Evaluation results of stud bulls by offspring quality

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Abstract. Purebred stud bulls of a related Holstein breed are widely used when breeding domestic black-and-white cattle breeds. Results' evaluation of using these stud bulls by offspring quality is relevant and has practical significance. Stud bulls of the Vis Back Ideal 1013415 line were evaluated in one of the breeding farms of the Moscow region. As a result, it was found that all the evaluated stud bulls had a high breeding value. Bulls Trubach 174 - A^1; Nog Odin-M 490626 - A^1; Lowlands-M 427373367 – A^2 were assigned categories by milk yield, bulls Memory-M 54215651 – B^2; Fern-M 107901925 - B^1; Lowlands-M 427373367 – B^1. The evaluation of nutrients' yield with milk showed that when using the offspring of Memory-M 54215651 bull, negative results were obtained despite that it has a category B^2. According to the nutrients' yield with milk. Thus, stud bulls of the Vis Back Ideal 1013415 line: Trubach 174; Nog Odin-M 490626; Memory-M 54215651; Fern-M 107901925; Lowlands-M 427373367 can be used on the farm considering their breeding value. Lowlands-M 427373367 bull with category A^2 B^1 requires wider use.

1 Introduction

Ensuring the food security of any country in the world is ensured by the development of agricultural production, including the livestock industry. Particular attention is paid to the development of dairy cattle breeding as an industry responsible for the sustainable supply of the population with high-grade and high-quality food products, such as milk and beef [1-2]. The increase in demand for livestock products is provided by an ever-increasing population and the importance of milk and dairy products as food that can be consumed by people of any age, health condition, and income. This ensures the health of the nation and the food security of any country [3]. Cattle produce over 97% of the total milk production. Raw milk has strict requirements for its quality; therefore, tasks are being set to improve the quality indicators of milk along with increasing productivity [4-5]. Dairy and combined breeds of cattle of both domestic and foreign breeding are used for its production in the Russian Federation. The main livestock of dairy cattle is represented by domestic black pied and Holstein breeds, which are related in origin. Since the mid-80s of the past century,

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Holstein stud bulls have been widely used to improve the productive and technological qualities of domestic cattle, which made it possible to create new breed types in different regions of the country. Currently, the use of the gene pool of domestic and foreign-bred Holstein stud bulls continues on the breeding stock of black pied cattle; breeding is mainly done along Holstein lines. For the Holstein breed, the thorough-bredness share of the breeding stock in individual farms of the country has increased to 91% and up [6-10]. The evaluation of used stud bulls by offspring quality remains relevant and has practical significance.

The purpose of the work was to evaluate the results of using stud bulls by offspring quality.

2 Materials and methods

The research was carried out in the conditions of one of the breeding farms for the breeding of Holstein black pied cattle in the Moscow region. 5 bulls of the Holstein breed of the Vis Back Ideal 1013415 line were identified; as of 01.05.2020, they had 25 daughters who had completed 1 lactation: Trubach 174 - A^1; Nog Odin-M 490626 - A^1; Memory-M 54215651; Fern-M 107901925; Lowlands-M 427373367 – A^2. The assessment of offspring quality was carried out by comparison with peers. Milk yield for 305 days of lactation, MFF and MFP in milk were taken into account. Milk yield per lactation was evaluated daily from each cow using the "Selex-Dairy Cattle" program "Plinor"; milk quality indicators were evaluated 1 time per month in an average milk sample from each cow. Data from the zootechnical and breeding records of the Selex database were used for the analysis.

3 Results

The farm is engaged in breeding highly productive Holstein cattle of a black pied breed with a high thorough-bredness share in the Holstein breed (over 91%). Its breeding mainly involves purebred stud bulls of Holstein breed lines Vis Back Ideal 1013415; Reflection Sovereign 198998; Montwick Chieftain 95679 and Pabst Governor 191. The main livestock is represented by animals of the Vis Back Ideal 1013415 line, the offspring of 21 bulls of this line.

Table 1 presents data on milk productivity indicators of evaluated stud bulls' first heifers of the Vis Back Ideal 1013415 line.

