

The effect of the genotype of servicing bulls on the growth and development of Hereford young stock

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Abstract. In the studies, the growth and development indicators of the Hereford young stock were studied, depending on the origin. The average daily growth of calf bulls aged 824±16.4 g, 8 months – 962.5±14.6 g, 9 months – 981.5±18.6 g, 12 months – 986.1±19.2 g. The height at hips of calf bulls aged 205 days was 109±11.7 cm, 8 months – 111±9.4 g, 9 months – 112±6.8 cm, 12 months – 124±7.9 cm. The average daily increase in heifers aged 205 days was 853.6±11.3 g, 8 months – 854.2±17.5 g, 9 months – 870.3±18.2 g, 12 months – 850±10.5 g, 15 months – 831.1±15.6 g, 18 months – 777.8±16.5 g. The height at hips of calves aged 205 days was 106±9.8 cm, 8 months – 109±7.8 g, 9 months – 110±11.1 cm, 12 months – 118±8.9 cm, 15 months – 121±10.9 cm, 18 months – 125±13.2 cm. It was found that the growth rate of calves and calf bulls on fattening is influenced by the father genotype. When comparing the average live weight of young stock at the age of 18 months, the best results were in calf bulls received from the bull Perets 3989 – 375.8±17.5 kg, this is 3.8 kg more than the same indicator for calf bulls received from the bull Timeline 2930348, and 7.8 kg more than the bull Emulation 2909514, and by the live weight of heifers at the age of 18 months the leader is the Timeline 2930348- 352.6±25.2 kg.

1 Introduction

Recently, special attention has been paid to the development of not only dairy, but also the meat industry of cattle breeding [1]. Unfortunately, in our country in recent years, there has been a decrease in the total number of cattle, both meat and dairy areas of productivity [1, 3, 2, 4, 5, 6]. Thus, in 2021, the number of cattle in agricultural enterprises decreased by 5.3% compared to 2020, of which the number of cows decreased by 3.3% [2, 4]. The share of beef in the meat balance is about 50% [1, 3, 4]. This indicates the need to develop the beef cattle industry in our country.

The necessity of breeding cattle of the meat direction of productivity is associated with their biological peculiarity. It is known that the meat obtained from the breeding of meat and meat-dairy breeds has a fragrant and delicate taste, and the animals are characterized by

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increased gains and a high meat content coefficient [7, 8]. The main characteristics of animals of these breeds are earliness, high growth energy, and high percentage of slaughter mass yield. The so-called "marble" meat, which cannot be obtained from breeding dairy breeds, is received from meat breeds of animals. Marbling indicates the presence of a fat layer in the muscle fiber [9, 10, 11, 12].

In practice of cattle breeding, both in our country and abroad, genetic potential is given significant importance, and work in this direction is based on purposeful breeding work [12,13, 14, 15, 16]. The analysis of the previous years shows that the introduction of new methods of biotechnology and population genetics contributes to breeding work intensification. To increase meat productivity in beef cattle breeding, it is recommended to create and improve structural units of the breed based on selection, metching, and breeding work in general [17, 18]. Based on the above, it can be concluded that the study of the features of breeding stud beef cattle, considering the created highly productive lines, types, and populations is relevant for science and practice.

The purpose of the work was a comparative study of the growth and development of Hereford young stock of different breeding.

2 Materials and Methods

Our research was carried out in the production conditions of the breeding multiplying farm Chebomilk LLC of the Cheboksary district of the Chuvash Republic. This company specializes in breeding of purebred black-and-white and Hereford cattle. The object of the study were Hereford breed animals of different genetic generation. Zootechnical reports and documents of the enterprise served as sources for the analysis. Annual reports, a summary of the bonus list, breeding cards of cows and bulls, a production report on the results of breeding work with the Hereford breed were analyzed.

