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ЭФФЕКТИВНОСТЬ ПРИМЕНЕНИЯ ТКАНЕВОГО БИОСТИМУЛЯТОРА ПРИ ВЫРАЩИВАНИИ ТЕЛОК

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Представлены материалы исследования эффективности применения тканевого биостимулятора в технологии выращивания ремонтных телок. Эксперимент проведен в условиях Алтайского края на четырех группах телочек приобского типа черно-пестрой породы живой массой 51,3 ± 1,48 кг в возрасте 1 мес. В каждой группе было по 10 гол. Продолжительность опыта составила 18 мес. Животным контрольной группы каждый месяц вводили подкожно физиологический раствор: с 1-го по 5-й месяц – в дозе 3,0 мл/гол., с 6-го по 11-й месяц – 6 мл/гол., с 12-го по 15-й месяц – 12,0 мл/гол. и с 16-го по 18-й месяц – 15,0 мл/гол. Телкам опытных групп делали инъекции тканевого биостимулятора по следующим схемам: в 1-й опытной группе – с 1-го по 5-й месяц – в дозе 2,0 мл/гол., с 6-го по 11-й месяц – 4 мл/гол., с 12-го по 15-й месяц – 8,0 мл/гол. и с 16-го по 18-й месяц – 10,0 мл/гол.; во 2-й опытной группе – с 1-го по 5-й месяц – в дозе 3,0 мл/гол., с 6-го по 11-й месяц – 6 мл/гол., с 12-го по 15-й месяц – 12,0 мл/гол. и с 16-го по 18-й месяц – 15,0 мл/гол.; в 3-й опытной группе – с 1-го по 5-й месяц – в дозе 4,0 мл/гол., с 6-го по 11-й месяц – 8,0 мл/гол., с 12-го по 15-й месяц – 16,0 мл/гол., с 16-го по 18-й месяц – 20,0 мл/гол. Биостимулятор изготовлен из боенских отходов и субпродуктов пантовых оленей. Схема его использования, применяемая во 2-й опытной группе животных, оказалась наиболее эффективной и способствовала повышению массы тела у ремонтных телок до 14% ($p < 0,001$), среднесуточного прироста – до 33% ($p < 0,001$), абсолютного прироста – до 23% ($p < 0,001$) и относительного прироста – до 2% ($p < 0,05$).

Ключевые слова: крупный рогатый скот, ремонтные телки, тканевый препарат, живая масса, абсолютный прирост, среднесуточный прирост, относительный прирост, интенсивность роста

EFFICIENCY OF TISSUE BIOSTIMULANT APPLICATION IN GROWING HEIFERS

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The materials of research on the effectiveness of tissue biostimulant application in the technology of breeding replacement heifers are presented. The experiment was conducted in the conditions of the Altai Territory on four groups of heifers of the Priobsky type of the Black-and-White breed with a live weight of 51.3 ± 1.48 kg at the age of 1 month. Each group had ten heads. The experiment lasted for 18 months. Animals of the control group were injected subcutaneously with physiological solution every month: from the 1st to the 5th month – at a dose of 3.0 ml/head, from the 6th to the 11th month – 6 ml/head, from the 12th to the 15th month – 12.0 ml/head and from the 16th to the 18th month – 15.0 ml/head. Injections of tissue biostimulant were given to the heifers of the experimental groups according to the following schemes: in the 1st experimental group – from the 1st to the 5th month – at a dose of 2.0 ml/head, from the 6th to the 11th month – 4 ml/head, from the 12th to the 15th month – 8.0 ml/head and from the 16th to the 18th month – 10.0 ml/head; in the 2nd experimental group – from the 1st to the 5th month – at a dose of 3.0 ml/head, from the 6th to the 11th month – 6 ml/head, from the 12th to the 15th month – 12.0 ml/head and from the 16th to the 18th month – 15.0 ml/head; in the 3rd experimental group – from 1st to 5th month – at a dose of 4.0 ml/head, from the 6th to the 11th month – 8.0 ml/head, from the 12th to the 15th month – 16.0 ml/head, from the 16th to the 18th month – 20.0 ml/head. Biostimulant is made of slaughter house tankage and by-products of the antler deer.

The scheme of its application, used in the 2nd experimental group of animals, was the most effective and contributed to the increase in body weight in replacement heifers up to 14% ($p < 0.001$), average daily gain – up to 33% ($p < 0.001$), absolute gain – up to 23% ($p < 0.001$) and relative gain – up to 2% ($p < 0.05$).

Keywords: cattle, replacement heifers, tissue preparation, live weight, absolute gain, average daily gain, relative gain, growth intensity

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Conflict of interest
The authors declare no conflict of interest.