Table 1. Productivity indicators of daughters and peers of stud bulls

Indicator	Stud bull				
	Trubach 174	Nog Odin-M 490626	Memory-M 54215651	Fern-M 107901925	Lowlands-M 427373367
Daughters					
Milk yield. kg	8119±102.34	8112±167.12	7650±139.34	7465±111.67	8079±87.12
MFF, %	4.06±0.02	4.05±0.03	4.23±0.02	4.36±0.03	4.40±0.03
MFP, %	3.27±0.01	3.25±0.01	3.30±0.02	3.34±0.02	3.42±0.03
Amount of milk fat. kg	330±3.41	329±5.01	324±2.67	325±3.11	355±2.56
Amount of milk protein. kg	265±2.13	264±2.34	252±2.46	249±2.31	279±2.14

	Peers				
Milk yield. kg	7819±98.56	7790±112.67	7931±121.39	8015±78.67	7891±109.78
MFF, %	4.15±0.03	4.16±0.02	4.08±0.02	4.02±0.03	4.03±0.04
MFP, %	3.28±0.01	3.29±0.01	3.24±0.02	3.24±0.02	3.21±0.02
Amount of milk fat. kg	324±2.96	324±2.25	324±2.43	322±2.03	318±3.46
Amount of milk protein. kg	256±2.32	256±2.91	257±1.98	260±1.58	253±3.01

The data presented in the table show that the daughters of stud bulls Trubach 174; Nog Odin-M 490626 and Lowlands-M 427373367 had higher yield compared to their peers by 188-300 kg or by 2.4 – 3.8%. The daughters of bulls Memory-M 54215651; Fern-M 107901925 had lower milk yield than their peers. This difference is better seen in Figure 1.

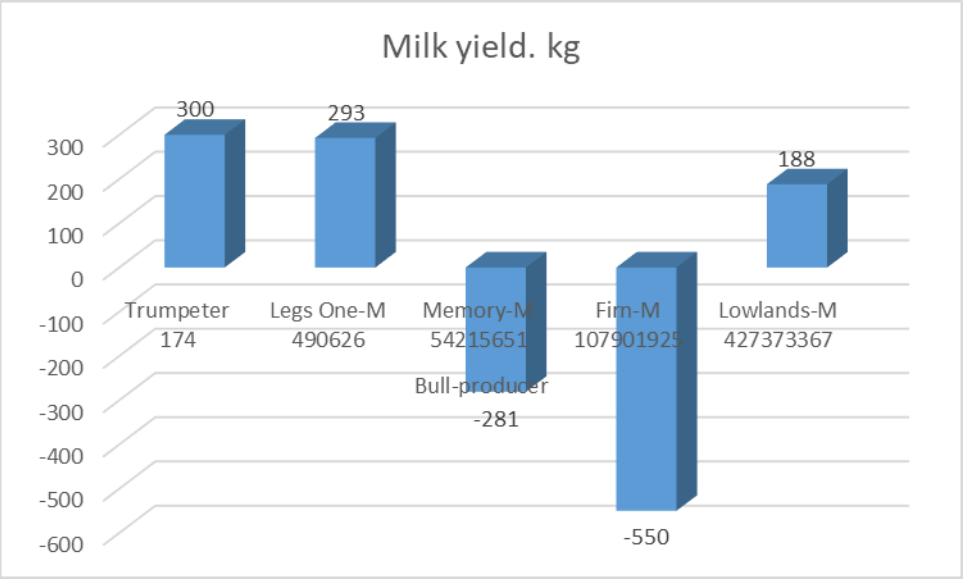

Fig. 1. The difference in milk yield between daughters and peers of stud bulls, kg

The figure clearly shows that despite the difference in milk yield between the offspring groups of the evaluated stud bulls being unreliable, there are tendencies to increase productivity in the daughters of bulls Trubach 174; Nog Odin-M 490626 and Lowlands-M 427373367, both among the daughters and in comparison with peers. Despite the slight difference in milk yield both in the direction of increase and decrease in milk yield compared to peers, based on the instructions for the evaluation of stud bulls, Trubach 174; Nog Odin-M 490626 can be assigned A^1 category of milk yield; Lowlands bull-M 427373367 – A^2; Memory-M 54215651 turned out to be neutral, and Fern-M 107901925 - a degrader.

