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Оценка влияния длительности сервис-периода на молочную продуктивность коров

РЕЗЮМЕ

Уральский тип отечественной черно-пестрой породы отличается высокими показателями продуктивности, хорошей пригодностью к использованию в условиях промышленной технологии молока, но длительность его продуктивного долголетия составляет 2,4–2,6 лактаций. Снижение продуктивного долголетия связано, в частности, с воспроизводительными качествами. В результате проведенных исследований установлено, что за счет удлинения продолжительности лактации (свыше 305 дней) получено больше молока на 847–890 кг, или на 9,5–10,0%. При этом наблюдается снижение МДЖ и МДБ в молоке за 305 дней лактации: на 0,01–0,02% по жиру и на 0,02% по белку. Наиболее высокие среднесуточные удои установлены при длительности лактации 305 дней. У дочерей всех оцениваемых быков-производителей была одинаковая продолжительность сервис-периода — 132–134 дня. Она была выше оптимальных показателей на 52–54 дня, или на 65–68%. Индекс плодовитости коров превышает 48%, поэтому можно говорить о том, что плодовитость у коров хорошая. Потенциал плодовитости маточного поголовья хороший и сокращение длительности сервис-периода позволит повысить эффективность молочного скотоводства в хозяйстве.

Ключевые слова: коровы, молоко, продуктивность, лактация, плодовитость, сервис-период, молочное скотоводство

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Assessment of influence of duration of the service period on the milk yield of cows

ABSTRACT

The Ural type of the Russian Black-and-White mottled breed features high rates of milk yield, good suitability for industrial milking technology, but the duration of their productive longevity is 2.4–2.6 lactations only. The decline in productive longevity is associated, in particular, with qualities of reproductive system. As a result of the conducted researches, it was found that due to elongation of lactation (over 305 days), more milk was obtained by 847–890 kg, or by 9.5–10.0%. At the same time, there is a decrease in MFF and MFP in milk for 305 days of lactation: by 0.01–0.02% for fat and by 0.02% for protein. The highest average daily milk yield was recorded in lactation duration of 305 days. The daughters of all assessed servicing bulls had the same service period of 132–134 days. It is 52–54 days higher than optimal indicators, or by 65–68%. The fertility index of cows exceeds 48%, so we can say that the fertility of cows is good. The fertility potential of the livestock is good and decrease of service period duration will increase the efficiency of dairy cattle breeding in the farm.

Key words: cows, milk, productivity, lactation, fertility, service period, dairy cattle breedinge

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Введение / Introduction

The food safety in any country poses large tasks for farmers to increase production and improve the quality of agricultural products, including the food products of animal origin [1–4].

Great importance is referred to the development of dairy farming as a branch of animal husbandry, from which milk is obtained. This is a valuable food product and raw material for the food industry [5–12].

For its production, highly productive dairy cattle are used, the main livestock of which is represented by related breeds of Dutch origin — Holstein, Black-and-White mottled breed, etc. [13–15].

The genetic pool of the Holstein breed, which is considered the best dairy breed in the world, for more than four decades has been widely used and continues to be used to improve Russian livestock, including the Black-and-White breed in order to increase abundant milk yield and improve technological characteristics in industrial production [16–18].

The increase in the livestock productivity led to decrease in productive longevity due to decline in the cows reproductive functions [19, 20].

In Sverdlovsk region the Ural type of Holsteinized black-and-white mottled cattle is used. The duration of the productive period of these cattle in agricultural farms varied on average within the range of 2.4–2.6 lactations and the duration of the service period exceeded 120 days. When breeding it, the world gene pool of servicing bulls of the Holstein breed continues to be used and the cattle is bred up along the lines, including the Holstein ones [21, 22].

The assessment of the reproductive qualities of cows-daughters of various servicing bulls is relevant and has practical value.

Материал и методы исследования / Materials and method

The cows of Holsteinized black-and-white mottled cattle, daughters of Holstein servicing bulls, were used as the objects of research. The studies were carried out in one of the pedigree reproducing farm for breeding of Holsteinized black-and-white cattle of the Ural type in Sverdlovsk region.