INTRODUCTION

Increasing the growth rate of replacement heifers allows for a significant reduction in the time it takes to raise cows, increases the live weight of first-calving heifers, and results in higher milk yields in their first lactation. In practical farming, it is essential to plan for the intensity of heifer growth, which ensures that the animals achieve live weights corresponding to breed standards at all age periods [1].

The organization of the replacement heifer rearing process, where animals are inseminated at a younger age, and calving occurs at 23–24 months, is a necessary condition for intensive milk production technology, which enhances milk productivity and economic indicators of the farm [2].

The technology for raising replacement heifers, which promotes the expression of the animals' inherited productive traits, must be economically viable. An essential condition for realizing the genetic potential of animals is the intensity of their growth [3].

In industrial livestock production, animals of modern dairy breeds and types are characterized by genetically determined high productivity. At the same time, this makes them exceptionally susceptible to the influence of adverse environmental factors. Therefore, when raising replacement young stock, it is necessary to create optimal conditions for their maintenance and feeding [4, 5].

Enhancing metabolic processes opens up reserve opportunities for increasing agricultural production without raising feed costs by identifying factors that contribute to the better utilization of the genetic potential. In this regard, methods related to the use of biologically active preparations as means of reducing the adverse effects of external factors on the organism and acting as regulators of metabolism to improve the efficiency of using the basic diet are used. This approach ensures the development of the feed base, selection, and genetic engineering [6].

Tissue preparations are among the biological growth stimulators. The use of biostimulants has a positive effect on animals (from immune system correction to stimulation of the body's enzymatic and hormonal systems). The use of biogenic stimulants in raising young livestock contributes to a reduction in feed costs, a decrease in the duration of rearing, an increase in herd survival, and an increase in the industry's profitability [7–9].

The purpose of the study is to investigate the effectiveness of using a tissue biostimulator in the technology of raising replacement heifers.

MATERIALS AND METHODS

The scientific and economic experiment was conducted in 2020 and 2021 at the Uchhoz Prigorodnoe AO in the Industrial District of Barnaul, Altai Territory, Russia. The experiment scheme is presented in the table.

To conduct the experiment based on the principle of analogs, four groups of replacement heifers were formed, each consisting of 10 heads. When selecting, age (1 month) and live weight (51.3 ± 1.48 kg) were taken into account. The duration of the experiment was 18 months.

The material for the tissue biostimulator was obtained from: uteri with fetuses (2–3 months), placenta, liver, spleen, mesenteric lymph nodes and interpleural space, collected under aseptic conditions during slaughter. The animals were healthy.

The live weight of replacement heifers was determined by individual weighing on VEP-X-N scales with an accuracy of 1 kg, starting from the 1st month, and then every month during the growth period, until the replacement young cattle reached the age of 18 months. Based on the live weight data of heifers in the age dynamics, the average daily, absolute, and relative weight gain for each month of growth were calculated using the generally accepted formula.

The obtained data were subjected to biometric processing using Microsoft Excel 2016 software. The reliability of the experiment results compared to the control group was calculated using the *t*-Student criterion for independent samples.

RESULTS AND DISCUSSION

Rearing replacement young cattle is one of the most important technological moments in the dairy cattle industry, as successful rearing of young cattle is the basis for high production performance [10]. The dynamics of live weight of replacement young cattle of the experimental groups are presented in Fig. 1.

From the analysis of the data presented in Fig. 1, it can be concluded that the introduction of a tissue biostimulator in different doses to replacement young cattle contributed to an increase in live weight at the age of 2 months in the 1st experimental group by 3.7%, in the 2nd group by 5.0%, in the 3rd group by 4.9% ($p < 0.05$). At the age of 3 and 4 months, the heifers of the 3rd experimental group showed the highest live weight, surpassing the control by 7.8% ($p < 0.01$) and 9.8% ($p < 0.001$), respectively. Animals in the 1st and 2nd experimental groups in the considered age periods also outperformed the control by 5.6–9.6% ($p < 0.001$). At the age of 5–6 months, the highest live weight was observed in the calves of the 2nd experimental group, to which the tissue biostimulator was administered at a dose of 3 ml/head. By this value, they exceeded the control by 11.4% ($p < 0.001$) and 12.6% ($p < 0.001$). Heifers of the 1st exper-

Схема научно-хозяйственного эксперимента
Scheme of the scientific and economic experiment

Group	*n*	Preparation	Age of replacement heifers at drug administration, months	Dose of subcutaneous injection of the drug, ml/goal.	Frequency and interval of drug administration
Control	10	Physiological solution	1–5 6–11 12–15 16–18	3,0 6,0 12,0 15,0	18 times with an interval of 30 days
Experimental:					
1-я	10	Tissue biostimulant	1–5 6–11 12–15 16–18	2,0 4,0 8,0 10,0	The same
2-я	10	The same	1–5 6–11 12–15 16–18	3,0 6,0 12,0 15,0	»
3-я	10	»	1–5 6–11 12–15 16–18	4,0 8,0 16,0 20,0	»