Young cattle were kept according to the technology of beef cattle breeding. Up to the age of 8 months, all young stock was suckled with cows, after weaning - on feedlots. The dynamics of growth and development were studied by monthly weighing of animals on the same day of the month in the morning hours before feeding. In newborn calf bulls at the age of 205 days, 6, 8, 9, and 12 months, and in heifers at an additional 15 and 18 months, the height at hips was examined. Based on the data from the weighing results, the absolute and average daily increase was calculated according to the formula:

$$D = \frac{W1 - W0}{N}$$

D – average daily increase, g;

W1- live weight at the end of the growing period, kg;

W0 – live weight at the beginning of the growing period, kg;

N – number of days in the period, days

The digital material was processed by methods of variational statistics using the Microsoft Office Excel 10.0 computer program.

3 Results and Discussion

Hereford cattle at the breeding multiplying farm Chebomilk LLC are kept according to the generally accepted technology of beef cattle breeding. The animals were kept loose, on a deep permanent litter with constant access to water. After weaning from cows, young stock of all groups at the age of 8 months is transferred to a growing and fattening site. Feeding of

calves and calf bulls is carried out three to four times a day, juicy and concentrated feeds are fed in the form of a feed mixture in two feedings.

They studied the breed and class composition of the herd. The herd contains purebred and IV generation animals. When characterizing the herd, it is established that whole livestock is assigned to the following valuation classes: Elite, Elite-Record, 1st class. 187 heads (65%) were assigned to the Elite-Record class, 94 heads (33%) - to the Elite class, and 5 heads (2%) - to the 1st class.

According to the valuation data for 2020, the company contains 286 heads of Hereford breed, including 127 heads of cows, 27 heads of calf bulls aged 10-18 months, 22 heads of heifers from 2 years and bred heifers, 33 heads of heifers from previous years, 20 heads of heifers from birth to 1-year-old, 12 heads of calf bulls from birth to 1-year-old.

Whole livestock of the Hereford cattle breed in Chebomilk LLC is undergoing immunogenetic analysis. This study is mandatory for all age and gender groups of animals, with the exception of calf bulls put on fattening [11].

Table 1 shows the characteristics of the growth and development of Hereford bulls.

Table 1. Characteristics of Hereford calf bulls

Age	Height at hips, cm	Body weight, kg	Average daily increase, g
At birth	-	39.4±3.7	-
205 days	109±11.7	208±15.3	824±16.4
8 months	111±9.4	270±11.3	962.5±14.6
9 months	112±6.8	304±9.8	981.5±18.6
12 months	124±7.9	394±13.2	986.1±19.2

The live weight of calf bulls at birth is 39±3.7 kg. When studying the growth and development indicators of Hereford bulls, it was found that the average daily increase at the age of 205 days was 824±16.4 g, 8 months – 962.5±14.6 g, 9 months – 981.5±18.6 g, 12 months – 986.1±19.2 g. The height at hips of calf bulls aged 205 days was 109±11.7 cm, 8 months – 111±9.4 g, 9 months – 112±6.8 cm, 12 months – 124±7.9 cm.

The characteristics of the growth and development of Hereford breed heifers are presented in Table 2.

Table 2. Characteristics of Hereford breed heifers

Age	Height at hips, cm	Body weight, kg	Average daily increase, g
At birth	-	37.1±2.8	-
205 days	106±9.8	212±11.5	853.6±11.3
8 months	109±7.8	242±9.8	854.2±17.5
9 months	110±11.1	272±14.3	870.3±18.2
12 months	118±8.9	343±12.8	850±10.50
15 months	121±10.9	411±14.6	831.1±15.6
18 months	125±13.2	457±12.3	777.8±16.5

The live weight of heifers at birth averages 37±2.8 kg. The height at hips of calves aged 205 days was 106±9.8 cm, 8 months – 109±7.8 g, 9 months – 110±11.1 cm, 12 months – 118±8.9 cm, 15 months – 121±10.9 cm, 18 months – 125±13.2 cm. The average daily increase in heifers aged 205 days was 853.6±11.3 g, 8 months – 854.2±17.5 g, 9 months – 870.3±18.2 g, 12 months – 850±10.5 g, 15 months – 831.1±15.6 g, 18 months – 777.8±16.5 g.

