

# Evaluating the growth of replacement heifers from different seed bulls

*O.V. Gorelik\**, *S.Yu. Harlap*, *O.P. Neverova*, *M.N. Sen*, *P.S. Galushina*, and *N.I. Sorokina*

Ural State Agrarian University, 42 Karl Liebknecht str., 620075 Yekaterinburg, Russian Federation

**Abstract.** In the Sverdlovsk region Holsteinized Black Pied cattle of the Ural type are bred which are represented by large, highly productive animals with a high genetic potential for productivity. Great importance is attached to the rearing replacement calves. The aim of the study was to study the dynamics of the live weight of replacement heifers from different seed bulls during rearing and its dependency on the age of the first insemination. The highest average daily weight gains were in the dairy period of heifers development, they ranged from 989 g for the daughters of the bull Thunderline to 1054 g for their peers from the bull Maximum. There were also high average daily gains during this period when rearing heifers from the bull Renigend. In the second period of rearing from 6 to 10 months of age there was a decrease in the average daily weight gain in all groups. Heifers from different seed bulls reach the required live weight for the first insemination at different ages. Maximum's daughters, which had the weight of 399.4 kg at the age of 12.9 months. reached the required live weight most quickly. Their peers from other seed bulls reached the aforementioned live weight only at the age of 13.7 months.

## 1 Introduction

Sustainable supply of the population with high-quality food products, including milk, is the main necessity in ensuring the health of the nation and food security of any country [1-7]. Particular attention is paid to the development of dairy farming, since the main quantity of a valuable food product and raw material for the dairy industry, milk, is obtained from cattle, more than 99 % of the total production. An increase in the productivity of cows is inseparably associated with an improvement in the quality of milk [8-18]. The main livestock of dairy cattle belongs to the domestic Black Pied breed, which has separate offsprings, differing in economic and biological characteristics. A related Holstein breed has been used to improve dairy cattle in recent years. The widespread, long-term use of the valuable gene pool of foreign breeding Holstein bulls led to the creation of a large array of Holstein cattle in various climatic and ecological forage zones of the country, which also differs in economically useful and biological characteristics, which is due to the breed resources of cattle breeding zone and country of origin of seed bulls involved in crossing [19-21]. So, in the Sverdlovsk Region, the breeding stock of Black Pied breed of the Ural

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\* Corresponding author: [olgao205en@yandex.ru](mailto:olgao205en@yandex.ru)

offspring was inseminated with the seed of breeding bulls of Canadian, Danish and German selection. As a result, large, highly productive animals with a high genetic potential for productivity and well adapted to industrial milk production were obtained. They are able to have good average daily milk yield during the entire lactation, produce milk for a long time without a sharp decrease in milk yield; however, a decrease in reproductive capacity is noted, which put the issues of herd reproduction and rearing young stock into the first place [22-28]. The study of the dynamics of the live weight of replacement heifers from different seed bulls and its conjugation by periods and with the age of the first insemination is relevant and has practical value.

The aim of the work is to study the dynamics of live weight of replacement heifers from different seed bulls during rearing and its correlation with the age of the first insemination.

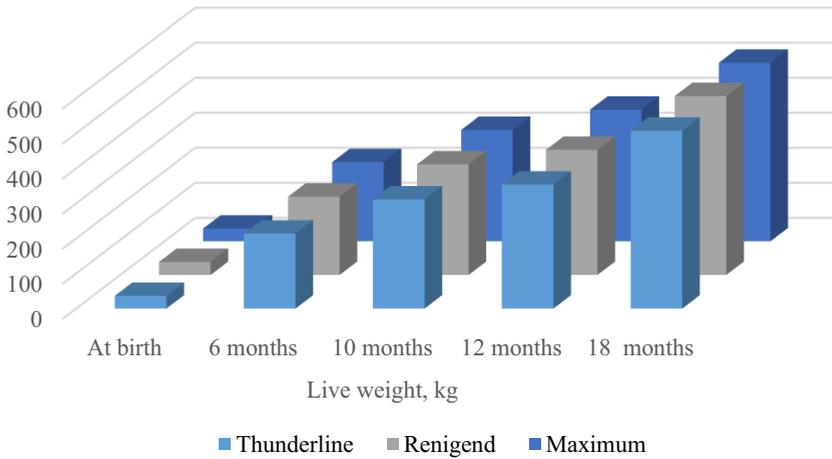
## **2 Materials and methods**

The studies were carried out in the conditions of one of the breeding factories for breeding Holsteinized Black Pied cattle of the Ural type. Groups of heifers from seed bulls of the Holstein breed of the Reflection Sovering line were selected. Group 1 of the bull Thunderline's daughters, group 2 of the bull Maximum's daughters and group 3 of the bull Renigand's daughters. For the analysis, the data of zootechnical and pedigree registration of the Seleks base were used. We studied the dynamics of the live weight of replacement heifers and the age of their first insemination. The contingency of live weight was determined by the periods of research and its relationship with the age of the first insemination.