The data of zootechnical and veterinary records of the IAS “SELEX.Dairy Cattle” database were used. Milk yield for 305 days of lactation, MFF and MFP in milk were taken into account. Milk yield per lactation was assessed by control milking once a month, the quality indicators of milk were determined in the dairy laboratory of the Uralplemcenter in average milk sample taken from each cow once per month. The reproductive qualities of cows were assessed by duration of the service period, the calving interval, the frequency of inseminations, the coefficient of reproductive capability (CRC) and the fertility index (PI Doha).

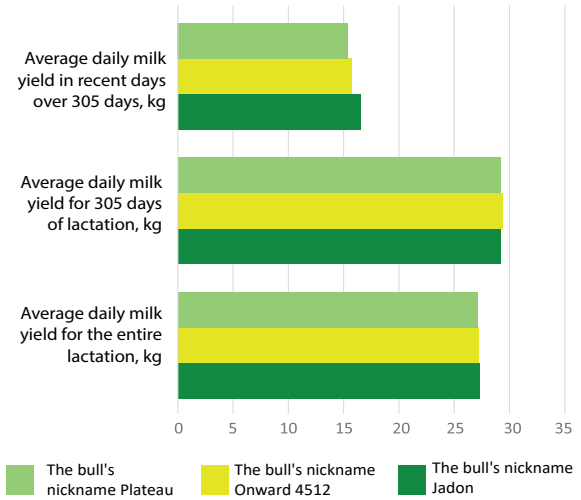
The animals were divided into groups depending on the servicing bulls' line: group 1 — daughters of the servicing bull Jadon; group 2 — daughters of the servicing bull Onward 4512; and group 3 — daughters of servicing bull Plateau.

The obtained digital data were processed by the methods of variation statistics. Statistical processing of the obtained digital data was carried out using a computer with an «Intel Core i9» processor (USA), licensed software package «Microsoft Office 2016» (USA). Student's *t*-test was used to assess the significance of differences between the two means. Differences were considered statistically significant at $p < 0.05$; $p < 0.01$; $p < 0.001$.

Table 1. **Milk productivity of daughters-cows**

Indicator	The bull's nickname		
	Jadon	Onward 4512	Plateau
Milk yield for the entire lactation, kg	9788±101.23	9829±99.34	9754±87.78
Average daily milk yield for the entire lactation, kg	27.300	27.2	27.1
Milk yield for 305 days of lactation, kg	8898±79.45	8952±89.21	8907±65.12
Average daily milk yield for 305 days of lactation, kg	29.2	29.4	29.2
Average daily milk yield in recent days over 305 days, kg	16.5	15.7	15.4
Difference, +–	–890	–877	–847
Lactation duration, days	359±10.3	361±9.4	360±9.9
MFF, for the entire lactation, %	3.90±0.004	3.91±0.003	3.92±0.004
MFF, for 305 days of lactation, %	3.89±0.013	3.89±0.007	3.90±0.009
Difference, +–	–0.01	–0.02	0.02
MFP, for the entire lactation, %	3.23±0.002	3.23±0.002	3.23±0.001
MFP, for 305 days of lactation, %	3.21±0.001	3.21±0.002	3.21±0.002
The difference, +–	–0.02	–0.02	–0.02

Fig. 1. Average daily milk yield of cows by lactation periods, kg



Результаты и обсуждение / Results and discussion

The main indicators of the efficiency of dairy cattle breeding and milk yield is its productivity.

Table 1 presents data on the milk yield of daughters of servicing bulls for the first lactation. Analysis of the data presented in the table showed that due to elongation of lactation over 305 days, more milk was obtained by 847–890 kg, or by 9.5–10.0%. At the same time, there is a decrease in MFF and MFP in milk for 305 days of lactation: by 0.01–0.02% for fat and by 0.02% for protein. This confirms the general pattern of increase in fat and protein content in milk of cows by the end of lactation.

Despite the prolonged lactation, the average daily milk yield in the groups of daughters of Holstein servicing bulls was quite high and varied approximately in the same range both for the entire lactation and for 305 days of lactation. The results are shown in the figure 1.

Average daily milk yields for different periods of lactation in cows-daughters of servicing bulls differed insignificantly. This proves a good management and arrangement in the dairy farm, including milk production, and also a high level of breeding work, including the selection of servicing bulls. At the end of lactation, the average daily milk yield decreases to 15.4–16.5 kg.

