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МОЛОЧНАЯ ПРОДУКТИВНОСТЬ КОРОВ-ПЕРВОТЕЛОК В ЗАВИСИМОСТИ ОТ ИНТЕНСИВНОСТИ ИХ ВЫРАЩИВАНИЯ

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Представлены результаты исследований молочной продуктивности коров черно-пестрой породы в зависимости от возраста первого осеменения и живой массы при первом отеле в условиях Иркутской области. Изучена динамика выращивания телок по годам, молочная продуктивность коров по 1-й и 3-й лактациям в зависимости от интенсивности их развития. Эксперимент проведен по материалам хозяйства Иркутской области с использованием общепринятых зоотехнических, аналитических, вариационно-статистических методов исследований с 2016 по 2020 г. Живая масса телок во все возрастные периоды соответствовала требованиям классов элита и элита-рекорд. Анализ данных показал, что скорость роста животных в период исследований возросла (6,0; 6,8; 2,3 и 4,8% соответственно при достоверной разнице $p \geq 0{,}90$). С увеличением интенсивности выращивания телок отмечено повышение уровня их удоя за 305 дней 1-й лактации. Наибольшая молочная продуктивность отмечена по 1-й (5309–5476 кг) и 3-й (5418–5817 кг) лактациям у коров, возраст первого плодотворного осеменения которых составил 13–14 мес. Наименьший удой по 1-й и 3-й лактациям получен от коров, осемененных в возрасте 20 мес и старше. Наибольшую молочную продуктивность в 1-ю и 3-ю лактации получили от коров с живой массой при первом отеле 541–550, 551 кг и выше (5197–5164, 5436–5545 кг соответственно). Наименьшая молочная продуктивность получена от коров с живой массой при первом отеле до 500 кг (4567–5122, 4943–5009 кг). Полученные результаты позволяют выявить влияние интенсивности выращивания телок на продуктивные качества коров.

Ключевые слова: рост и развитие, молочная продуктивность, возраст первого осеменения, живая масса при первом отеле

MILK PRODUCTIVITY OF FIRST-CALF COWS DEPENDING ON THE INTENSITY OF THEIR BREEDING

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The paper presents the results of studies of milk productivity of black-and-white cows depending on the age of the first insemination and live weight at the first calving in the conditions of the Irkutsk region. The dynamics of heifer rearing by year, milk productivity of cows in the 1st and 3rd lactations depending on the intensity of their development has been studied. The experiment was conducted on farm materials from the Irkutsk Region using generally accepted zootechnical, analytical, variation and statistical research methods from 2016 to 2020. Live weight of heifers at all ages met the requirements of the elite and elite-record classes. Analysis of the data showed that the growth rate of the animals increased during 5 years (6.0%, 6.8, 2.3 and 4.8% respectively with a significant difference $p \geq 0.90$). With the increased intensity of heifer rearing, an increase in milk yield over 305 days of the first lactation was observed. The highest milk production was noted in the 1st (5309-5476 kg) and 3rd (5418-5817 kg) lactations in cows with the first fruitful insemination at 13-14 months. The lowest 1st and 3rd lactation yields are obtained from cows inseminated at 20

months of age or older. Higher milk production in the first and third lactations was obtained from cows with a live weight at first calving of 541-550 kg, 551 kg and higher (5197-5164, 5436-5545 kg respectively). Less milk production was obtained from cows with a live weight at first calving of up to 500 kg (4567-5122, 4943-5009 kg). The results obtained make it possible to reveal the influence of the intensity of rearing heifers on the productive qualities of cows.

Keywords: growth and development, milk productivity, first insemination age, live weight at first calving

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INTRODUCTION

Milk productivity of cows is the main economic and breeding trait in cattle breeding. The formation of milk productivity occurs during the growth and development of the animal [1-7]. Intensive breeding of replacement heifers and bred heifers, determination of optimal age and live weight at the beginning of their economic use are important elements of highly productive dairy cattle breeding with annual cow productivity of 6-10 thousand kg. Obtaining this level of productivity from the first lactation of cows is an urgent task of herd management and increasing economic efficiency of business activities in dairy cattle breeding [8, 9].