Breeding heifers and calf bulls are sold to other farms, and young stock that does not have breeding value is transferred to fattening and subsequently handed over for meat after fattening.

When studying the herd genealogy, it was revealed that all the breeding stock was distributed among 28 stud bulls belonging to the Mayer-Verne 88480 line.

When studying the growth characteristics of young stock from different stud bulls, it was revealed that according to the number of offspring obtained, bulls are distributed as follows: Perets 3989 - 57 heads, Emulation 2909514 – 42 heads, Timeline 2930348 – 16 heads. The number of offspring received from bulls of different lines (heifers/calf bulls): Perets 3989 – 28/29 heads, Emulation 2909514 – 15/27 heads, Timeline 2930348 – 9/7 heads.

The figures clearly show the dynamics of changes in the live weight of calf bulls and heifers by age, depending on the genotype.

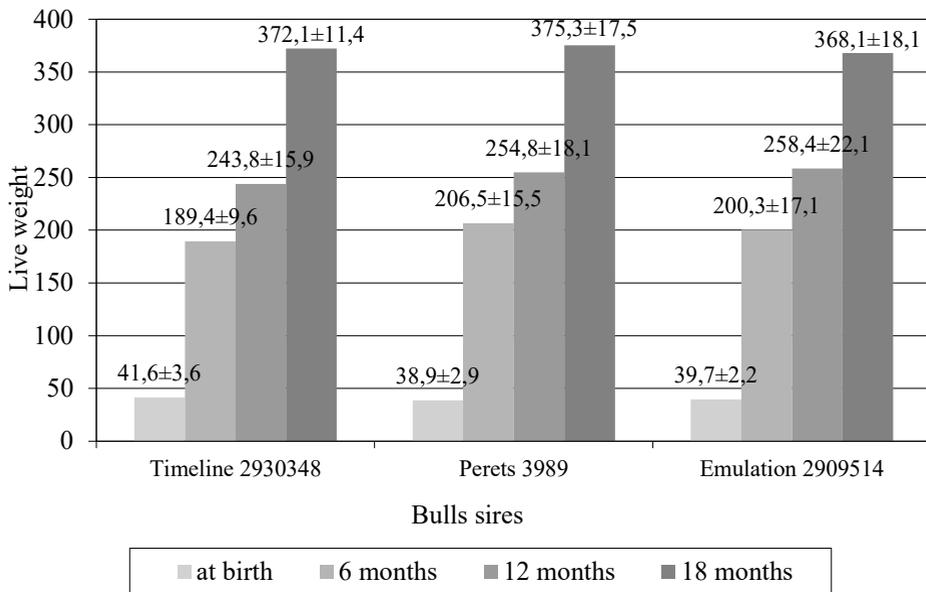


Fig. 1. Dynamics of changes in the live weight of calf bulls, kg.

It should be noted that when comparing the average live weight of young stock at the age of 18 months, the best results were in calf bulls received from the bull Perets 3989 – 375.8±17.5 kg, this is 3.8 kg more than the same indicator for calf bulls received from the bull Timeline 2930348 and 7.8 kg more than the bull Emulation 2909514. At the age of 12 months, the best live weight is characterized by calf bulls received from the bull Emulation 2909515 – 258.4±22.1 kg, which is 3.6 kg higher than from the bull Perets 3989 and 14.6 kg from the bull Timeline 2930348.