## **3 Results and Discussion**

The farm is engaged in breeding highly productive Holsteinized Black Pied cattle of the Ural type with a high proportion of Holstein blood (more than 91%). In 2018, 9299 kg of milk were received from 1391 cows, with 3.93% of mass fraction of fat and 3.24% of mass fraction of protein in milk. The live weight of mature cows is 660-670 kg. The high live weight of cows sets the task of increasing the intensity of rearing replacement calves and ensuring their live weight is 65-75% of a full-grown cow's weight.

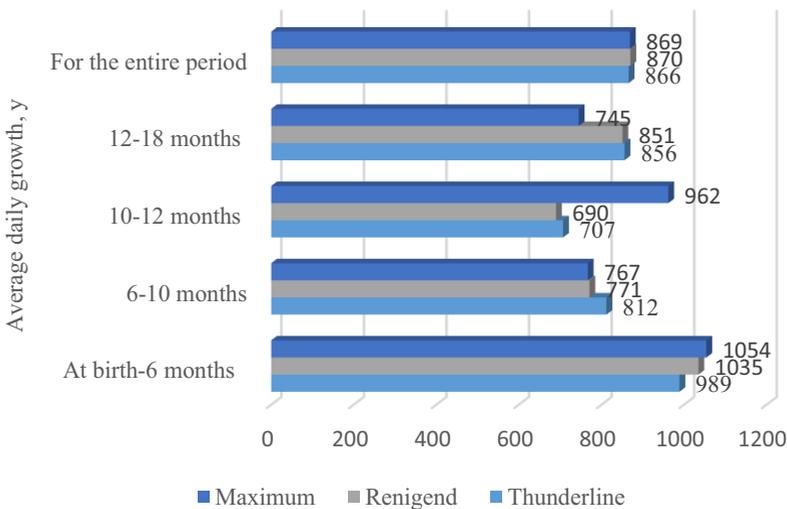
Figure 1 shows the change in live weight of replacement heifers by growth periods depending on the origin.



**Fig. 1.** Dynamics of live weight of replacement heifers from different seed bulls, kg.

The figure clearly shows that heifers, regardless of origin (breeding bull), grew the same at 6 months of age and had a weight of 214.1 - 226.1 kg (the difference is significant at  $P \leq 0.05$  in favor of the bull Maximum’s daughters relative to the bull Thunderline’s daughters); at 12 months they had a weight of 353.9 - 375.8 kg ( $P \leq 0.05$  in favor of the bull Maximum’s daughters, relative to the daughters of the bull Thunderline and the bull Renigand). At the age of 18 months, they all had practically the same body weight in the range of 508.0 - 511.0 kg.

When rearing replacement calves, in addition to live weight, the growth rate is assessed by the average daily live weight gain (see Figure 2).

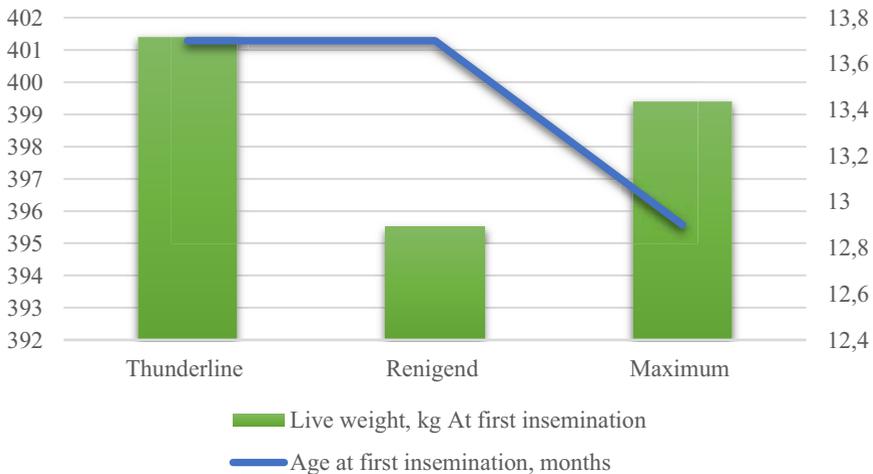


**Fig. 2.** Average daily live weight gain of replacement heifers by period, g.

The highest average daily gains were in the dairy period of development of heifers, they ranged from 989 g in the bull Thunderline’s daughters to 1054 g in their peers from the bull Maximum. High average daily gains were observed during this period and when rearing

heifers from the bull Renigend. In the second growing period from 6 to 10 months of age in all groups there was a decrease in average daily gains, and the lower were daily gains in the second growing period the higher they were in the dairy period. In calves from bulls Thunderline and Renigend, the decrease in growth continued with an increase in performance from 12 to 18 months of age. In the period from 10 to 12 months, the bull Maximum's daughters grew more intensively, and from 12 months to the end of the study, they reduced their average daily gains, compared with their peers.