Determination of optimal age and live weight at first calving is of great importance in herd selection [10]. Some scientists believe that early heifer mating (13-15 months) under optimal feeding and housing conditions does not adversely affect the subsequent milk productivity of cows. Other authors believe that the optimal period for the first fertile insemination of heifers should be at least 18, 19 months [11, 12].

The problem of studying the growth and development of heifers is of great economic importance, since the indicators of full development and readiness of animals for the first insemination largely determine the efficiency of further production use of cows [13]. In this connection, the issues of peculiarities of growth and development dynamics of heifers are considered. Dairy productivity depends on many paratypical factors, but the main one is the age of heifers at the first insemination [14, 15]. The age of the first fruitful insemination and calving, the live weight at the first calving have a certain influence on the subsequent productivity and the manifestation of the main breeding traits.

The purpose of the study is to identify the dependence of milk productivity of first heifers on the intensity of their rearing in the conditions of the Irkutsk region.

Research objectives:

– determine the effect of heifer rearing intensity on their future dairy productivity;

– determine the effect of live weight at first calving on milk productivity of cows.

MATERIAL AND METHODS

The information database of the SELEX pedigree accounting program of the highly productive herd of black and white cattle in "Okinsky" SEC of the Irkutsk region served as the research materials. The experiment was conducted from 2016 to 2020. The animals (949 heads) that were evaluated according to growth and development indices, and subsequently according to milk productivity for the 1st and 3rd

lactations were chosen as the object of research.

When performing this work, generally accepted research methods were used: zootechnical, analytical, variation and statistical. All obtained results were processed on the basis of private methods of population genetics and mathematical statistics on a personal computer using Microsoft Excel, Snedecor V5.

RESULTS AND DISCUSSION

Among modern problems in dairy cattle breeding, early maturity deserves attention. Timely use of replacement heifers for herd reproduction is of great production importance because it affects not only zootechnical but also economic issues.

It is known that the productive period of cows begins with calving. The formation and level of the reproductive ability manifestation in adult heifers is determined not only by heredity but also by the intensity of breeding of replacement heifers.

The main indicators of heifer growth intensity, which characterize the growth and development of animals in different age periods of rearing, are absolute and average daily gain. The characteristics of growing heifers are presented in Table 1.

Heifers with the age of the first fruitful insemination at 13-15 months had the highest average daily gains at different ages. At 0-6 months of age (with an average daily gain of 754 g) and 6-12 months (759 g), the first insemination age was 15 months; 0-6 months (778 g), 6-12 months (810 g), 14 months; 0-6 months (808 g), 6-12 months (901 g), 13 months ($p \geq 0.95$). Absolute gains at 0-6 months of age were 136, 140, 145 kg; at 6-12 months, 136, 146, 162 kg, respectively. The highest age of the first fruitful insemination was observed for heifers at 19, 20 months and older, with average daily gains of 722 and 677 g during the 0-6 months breeding period, respectively. During the rearing period of 6-12 months, the average daily gains were also minimal (632 and 665 g, respectively).

Dairy productivity of cows during the first lactation depends largely on how heifers are prepared for insemination, the determining factors are age and live weight [1].

Tables 2, 3 show the dynamics of milk productivity of cows depending on the age of the first calving.