Fig. 2. Duration of the service period, days

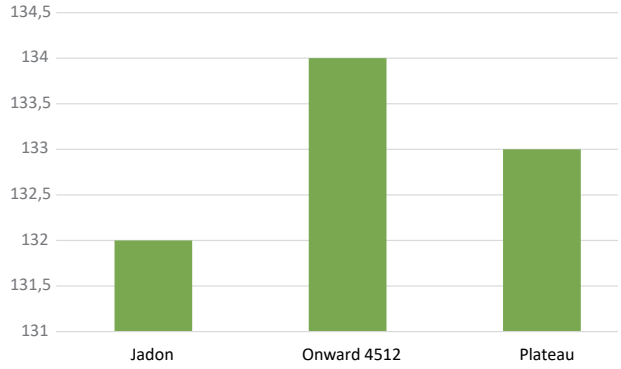


Fig. 3. Duration of the productive period of cows-daughters, lactations

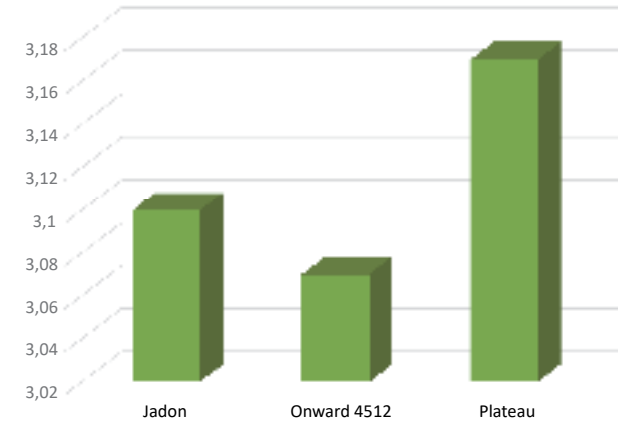
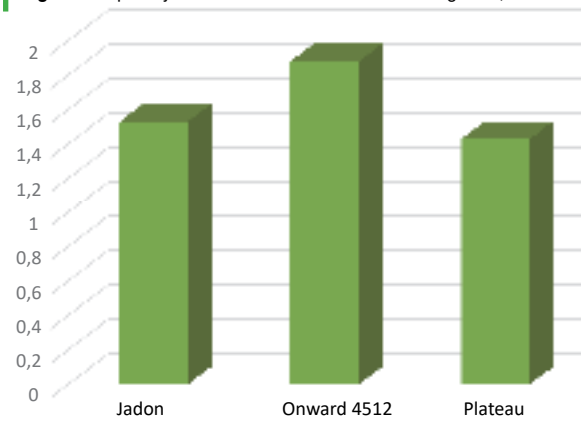


Fig. 4. Frequency rate of insemination of cows-daughters, times



52–54 days higher than optimal duration, or 65–68% higher than the maximum duration of 80 days.

This led to increase in the duration of lactation and, accordingly, to increase of milk yield for the entire lactation period. This increase is 10.0; 9.8 and 9.5%, but leads to a decrease in productive longevity (figure 3).

In case of optimal service period and normal lactation duration, a calf (i.e. a heifer for replacement stock or a bull for fattening) and milk, in our case 8898–8952 kg, can be obtained from the cow during the calendar year.

The increase of lactation duration by 54–56 days per lactation in the entire period of use of a cow will amount to 167–178 days. During this period, the farm can get 4876–5233 kg of milk additionally, which is more than almost two times even in case of lactation elongation, so practically the losses occur due to lack of newly-born calf and milk. With increase of lactation duration for the period of productive use of cows on the farm, the milk yield will be 2685–2759 kg, which is lower than that can be obtained in case of normalizing the reproductive functions of a cow.

The reproductive functions of cows are assessed not only by the duration of the service period, but also by other indicators, like frequency of insemination, the calving interval, the coefficient of reproductive capability, and others. Data on the frequency of insemination of cows-daughters of different servicing bulls are presented in figure 4.

The figure shows that when inseminating the cows-daughters of the bull Onward 4512, more doses of semen are consumed, which leads to overuse of the expensive semen.

