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Influence of the age of cows on the dynamics of dairy efficiency depending on a breeding line

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Abstract. The article suggests that one of the most widespread dairy breeds in the world is the Holstein breed; and the black-mottled breed in the Russian Federation. This breed has been improving during the past four decades by interbreeding it with the best one, the Holstein breed. A large set of the Holsteinized black-mottled livestock of the high thoroughbred cows of the Holstein breed has been produced. The aim of the work is to study the effect of age on the dynamics of dairy efficiency of the Holsteinized cows depending on the breeding line. At present, the dairy herd of the farm actually consists of cows of three breeding lines, Reflection Sovering 198998, Vis Back Ideal 1013415, Montvik Chieftain 95679. The rest breeds are not developing due to the absence of breeding valuable breeding bulls. It was found that the Reflection Sovering breeding line 198998 has that the highest milk yield during the sixth lactation, and then there is a decrease in milk yield. The article considers that the milk yield changes with age, starting from the first lactation, increasing during the second lactation and then it is gradually decreasing in productivity to the fifth one. The regularity of the increase in milk yield of mature cows during the third and fourth lactation is not confirmed of the dairy cows of this breeding line. It can be explained by the intensity of herb replacement, when it accumulates a significant amount of nutrients in the body. That is why, they can be used during the first and the second lactations without restoring nutrients in further. Dairy cows of the Vis Back Ideal 1013415 breeding line have a gradual increase in milk yield, starting from the first to the fourth lactation, by 52, 292, 300 kg or by 0.5; 2.8% and 2.8%, respectively. Further, there is a decrease in dairy efficiency. At reaching physiological maturity they have a natural increase in dairy efficiency. The same tendency is observed with cows of the Montvik Chieftain 95679 breeding line.

1. Introduction

The main problem of maintaining the health of the nation and food security of any country is ensuring an uninterrupted and sustainable supply of the population with high-quality food, including milk [1-5]. To increase the production of high-quality products is one of the most important tasks in the



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development of animal husbandry, including dairy livestock breeding. It is becoming increasingly important due to the growth of the population of our planet and the satisfaction of humanity's needs for nutritious food. In this regard, the development of dairy stock breeding is of the great national economic importance [6-12]. The increase in the dairy efficiency of cows is inseparably associated with the intensification of selection work with dairy livestock [13-23]. All over the world, dairy livestock is used to obtain milk. They use such breeds as black-mottled one, Holstein, Dutch. They differ in economically useful qualities depending on the climatic and ecological-forage conditions of the breeding zone, and the gene pool of breed resources [24-26]. In recent years, there has been an acute problem of increasing the productive longevity of cows in order to increase the efficiency of dairy efficiency. Despite the fact that some practitioners and researchers are inclined to conclude that the intensive use of dairy cows provides a quick payback of breeding. It makes it possible to achieve profitability of production by using a cow during the first and second lactations [21-25]. However, from our point of view, in this case, we cannot guarantee the full presence of the genetic potential of dairy efficiency, since at this age they do not yet reach physiological maturity; secondly, there was a decrease in the reproductive functions of cows, which led to a reduction in the number of breeding cows, including replacements, and the rapid turnover of the herd requires a large number of heifers to renew (replace) the herd. In this regard, the dynamics of dairy efficiency of cows according to lactations is of particular interest [26-29]. The evaluation of the Holsteinized full-aged black-mottled breed according to the dynamics of dairy efficiency depending on age is relevant and of practical importance, especially in conditions of increased interbreeding of the Holstein breed and reducing the productive longevity of cows.

The aim of the work was to study the influence of age on the dynamics of dairy efficiency of the Holstein breed depending on the breeding line.

2. Materials and methods

The studies were carried out on Holsteinized black-mottled breed of three Holsteinized breeding lines (Reflection Sovering 198998, Vis Back Ideal 1013415, Montvik Chieftain 95679). All cows that left the herd from 2018 till 2020 were studied. The research was carried out at the dairy complex of one of the breeding reproducers of the Sverdlovsk region. The dairy efficiency was taken into account according to control milking during the studied period. Once a month, milk of each cow was evaluated for the fat content using "Klever – 1M" unit, for the protein content using "Milkotester" unit. The research was carried out in the regional dairy laboratory. Milk control was carried out once a month, in duplicate, using the data of zootechnical and breeding records, a Selex program database.

3. Results

The agricultural enterprise is engaged in the breeding of highly productive, the Holsteinized black-mottled breed of the Ural type with high interbreeding of the Holstein breed. A large percentage of heifers reduces the duration of productive longevity of cows, which in the farm is 2.1-2.2 lactation. Currently, the herd actually consists of dairy cows of three lines Reflection Sovering 198998, Vis Back Ideal 1013415, Montvik Chieftain 95679, the rest are not developing due to the lack of breeding valuable breeding bulls there.

The distribution of cows according to breeding lines is given in figure 1.

