

Influence of reproductive qualities on dairy productivity of cows of the Simmental breed

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Abstract. The aim of work is to explore influence of first fruitful insemination, service period and dry period to dairy productivity of Simmental cows. The research is aimed at studying the milk production of Simmental cows with different levels of reproductive qualities. The result of the research, a relation was established between the age of the first fruitful insemination, the duration of the service period, the duration of the dry period and milk production performance. It has been established that the age of the first fruitful insemination at 18-24 months has the most beneficial effect on subsequent milk production. The service period of 90-120 days has a positive effect to an increase in milk yield per 305 days of lactation, the longer service period negatively affects to the mass fraction of fat. With an increase in the duration of the dry period, the mass fraction of fat increases, but milk yield decreases. The influence of reproductive qualities to the milk protein is negligible. It was revealed that the age of the first insemination at 18-24 months is the most profitable for production. According to the results of the research, it can be judged that reproductive qualities, in combination with other factors, affect the milk productivity of Simmental cows.

1 Introduction

Most of the factors affecting milk production have effect in combination, so it is not easy to establish the level of impact of each of them individually [1].

In dairy farming, simultaneously with an increase in productivity, a tendency for a decrease in reproductive capacity and a reduction in the length of the economical use of cows is found, which leads to a slowdown in the intensity of reproduction and the effectiveness of selection and breeding work [2]. A decrease in the age of pubescence and physiological maturity of heifers, that is, early maturity, is the main factor that determines the duration of use. Heredity, along with paratypical factors, affects the reproductive system and its successful functioning, including the age of reproductive use of livestock [3-4]. The main task of dairy farming is to intensify the industry by accelerating the increase in the genetic potential of animals [5-7].

Under conditions of intensification, the age of the first calving of Holsteinized animals should be 24-25 months, although the optimal age is 27-29 months [8]. Reducing the age of first calving allows you to reduce the cost of raising cows and get a larger number of

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offspring in the same period with early calving, which subsequently gives an increased production of milk and meat [9]. The combination of high milk productivity and good reproductive ability in animals is an important selection criterion in breeding work with dairy cattle [10].

This research analyzes the influence of the age of first insemination, the duration of the service period and the dry period on milk yield for 305 days of lactation, the milk fat, the milk protein on Simmental cows in the conditions of the peasant farm Tasaliev DM Kaliningrad region.

The aim of the research is to explore the milk productivity of Simmental cows with different levels of reproductive qualities.

2 Materials and methods

The assessment of reproductive qualities was carried out at the livestock enterprise of the peasant farm Tasaliev DM (Kaliningrad region) on Simmental cows (n = 56). During the research, the animals were under the same feeding and housing conditions.

During the experiment, the assessment of milk productivity (milk yield per 305 days of lactation, mass fraction of fat, mass fraction of protein) in cows with different levels of reproductive qualities (age of the first fruitful insemination, duration of the service period, duration of the dry period) was carried out.

The animals were divided into three groups. The first group included animals with an indicator below the average (recommended by literary sources), the third group - animals with an indicator above the average. Accordingly, the second group included animals with average reproduction rates. The research materials were the results of milk production and reproductive qualities of first-calf heifers and cows and reports on the production activities of the farm.

3 Results

Analysis of the data showed that first-calf heifers with the age of the first fruitful insemination of 18-24 months subsequently have a higher level of milk productivity (Table 1).

Table 1. Indicators of milk productivity in first-calf heifers depending on age at the first fruitful insemination

Characteristic value	Age of the first fruitful insemination, months		
	< 18 (n=13)	18-24 (n=32)	>24 (n=11)
Milk yield per 305 days of lactation, kg	4285	4889	5001
MFF, %	4.10	4.23	4.29
MFP, %	3.3	3.3	3.3
Milk fat, kg	173	207	186
Milk protein, kg	141	162	144
Milk fat and milk protein, kg	314	369	330

Animals inseminated at the age of less than 18 months and more than 24 months were significantly inferior in milk yield to first-calf heifers aged 18-24 months ($P < 0.05$).

There were no significant differences in the percentage of protein between the three groups ($P > 0.05$).

With an increase in the age of first insemination, milk fat content in first-calf heifers significantly increased ($P < 0.05$).

Corresponding results were obtained when analyzing the age of first calving. In first-calf heifers with a calving age of 27-33 months, milk yield was significantly higher than in heifers calving at an age of less than 27 months ($P < 0.05$).

In first-calf heifers with an early calving age, the MFF is 4.10%, which is lower than the values of this indicator in the second and third groups by 0.13% and 0.19%, respectively. According to calculations, the difference in values in the groups can be considered statistically significant ($P < 0.05$). The percentage of protein in milk of later calving cows did not differ significantly. The results obtained indicate that insemination of heifers at the age of 18-24 months is most favorable for their subsequent milk production.

Despite the fact that first-calf heifers, inseminated at the age of over 24 months, had higher milk yield than those inseminated at 18-24 months, it is more rational to inseminate animals no later than 24 months, since for the additional time spent on raising heifers, milk yield increases insignificantly.

The next factor affecting the level of milk production is the regulation of the duration of lactation of the cow by choosing the period of insemination after calving [11-12]. The optimal duration of the service period is 45-60 days [13]. However, it is not always possible to regulate these periods, since not every insemination of a cow is fruitful, which is why there are differences in the duration of the service period. In this regard, during artificial insemination of cows, they try not to miss the emerging estrus.