The duration of the calving interval can serve as indicator for the reproductive capabilities of the livestock. Coefficient of reproductive capability shows the level of reproduction.

Optimally, it must be at least 0.95 and strive for 1, that means than each cow every year can give a calf. In our case this index is 0.86–0.87 and indicates that there are certain problems with reproduction system in the herd, including in the groups of assessed servicing bulls (figure 5).

Low indices of the coefficient of reproductive capability and high calving interval confirm the data that shows decrease in reproductive functions. They were lower in the group of cows from the servicing bull Onward 4512.

Calculation of the fertility index of cows showed that it is quite good (figure 6).

The highest average daily milk yield was recorded in case of lactation duration of 305 days. The daily yield was within the range of 29.17–29.35 kg, while increase in lactation duration led to decrease in the average daily milk yield by 4.96; 5.26 and 5.24 kg, or by 17.0; 17.9, and 17.9% those numbers are significant at $p \leq 0.01$. This is due to the rather low, in comparison with previous indicators of milk yield in the period starting from the 306th day of lactation.

It is known that the duration of lactation to some extent depends on the duration of the service period. In our case it exceeded 130 days (figure 2).

The daughters of all assessed servicing bulls showed almost the same service period. The difference between the groups of daughters was only 1–2 days and thus was not significant. It was

Fig. 5. Reproduction indices of cows-daughters of servicing bulls

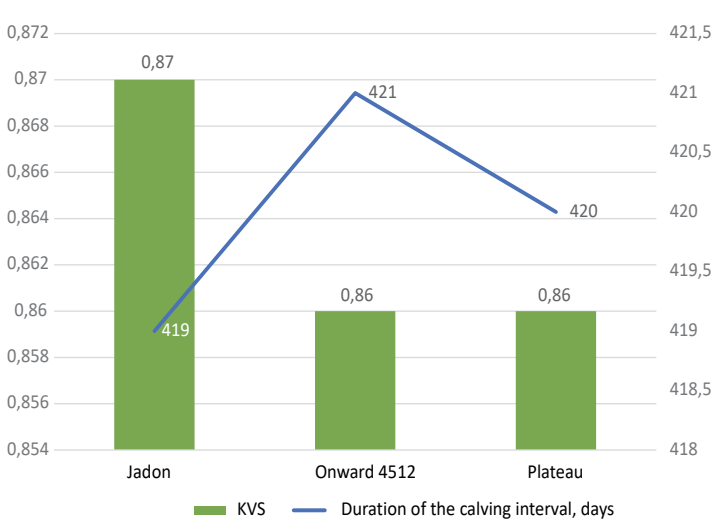
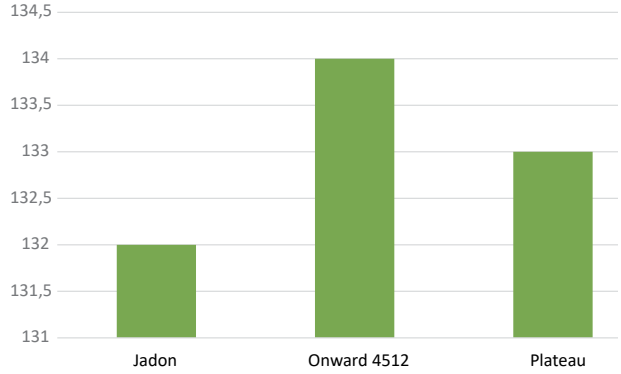


Fig. 6. Cows' fertility index, %



The cows' fertility index exceeds 48%, so we can say that the cows' fertility is quite good.

Выводы / Conclusion

Thus, the duration of the service period influences the milk productivity of cows. It increases milk yield by increasing the duration of lactation, but reduces the efficiency of using the cows on the dairy farm by reducing the productive longevity. That is confirmed by a low coefficient of reproductive capability. However, the fertility potential of the livestock is quite good and a reduction of the service period will increase the efficiency of dairy cattle breeding in the farms.

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Авторы в равной степени участвовали в написании рукописи и несут равную ответственность за плагиат.
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All authors bear responsibility for the work and presented data.
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The authors were equally involved in writing the manuscript and bear the equal responsibility for plagiarism.
The authors declare no conflict of interest.

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