Analysis of Table 2 makes it possible to determine the desirable age of the first insemination, at which the greatest amount of milk can be obtained. Heifers first inseminated at the age of 13 and 14 months with an average live weight of 370-374 kg gave the highest milk productivity in the first lactation (5309-5476 kg, respectively, milk fat content 3.74%). The lowest milk productivity in the 1st lactation was obtained from cows whose age of first insemination was 20 months and older (5036 kg, 3.75%). The heifers inseminated at 15, 16, 17,

Табл. 1. Влияние интенсивности роста телок на возраст первого осеменения
Table. 1. Influence of heifer growth rate on the age of first insemination

Age of the first insemination, months	Heifers, heads.	Absolute weight gain per month on average, kg			Average daily weight gain, g	
		Rearing period			Rearing period	
		0–6 months	6–12 months	6 months before the insemination	0–6 months	6–12 months
13	11	145 ± 4,2	162 ± 3,0	32 ± 3,3	808 ± 73,5	901 ± 16,5
14	150	140 ± 1,5	146 ± 1,2	56 ± 1,1	778 ± 8,4	810 ± 6,9
15	153	136 ± 1,2	136 ± 1,3	75 ± 1,0	754 ± 6,7	759 ± 7,1
16	162	130 ± 1,2	130 ± 1,2	93 ± 1,1	720 ± 6,9	724 ± 6,9
17	151	130 ± 1,4	126 ± 1,5	106 ± 1,6	726 ± 7,5	701 ± 8,3
18	157	128 ± 1,5	121 ± 1,5	120 ± 1,4	714 ± 8,1	674 ± 8,4
19	66	130 ± 1,8	119 ± 2,0	131 ± 2,5	722 ± 9,8	665 ± 11,1
20 and older	99	121 ± 2,2	113 ± 2,4	148 ± 2,8	677 ± 12,1	632 ± 13,1

18, 19 months of age had yields of 5226, 5198, 5147, 5225, 5067 kg, respectively.

The best productivity indices in the 3rd lactation were also observed in heifers inseminated at the age of 13, 14, 15 months (5418, 5817, 5510 kg). The lowest yields in the 1st and 3rd lactations were obtained from animals inseminated at the age of 20 months and older.

Studies conducted in various regions of Russia have proven that heifers with a constant growth rate at all periods have high fertility; young heifers with a high growth rate during pregnancy have a higher mass at calving, which leads to fewer complications during calving, as well as greater productivity in the first lactation. Heifers should have optimum live weight by the time of calving.

Tables 4, 5 show the dynamics of milk production as a function of live weight at first calving.

The highest milk productivity in the 1st and 3rd lactations in "Okinsky" SEC was obtained from cows with live weight at first calving of 541-550, 551 kg and higher (5197-5164, 5436-5545 kg respectively) with a reliable difference $p \geq 0.90$) (see Tables 4, 5). The lowest milk production was obtained from cows with live weight at first calving up to 500 kg (4567-5122, 4943-5009 kg).

Табл. 2. Молочная продуктивность коров по 1-й лактации в зависимости от возраста первого осеменения

Table. 2. Milk productivity of cows in the 1st lactation depending on the age of first insemination

Age of the first insemination, months	Cows, heads.	Live weight at the first productive insemination, kg	Milk productivity			
			Milk yield, kg	Fat, %	Fat, kg	Protein, %
13	9	370	5309 ± 79	3,74 ± 0,002	198,6 ± 2,9	3,11 ± 0,001
14	149	374	5476 ± 33	3,74 ± 0,003	204,8 ± 1,2	3,11 ± 0,001
15	160	378	5226 ± 35	3,74 ± 0,004	195,4 ± 1,3	3,11 ± 0,002
16	168	384	5198 ± 32	3,74 ± 0,004	194,4 ± 1,2	3,12 ± 0,002
17	151	394	5147 ± 28	3,74 ± 0,004	192,4 ± 1,1	3,11 ± 0,002
18	161	405	5125 ± 35	3,74 ± 0,004	191,7 ± 1,3	3,12 ± 0,002
19	70	421	5067 ± 39	3,73 ± 0,005	190,0 ± 1,5	3,12 ± 0,003
20 and older	102	426	5036 ± 50	3,75 ± 0,006	188,9 ± 1,9	3,12 ± 0,003

Табл. 3. Молочная продуктивность коров по 3-й лактации в зависимости от возраста первого осеменения

Table 3. Milk productivity of cows in the 3d lactation depending on the age of first insemination