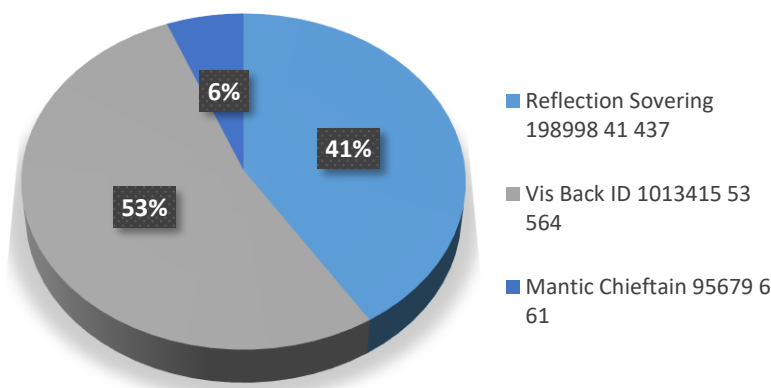


Figure 1. Distribution of cows of the Reflection Sovering breeding line 198998.

The breeding stock is represented mainly by dairy cows of two breeding lines, i.e., Reflection Sovering line 198998 - 41%, Vis Back Ideal 1013415 line - 53% of the total livestock.

Figure 2 presents the information on the dynamics of milk yield for lactation and nutrient yield with milk (the sum of the amount of milk fat and milk protein) of cows of the Reflection Sovering 198998 breeding line depending on age.

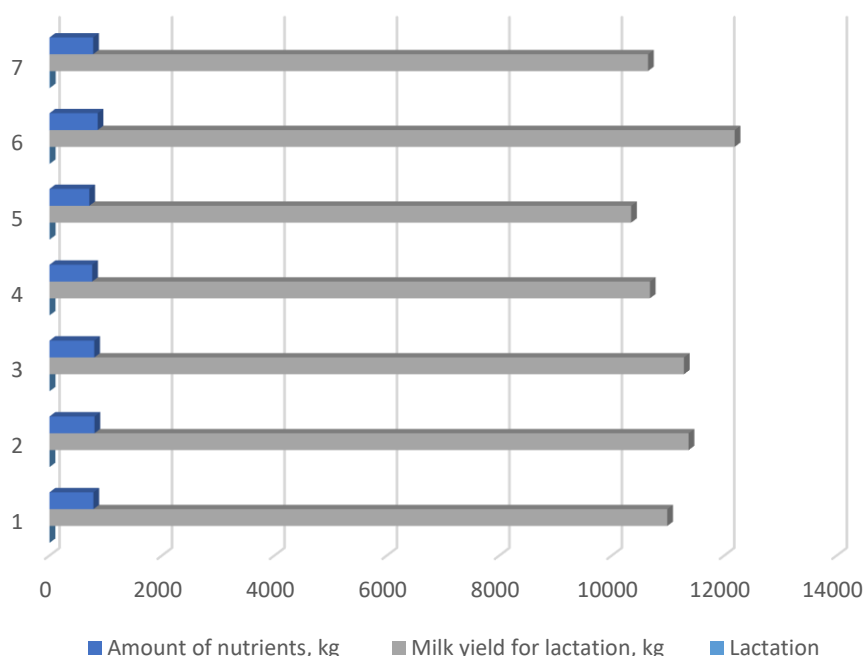


Figure 2. Dynamics of dairy efficiency of the Reflection Sovering breeding line 198998.

Figure 2 shows that the highest milk yield for the sixth lactation, and then there is a decrease in milk yield. Considering the changes in milk yield, starting from the first lactation, it must be said that the

milk yield changes with age, starting from the first lactation, increasing at the second lactation and then it is gradually decreasing in dairy efficiency to the fifth one. The sharp increase in dairy efficiency at the sixth lactation is explained by a small sample of dairy cows. At this age about twelve heads were lactating. All they have by high dairy efficiency rates. The yield of milk fat and milk protein with milk of dairy cows changed the same as milk yield, which indicates the stability of the quality indicators of milk, namely fat and protein in milk, and the yield of nutrients is mainly evaluated by the milk yield per lactation.

In this case, the regularity of an increase in milk yield in mature cows at the third and fourth lactations is not confirmed. In our opinion, it is explained by the intensity of the herb replacement, when it accumulates a significant amount of nutrients in the body. It allows them to be used during the first and the second lactations without their recovery their stock in future. Moreover, they need a longer time to reach the physiological maturity.

Then, we analysed the dynamics of dairy efficiency of dairy cows of the Vis Back Ideal 1013415 breeding line (figure 3).