It should be noted that the milk of bulls' daughters differs in quality indicators - both in the direction of their decrease and increase in comparison with their peers. Considering the variability of MFF and MFP in the milk of cows from different bulls, it can be noted that the highest rates are observed in the milk of daughters of Lowlands-M 427373367 - 4.40% MFF and 3.42% MFP in milk at their ratio of 0.80; that is, for every 180 g of protein there are 100 g of fat, which indicates a high nutritional value of this product. The difference in

MFF and MFP in milk between the groups of stud bulls' daughters and peers is clearly seen in Figure 2.

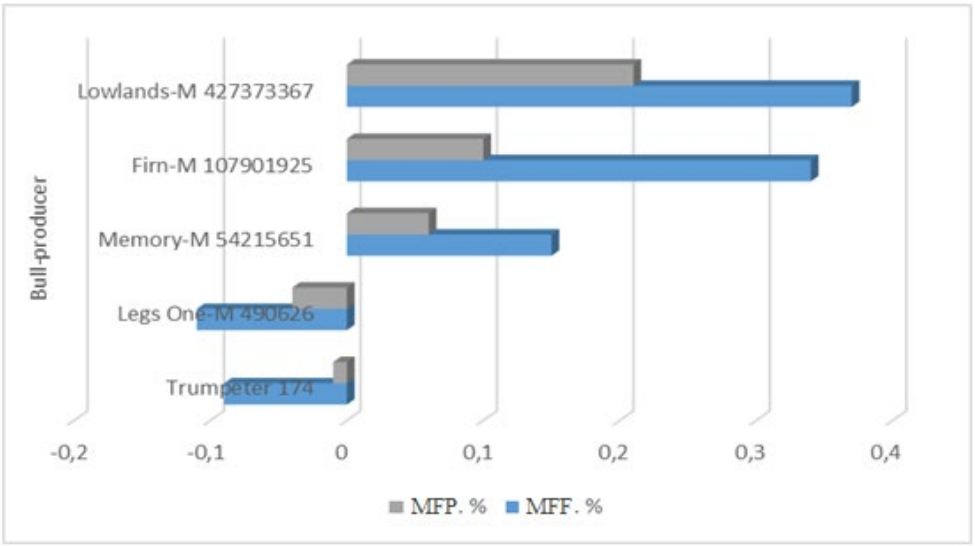

Fig. 2. The difference in MFF and MFP in milk between groups of stud bulls' daughters and peers

The figure shows that the daughters of bulls Trubach 174 and Nog Odin-M 490626 had lower MFF and MFP in milk compared to their peers. The daughters of other evaluated bulls had increased indicators of MFF and MFP in milk relative to their peers. The categories of bulls were established by milk MFF: Fern-M 107901925; Lowlands-M 427373367 – B^1; Memory-M 54215651 – B^2; Trubach 174; Nog Odin-M 490626 were neutral.

It should be noted that to some extent, the quality indicators of milk were interrelated with milk yield, which is clearly seen in Figure 3.

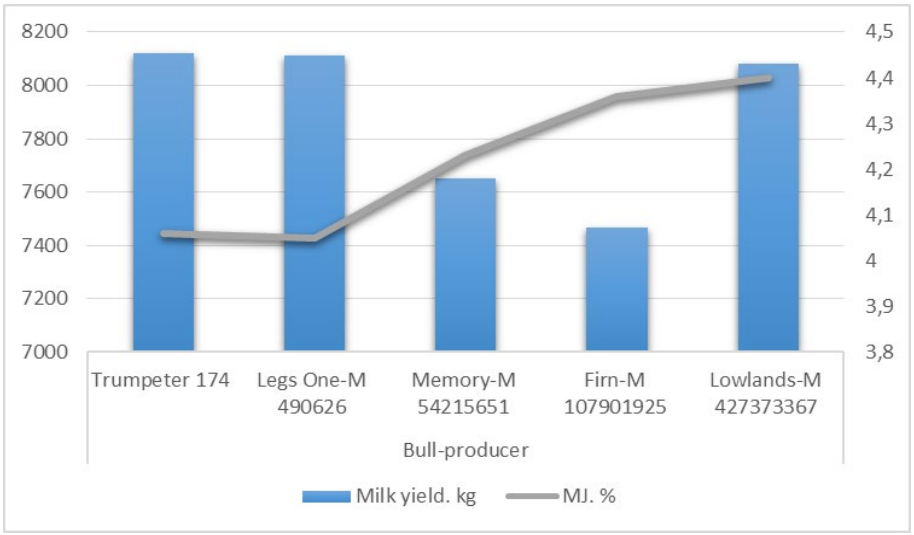

Fig. 3. The conjugacy of milk yield and MFF in the milk of the stud bulls' daughters