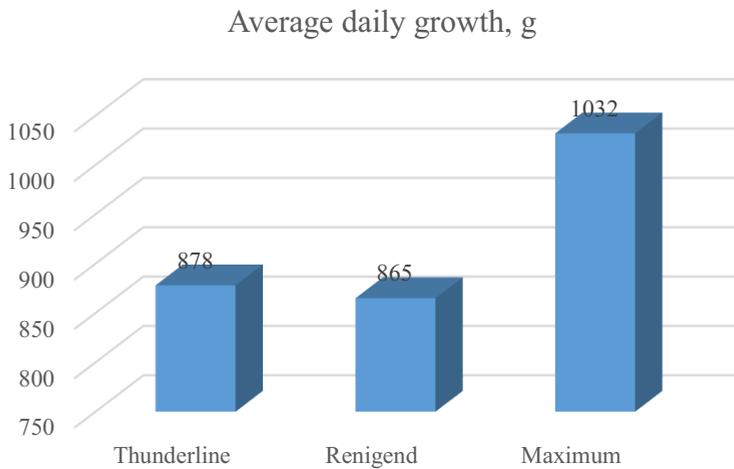
Live weight and age of heifers at first insemination are shown in Figure 3.



**Fig. 3.** Live weight and age at the first insemination of replacement heifers.

As a result of the studies, it turned out that heifers from different breeding bulls reach the required live weight for the first insemination at different ages, despite its insignificant and unreliable difference, which reaches from 2.0 to 5.9 kg among groups. It was the highest in the group of heifers from the bull Thunderline (401.4 kg), and the smallest in the group of replacement calves from the Renigend bull - 395.5 kg. The bull Maximum's daughters reached the required live weight most quickly, they had a weight of 399.4 kg as early as at the age of 12.9 months. Their peers from other breeding bulls of the above-named live weight will only reach the age of 13.7 months, which is 0.8 months or 6.2% more than that of the bull Maximum's daughters. The difference is significant and the latter benefit at  $P \leq 0.05$ .

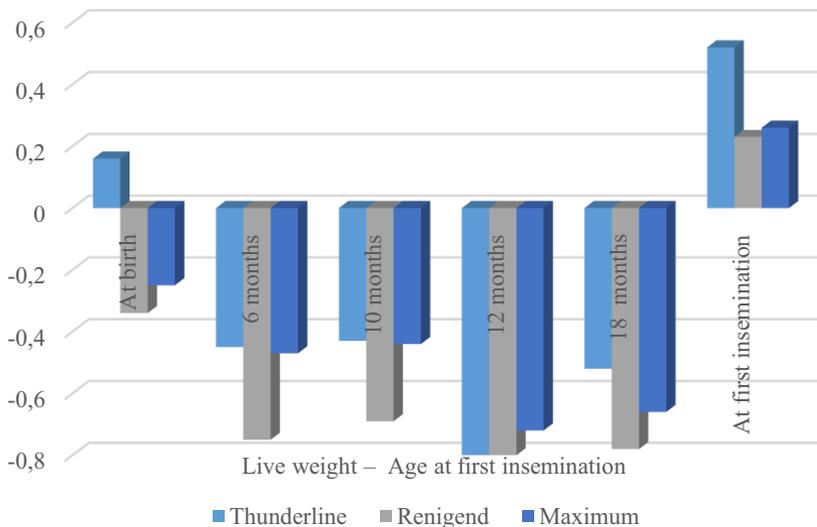
Daughters of breeding bulls also differed in average daily gains from birth to the live weight of the first insemination (Figure 4).



**Fig. 4.** Average daily live weight gain of heifers for the period from birth to the first insemination, g.

The difference in the average daily gains in live weight for the period from birth to the first insemination of replacement heifers from the bull Maximum was significantly higher than that of the daughters of other breeding bulls at  $P \leq 0.01$ . It was 154 and 167 g or 17.5 and 19.3%.

We calculated the correlation coefficients between body weight by periods of growth and the age of first insemination (Figure 5).



**Fig. 5.** The conjugacy of the live weight by the periods of growth and the age of the first insemination.

## 4 Conclusion

Based on the above stated, it can be concluded that the farm has a well-developed technology for intensive rearing of replacement heifers, early insemination is carried out at

the age of 13-14 months when the live weight reaches 400 kg. The growth rate of heifers depends on the origin, including the breeding bull.

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