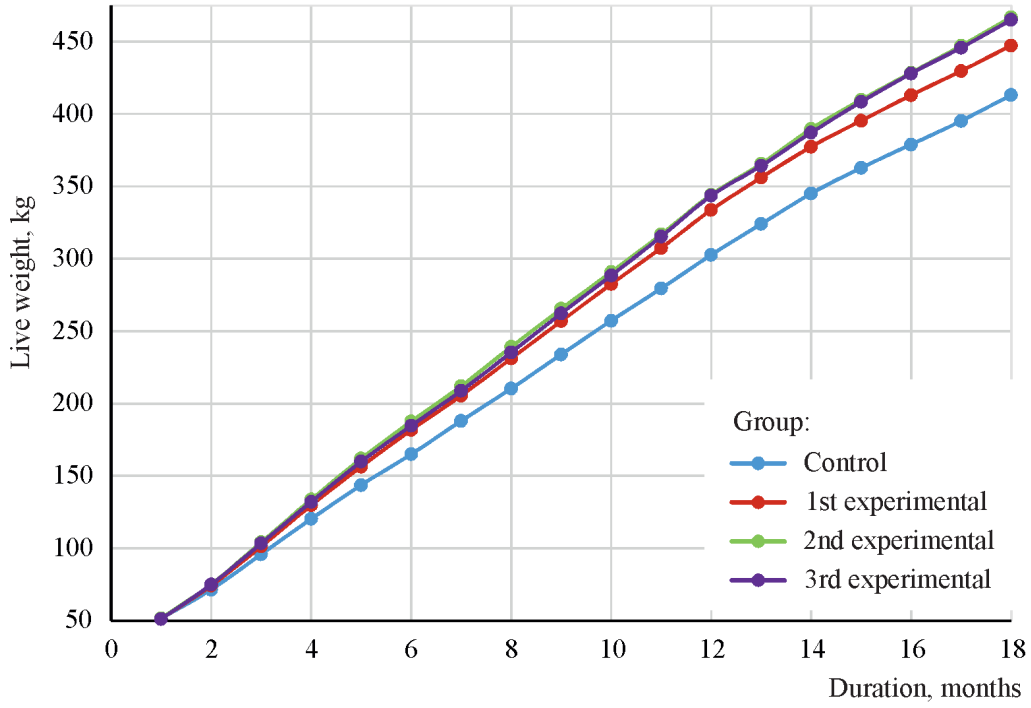

Рис. 1. Динамика живой массы ремонтного молодняка, кг
Fig. 1. Dynamics of the live weight of replacement young animals, kg

imental group in terms of live weight at the age of 5 and 6 months exceeded the animals of the intact group by 8.8% ($p < 0.001$) and 10.1% ($p < 0.001$), respectively. The analogs of the 3rd experimental group exceeded by 11.2% ($p < 0.001$) and 11.9% ($p < 0.001$), respectively.

In the age periods of 7–11 months of growth, the young cattle of the 2nd experimental group showed the highest live weight, exceeding the control counterparts by 12.0–13.2% ($p \leq 0.001$). Heifers of the 1st and 3rd experimental groups in the same age periods had a live weight greater by 9.3–12.8% ($p \leq 0.001$) compared to the control.

Animals in the experimental groups at the age of 12 months exceeded the control group by 10.2% ($p < 0.001$), 13.2% ($p < 0.001$), and 13.4% ($p < 0.001$), respectively.

The live weight of replacement heifers in the experimental groups at the age of 13–14 months was at a higher level compared to similar values in the control group. In the 1st experimental group, it was higher by 9–10% ($p < 0.001$), in the 2nd group by 13% ($p < 0.001$), and in the 3rd group by 12% ($p < 0.001$).

The highest live weight from the 15th to the 18th month of growth was observed in the heifers of the 2nd experimental group, which was 13% ($p < 0.001$) higher than in the control. In these age periods, the replacement young cattle of the 1st and 3rd experimental groups in terms of live weight exceeded the intact group by 8–13% ($p < 0.001$).

The indicators for average daily weight gain of replacement young cattle are presented in Figure 2. The analysis of the dynamics of average daily weight gains (see Fig.2) shows that in the 1–3-month period, the highest average daily weight gain was observed in the young cattle of the 3rd experimental group, which was 20% and 16% ($p < 0.001$) higher than in the control.