The figure clearly shows that the conjugation between milk yield and MFF in milk is negative, that is, with an increase in milk yield, a decrease in MFF in milk is observed; therefore, when planning breeding work with the brood stock on the farm, it is vital to consider these traits' conjugation. The exception is the daughters of Lowlands-M 427373367 stud bull; they were distinguished by high milk yields and the highest rates of MFF and MFP in milk, which is explained by the breeding value of the stud.

When evaluating cows by their own productivity, such indicators as the amount of milk fat and milk protein obtained from cows during lactation are considered. Data on the difference in the amount of milk fat and milk protein obtained from daughters and peers are presented in Figure 4.

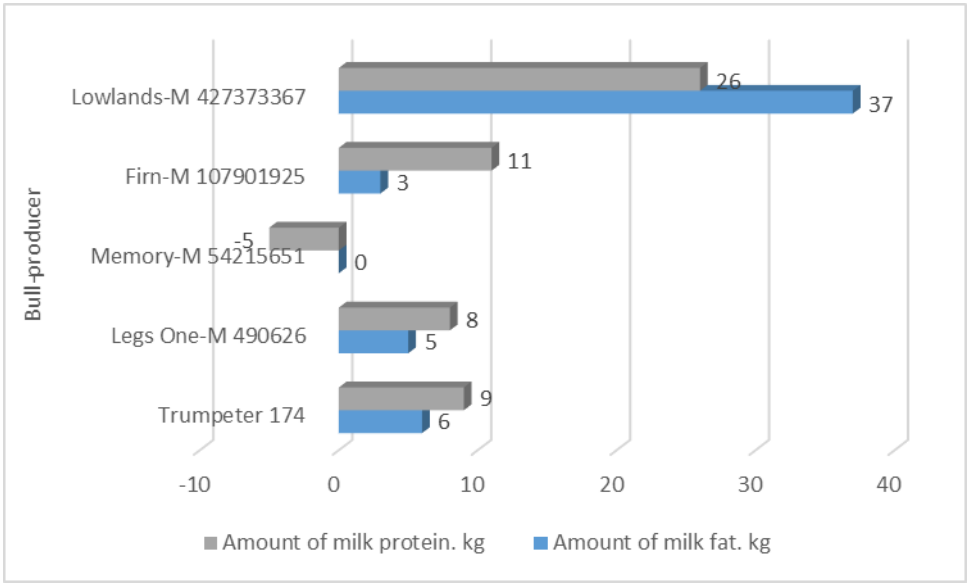

Fig. 4. The difference in the amount of milk fat and milk protein between the bulls' daughters and peers.

The figure clearly shows that only when using the daughters of the bull Memory-M 54215651, negative results were obtained on the yield of nutrients with milk despite that it has a category B^2. This bull should be used on breeding stock with high milk yields but low indicators of MFF and MFP in milk.

4 Discussion

The authors' data on the high breeding quality of Holstein bulls are confirmed by the studies of many authors such as N. Fedoseeva, E. Zakabunina [9], A.S. Gorelik, A.A. Nesterenko, P.V. Arkanov, O.A. Vagapova, E. Melnikova [10].

5 Conclusion

Based on the above, it can be concluded that stud bulls of the Vis Back Ideal 1013415 line: Trubach 174; Nog Odin-M 490626; Memory-M 54215651; Fern-M 107901925; Lowlands-M 427373367 can be used on the farm considering their breeding value. Lowlands-M 427373367 bull with category A^2 B^1 requires wider use. When using other stud bulls, it is

necessary to consider the planned indicators of offspring genetic potential and carry out appropriate selection.

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