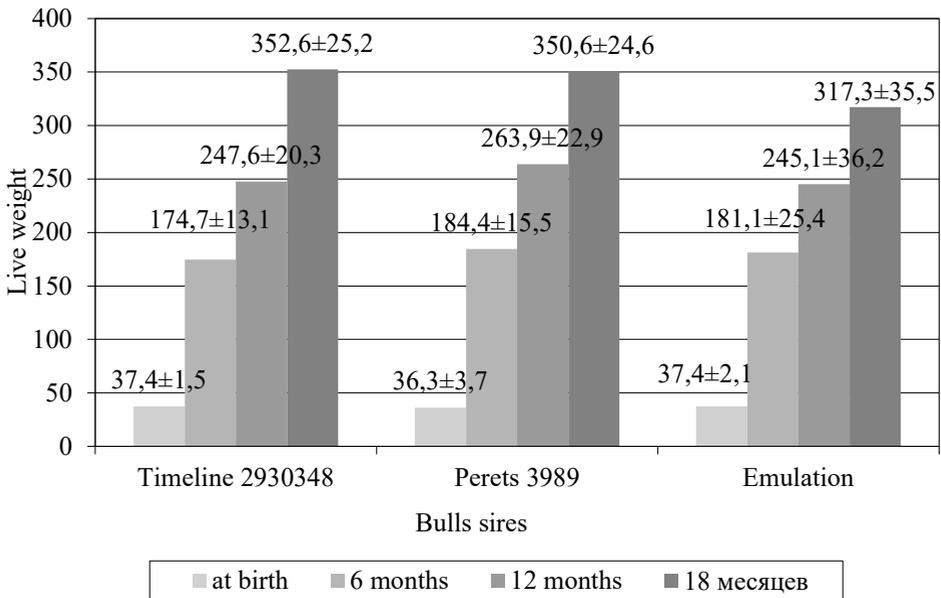


Fig. 2. Dynamics of changes in the live weight of heifers, kg.

According to the indicators of the live weight of heifers at the age of 18 months, the Timeline 2930348 is leading - 352.6±25.2 kg. Nevertheless, according to the live weight at birth, the young stock from the bull Timeline 2930348 shows the best results, both for calf bulls – 41.6±3.6 kg, and for heifers – 37.4±1.5 kg. When studying the comparative characteristics of the live weight of heifers and calf bulls, it was found that the offspring of the bull Perets 3989 has the best growth rates.

The main indicator characterizing the lifetime assessment of the growth rate of young stock is the average daily gain in live weight. According to the results of weighing, this indicator was calculated in calf bulls and heifers of different bull fathers. The data are presented in table 3.

Table 3. Indicators of the average daily growth of heifers and bulls of different breeding

Age, months	Timeline 2930348	Perets 3989	Emulation 2909514
Calf bulls			
0-6	821±65.4	931±57.2	892±60.9
6-12	573±49.6	605±48.6	613±54.3
12-18	619±68.3	628±39.5	612±38.1
Heifers			
0-6	762±45.4	823±41.2	798±63.5
6-12	572±58.9	625±47.8	570±42.3
12-18	575±69.8	577±54.1	514±39.1

The highest growth rate is observed in both bulls and heifers in the period from birth to 6 months of age. Moreover, the best results are shown by animals obtained from the bull Perets 3989. Thus, the average daily increase in 6 months in calf bulls was 931±57.2 g, in heifers – 823±41.2 g.

4 Conclusions

The analysis of the weight and linear control of the growth of Hereford young stock of different genotypic generation showed that all the studied animals developed normally, corresponding to the general patterns of growth and development of this breed. At the same time, it should be noted that the bulls and heifers - offspring of the bull Perets 3989 of the Mayer-Verne 88480 line differ in the best growth rate. The average daily increase at 18 months of age in calf bulls was 931 ± 57.2 g, in heifers – 577 ± 54.1 g, which is higher than their peers by 1.2-12.2%. This also allows to conclude about the positive genotype effect of the bull Perets 3989 on their offspring and their advantage over their peers. In the perspective of planning the breeding work of Hereford cows, it is recommended to use breeding bulls belonging to different lines.

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