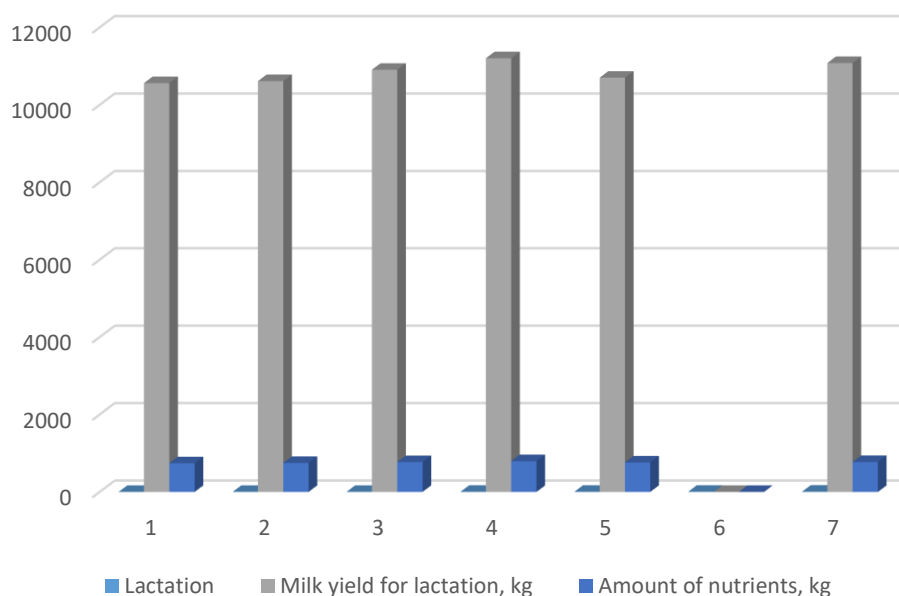


Figure 3. Dynamics of dairy efficiency of the Vis Back Ideal breeding line 1013415.

The difference in milk yield of this breeding line depends on age during lactations ranged from 10563 (the first lactation) kg to 11206 (the fourth lactation) kg, i.e., it is 643 kg or 5.7%. Moreover, there is a gradual increase in milk yield, starting from the first to the fourth lactations by 52, 292, 300 kg or 0.5; 2.8% and 2.8%, respectively. Further, there is a decrease in dairy efficiency. In this case, a natural increase in dairy efficiency is also confirmed when physiological maturity is reached. It can be concluded that there is a tendency to increase dairy efficiency in full-aged cows that reach physiological maturity for the fourth lactation despite the fact that during the first two lactations, the milk yield was almost the same.

Dairy cows of the Montvik Chieftain 95679 breeding line show a regular increase in milk yield with a slight decrease in quality indicators in milk. It can be seen from the yield of nutrients with milk (figure 4). A decrease in milk yield during the second and third lactation is explained by the fact that after the first lactation, an animal is recovered and it continues to grow until it reaches physiological maturity.

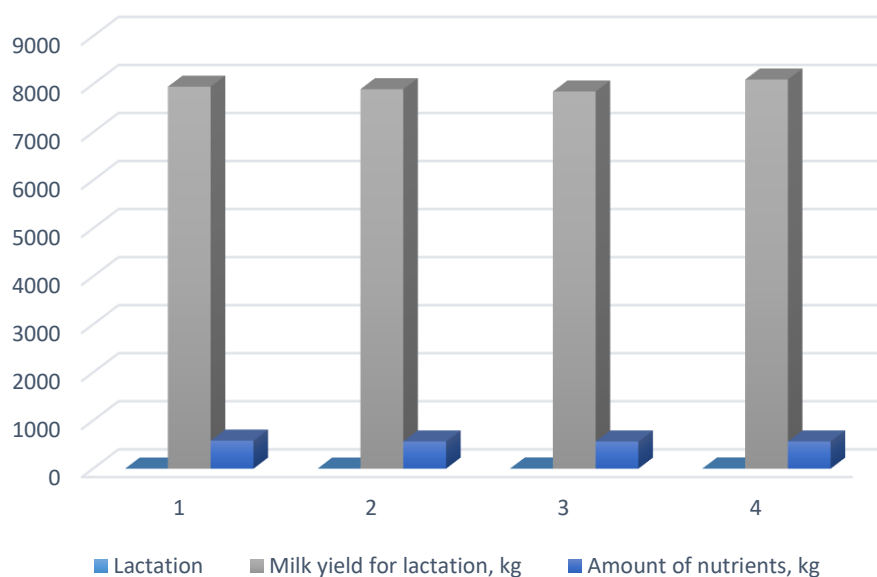


Figure 4. Dynamics of dairy efficiency of the Mantic Chieftain breeding line 95679.

Thus, it is possible to make a conclusion that the dynamics of milk yield of cows of different ages and breeding lines changes unstably; it does not have general regularities and is more dependent on the level of productivity of the breeding livestock of a particular breeding line.

4. Discussion

The authors conducted the analysis of the dynamics of dairy efficiency of the Holsteinized black-mottled breed of the Ural type of different breeding lines, depending on lactations. It showed that milk yield of dairy cows of different ages and breeding lines changes unstably, and it does not have general regularities and depends mainly on the level of dairy efficiency of the breeding stock of one or another breeding line. The similar studies were conducted by V.S. Mymrin, O.G. Lorets [7], I.V. Tkachenko, V.F. Gridin, S.L. Gridina [10], S.L. Gridina, V.F. Gridin, O.I. Leshonok [8]; they received identical data.

5. Conclusion

The age of cows in breeding the Holsteinized black-mottled breed of the Ural type does not significantly affect the dairy efficiency. It largely depends on the level of productivity of the breeding stock of the particular breeding line.

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