain 95679, Pabst Governor 882933 and Annas Adema 30587. Animals of these types feature high milk productivity indices. In particular, the cows of all the researched lines have high milk productivity indices - more than 9,000 kg of milk per lactation. The highest milk yields are achieved by cows of the Montwick Cheiftain 95679 line. The yields are 16-339 kg higher than ones of the animals from the Annas Adema 30587 and Pabst Governor 882933 lines, respectively. According to the quality indices of milk, cows of all lines exceed the requirements of the breed standard. Data on amount of milk fat confirms the level of breeding value of the cattle breeding stock used in the farm. They exceed the breed standard in terms of milk fat yield by more than 2 times. The highest coefficient of the cows’ biological efficiency was recorded in the cows groups of Annas Adema 30587 and Montwick Cheiftain 95679 and Montwick Cheiftain 95679 and Pabst Governor 882933 lines.

1. Introduction
Milk provides people with full-fledged essential nutrients and is well digested by human body. The increase in cow productivity is inseparably linked to the improvement of milk quality, which has a significant impact on the quality of finished dairy products [8-16]. In recent years to produce milk in our country the dairy cattle of domestic and foreign selection is used; the core livestock of the cattle is represented by black-and-white and Holstein breeds. Since the end of the 70s of the last century the domestic black-and-white cattle has been systematically improved everywhere by admixing the blood (genetic material) of the world’s best dairy breed – the Holstein. In result of such selection and breeding work in individual regions of the country large groups of dairy cattle were created with a high proportion of Holstein breed blood, which features biological and economically useful parameters depending on the breeding zone and breed resources used for cross-breeding [12-16]. Animals of this type are large-bodied and have high milk productivity indices [17-27]. At present time the Holstein bulls, which belong to the Holstein lines, are used in the breeding of Holstein black-and-white cattle. In this regard the...
evaluation of Holsteinized black-and-white cows of Holstein lines according to their productive qualities has practical interest. The research is relevant and has practical value.

The aim of the research: evaluation of correlation of productive qualities of Holsteinized black-and-white cows of Holstein lines.

2. Materials and method
The research was carried out at one of the cattle breeding farms for breeding of Holsteinized black-and-white cattle in Moscow region. All animals that have completed 3 lactations are divided into 5 groups corresponding to their linear origin: the 1st group – Vis Back Ideal 1013485 line; 2nd – Reflection Sovering 198998; 3rd – Montwick Chieftain 95679; 4th – Pabst Governor 882933 and the 5th group – Annas Adema 30587 line. Data and records of zootechnical and breeding information from Selex database were used for analysis. Milk productivity was taken into account by control milking once a month, as well as by milk quality parameters: mass fraction of fat (MFF) and mass fraction of protein (MFP) in milk. These parameters per every cow were checked monthly in a dairy laboratory. The coefficients of milk content, the amount of milk fat and milk protein were calculated.

3. Results
Dairy farms use holstinized black-and-white cattle with a high genetic potential for milk productivity. In recent years there has been an increase in blood content for the Holstein breed, in 2019 this index increased in first-heifers up to 82% or more, and in full-aged cows it was 75% or more. It is necessary to note that 4.6% of cows have a high blood content of 95% and more.

The genealogical structure of the herd is represented by animals belonging to the following genealogical lines: Vis Back Ideal 1013485, Reflection Sovering 198998, Montwick Cheiftain 95679, Pabst Governor 882933 and Annas Adema 30587 (figure 1).

![Genealogical structure of the herd, %](image)

The circle diagram above clearly shows that the herd has approximately the same number of animals belonging to one or another line, but we can distinguish 2 main lines - Vis Back Ideal 1013485 and Reflection Sovering 198998, which occupy 55% of the specific weight of the breeding stock. The cows of Montwick Cheiftain 95679, Pabst Governor 882933 and Annas Adema 30587 lines are of the greatest interest, since they have recently been used on the farm. We analyzed the results of dairy productivity of cows of these lines.

Data on milk productivity is as follows – milk yield for 305 days of lactation, the mass fraction of fat and protein in milk are presented below in figure 2.
Cows of all the researched lines had high productivity indicators—more than 9,000 kg of milk per lactation. The highest milk yields were recorded among the cows of Montwick Cheiftain 95679 line. The milk yields were 16-339 kg higher than milk yields obtained from the animals of Annas Adema 30587 and Pabst Governor 882933 lines respectively. The difference was insignificant and unreliable. According to the quality parameters of milk, the cows of Montwick Cheiftain 95679 line showed certain difference. In milk of cows of this line high fat content was noted – 4.99±0.04%, and this milk parameter significantly exceeded the milk fat parameter from the cows from other lines at P≤0.001. Also, they featured higher mass fraction of protein (MFP), but the difference with the other groups was negligible and unreliable. According to these parameters the cows of all lines exceeded the requirements of the breed standard.

Important parameters of cows dairy productivity are yield of milk fat and milk protein along with milk during lactation period. More milk fat and milk protein were obtained from Montwick Cheiftain 95679 cows (figure 3).

Data on amount of milk fat confirms the level of breeding value of breeding stock used in the farm. They exceed the breed standard for yield (output) of milk fat by more than 2 times and therefore,
According to this parameter, they can be classified as Elite-record. In the researched and assessed lines, the yield of nutrients with milk depended on both the milk yield of cows and the quality of milk, especially in milk of cows of Montwick Cheiftain 95679 line.

The coefficients of biological efficiency of the cow (BEC) and biological full value (BFV) show the efficiency of a cow’s digestion of nutrients from the feed in terms of their processing and discharging them with milk in form of dry matter and skim solids (SOMO) (figure 4).

Figure 4. Coefficients of biological efficiency of the cow and biological usefulness.

The highest coefficient of biological efficiency of cows was recorded in groups of cows of Annas Adema 30587 and Montwick Cheiftain 95679 lines, and the biological full value of Montwick Cheiftain 95679 and Pabst Governor 882933 lines. Since along with milk yield those indices depend on content of dry matter and skim solids in milk, we can say that the milk from the cows of the first two lines had a higher content of dry matter due to increased MFF in milk, and milk from the cows of the second lines featured a higher content of dry matter due to increased skim solids which determines the biological full value of the product basing on content of its components – protein and lactose.

4. Discussion

The origin of animals, namely a cow’s belonging to the breed line, affects the productive qualities of cows – milk yield and milk quality parameters: the content of dry matter, skim solids, MFF and MFP in milk.

5. Conclusion

Belonging to the breed line provides an impact on milk yield and milk quality parameters. The best parameters for milk yield were recorded for the cows of the Montwick Cheiftain 95679 line, and the highest milk quality parameters – MFF and MFP in milk – were recorded for the cows of Annas Adema 30587 line. We consider that in a farm the animals of all lines can be used.

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