Table 2 shows the indicators of milk production depending on the duration of the service period. There was a tendency to increase milk yield for 305 days of lactation in the group with a service period of 90-120 days, however, this tendency turned out to be statistically insignificant ($P > 0.05$) (Table 2).

Table 2. Indicators of milk production in cows with different duration of the service period

Service period duration	less than 90 days	90 - 120 days	over 120 days
Characteristic value	(n = 10)	(n = 23)	(n = 23)
Milk yield per 305 days of lactation, kg	5268.50	5764.52	5732.70
MFF, %	4.21	4.25	4.17
MFP, %	3.32	3.31	3.32

An increase in the duration of the service period significantly leads to a decrease in the percentage of fat in milk ($P < 0.05$). No statistically significant differences in protein percentage were found ($P > 0.05$).

The results obtained indicate that the physiologically determined duration of the service period most favorably affects the increase in milk productivity (Figure 1).

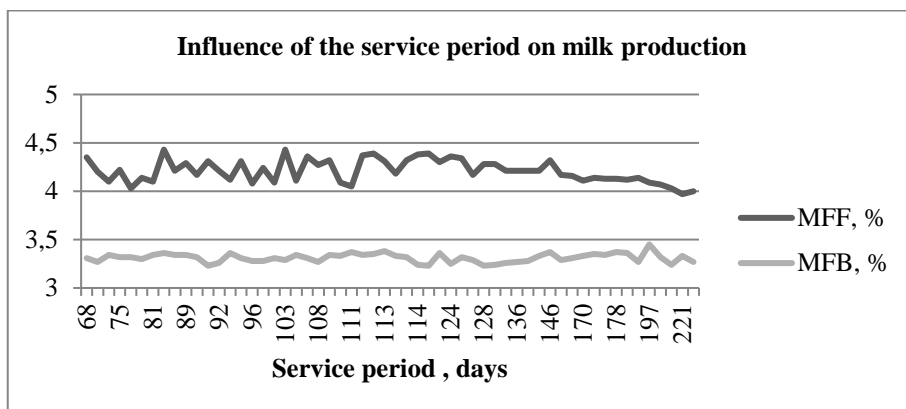


Fig. 1. Influence of the duration of the service period on the mass fraction of fat and mass fraction of protein

The service period has an even more significant effect on the reproductive capacity of cows than on milk production. Calf reproduction consists of two periods: the gestation period and the service period. Since the gestation period is relatively constant, equal to 285 days, the number of calves obtained from cows per unit of time of use depends mainly on the service period. With its increase, annual calf crop decreases [14].

Table 3. Calf crop depending on the duration of the service period

Service period duration	less than 90 days	90 - 120 days	over 120 days
Characteristic value	(n = 10)	(n = 23)	(n = 23)
Calves, heads	10	22	13
Calves received per 100 heads, %	100	95.7	56.5
Calf losses with an extended service period, %	-	4.3	43.5

Table 3 shows that an increase in the duration of the service period leads to a significant loss of calves per year.

Table 4 shows the indicators of milk productivity depending on the length of the dry period. The highest milk yield in 305 days of lactation was found in cows with a dry period of 45-60 days, the lowest in cows with a dry period of more than 60 days, but, according to calculations, the dependence of milk yield on the duration of the dry period is statistically insignificant ($P > 0.05$).

Table 4. Indicators of milk production in cows with different duration of the dry period

Duration of the dry period	less than 45 days	45-60 days	over 60 days
Characteristic value	(n = 11)	(n = 26)	(n = 19)
Milk yield per 305 days of lactation, kg	5749.18	5902.42	5733.84
MFF, %	4.20	4.24	4.26
MFP, %	3.32	3.32	3.32

With an increase in the duration of the dry period, the mass fraction of fat in the milk of the studied livestock significantly increases, the highest percentage of fat was noted in the group with a duration of more than 60 days ($P < 0.05$).

No statistically significant connection was found between the duration of the dry period and the mass fraction of protein in milk ($P > 0.05$).

4 Conclusion

According to the results of the research, it can be estimated that reproductive qualities, along with other factors, affect the milk productivity of Simmental cows.

The age of the first fruitful insemination at 18-24 months has the most favorable effect on milk yield in 305 days of lactation, on the mass fraction of fat and the mass fraction of protein.

The physiologically determined duration of the service period of 90-120 days has a positive effect on increasing milk production. The average service period of the studied livestock was 125 days, which exceeds the norm by 5 days and reduces the calf crop. A shortened service period, that is, less than 90 days, due to the influence of the hormonal system, leads to a decrease in productivity after 305 days of lactation.

The advantageous effect of the dry period on increasing milk yield and fat mass fraction is observed with duration of 45-60 days. With an extended dry period, milk yield decreases, and the mass fraction of fat increases, with a shortened period, all indicators of milk productivity are inferior to other groups.

Based on the above, it is necessary to recommend the peasant farm "Tasaliyev D.M." insemination of heifers no later than 21 months, when they reach a live weight of at least 380 kg, which will contribute to the safety of newborn calves, increase milk productivity and reduce the cost of raising animals.

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