Age of the first insemination, months	Cows, heads	Milk productivity			
		Milk yield, kg	Fat, %	Fat, kg	Protein, %
13	9	5418 ± 72	3,89 ± 0,004	210,6 ± 2,8	3,11 ± 0,002
14	149	5817 ± 48	3,90 ± 0,004	199,4 ± 1,9	3,12 ± 0,004
15	160	5510 ± 72	3,89 ± 0,003	214,4 ± 2,8	3,11 ± 0,002
16	168	5308 ± 55	3,89 ± 0,003	206,6 ± 2,1	3,12 ± 0,002
17	151	5325 ± 66	3,88 ± 0,008	206,3 ± 2,5	3,13 ± 0,003
18	161	5283 ± 55	3,89 ± 0,004	205,4 ± 2,1	3,12 ± 0,002
19	70	5256 ± 372	3,88 ± 0,02	243,2 ± 15,1	3,11 ± 0,008
20 and older	102	5203 ± 41	3,89 ± 0,004	202,4 ± 1,6	3,12 ± 0,002

Табл. 4. Влияние живой массы при первом отеле на молочную продуктивность коров по 1-й лактации

Table 4. Effect of live weight at first calving on milk productivity of cows in the 1st lactation

Live weight at first calving, kg	Cows, heads	Milk productivity			
		Milk yield, kg	Fat, %	Fat, kg	Protein, %
До 480	21	4567 ± 444	3,82 ± 0,05	175,4 ± 19,3	3,14 ± 0,02
481–500	34	5122 ± 40	3,73 ± 0,006	191,2 ± 1,5	3,12 ± 0,002
501–520	178	5229 ± 35	3,73 ± 0,003	195,1 ± 1,3	3,11 ± 0,002
521–530	350	5197 ± 76	3,70 ± 0,004	192,5 ± 2,8	3,11 ± 0,004
531–540	127	5164 ± 26	3,73 ± 0,003	192,7 ± 1,0	3,11 ± 0,001
541–550	109	5264 ± 53	3,76 ± 0,01	198,1 ± 1,9	3,12 ± 0,003
551 and more	130	5526 ± 339	3,75 ± 0,02	207,2 ± 13,0	3,13 ± 0,02

Табл. 5. Влияние живой массы при первом отеле на молочную продуктивность коров по 3-й лактации

Table 5. Effect of live weight at first calving on milk productivity of cows in the 3d lactation

Live weight at first calving, kg	Cows, heads	Milk productivity			
		Milk yield, kg	Fat, %	Fat, kg	Protein, %
Up to 480	21	4943 ± 350	3,92 ± 0,06	192,8 ± 12,2	3,13 ± 0,05
481–500	34	5009 ± 249	3,85 ± 0,06	193,3 ± 12,2	3,15 ± 0,02
501–520	178	5282 ± 50	3,89 ± 0,004	205,2 ± 1,9	3,12 ± 0,002
521–530	350	5249 ± 124	3,88 ± 0,007	203,6 ± 4,7	3,10 ± 0,003
531–540	127	5200 ± 60	3,89 ± 0,004	202,3 ± 2,3	3,11 ± 0,002
541–550	109	5436 ± 84	3,89 ± 0,004	211,2 ± 3,2	3,11 ± 0,002
551 and more	130	5545 ± 66	3,89 ± 0,004	215,5 ± 2,5	3,13 ± 0,002

CONCLUSION

According to the research data, the most optimal age of the first insemination and live weight of cows that allow to get the highest milk yield under farm conditions at the first calving were determined. The highest milk productivity in 305 days of the first lactation (5309-5476 kg of milk with fat content 3,74%) was registered in cows of 13-14 months of age of the first insemination with an average live weight of 370-374 kg at the first fruitful insemination. The highest milk productivity in the 1st and 3rd lactations in the Okinsky SEC of the Irkutsk region was obtained from cows with a live weight of more than 541 kg at the first calving.

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