For replacement heifers of the 1st and 2nd experimental groups, daily weight gains during the 1–2-month period increased by 11% and 18% ($p < 0.05$), and during the 2–3-month period, by 11% and 16% ($p < 0.001$), respectively, compared to the control. In the 3–4-month period, the average daily weight gains of replacement young cattle in the 1st, 2nd, and 3rd experimental groups exceeded the control by 16–17% ($p < 0.001$), respectively. The highest growth intensity in the age periods of 4–5 and 5–6 months was observed in the heifers of the 2nd experimental

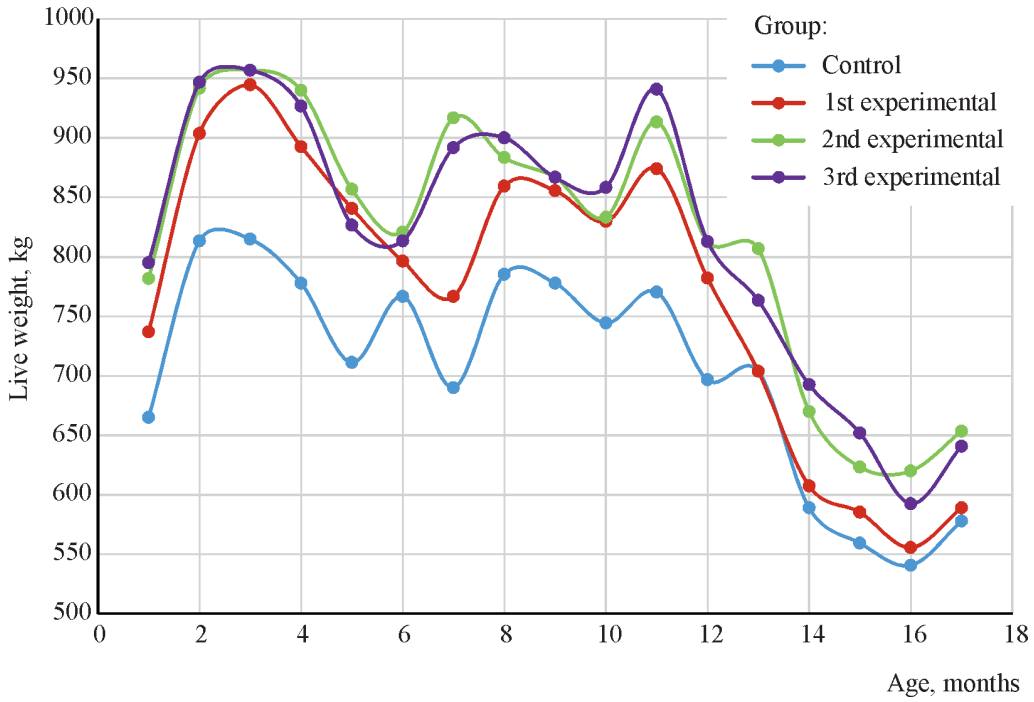

Рис. 2. Динамика среднесуточных приростов живой массы ремонтного молодняка, г
Fig. 2. Dynamics of average daily increases in the live weight of replacement young animals, g

group, which exceeded the control counterparts by 21% ($p < 0.001$) and 20% ($p < 0.001$), respectively. The young cattle of the 1st and 3rd experimental groups also showed the highest average daily weight gain values, by 15% and 19% ($p < 0.001$), compared to the control animals.

In the growth periods of 6–8 months, the highest indicators of average daily weight gain were observed in the young cattle of the 2nd experimental group, which exceeded the control group by 7–33% ($p < 0.001$). Replacement heifers of the 1st and 3rd experimental groups also outperformed the intact animals by 4–29% ($p < 0.001$) in terms of these indicators. In the growth periods of 7–12 months, the animals of the 3rd experimental group showed the highest growth intensity, surpassing the control by 11–22% ($p < 0.001$). Animals of the 1st and 2nd experimental groups also outperformed the control by 9–17% in the same age periods.

The value of average daily weight gain for heifers of the 2nd and 3rd experimental groups at the age of 12 to 14 months was 8–17% ($p < 0.001$) higher compared to the control. For the young cattle of the 1st experimental group, the average daily weight gains in the considered age periods were at a higher level, up to 12% ($p < 0.001$), than in the control group. From the 14th to the 18th month of growth, the average daily weight gains in the animals of the experimental groups exceeded the control by 2–18% ($p < 0.01$).

The mechanism of action of the obtained biogenic stimulators is based on the biological activity of the substances they contain (amino acids, peptides, nucleic acids, polysaccharides, phospholipids, vitamins, microelements, etc.). They stimulate the reactions of cellular and humoral immunity, increase non-specific resistance of the body, activate metabolic processes, and have antioxidant and stress-protective effects. The main role in the mechanism of action of tissue preparations is assigned to the neurohumoral and humoral systems, the basis of which is the central nervous system and the hypothalamic-pituitary complex. It has been established that the main role in changing the body's resistance to external influences belongs to the nervous system, its adaptive-trophic function. The hypothalamic-pituitary complex regulates neuroendocrine activity and maintains the body's homeostasis [11, 12].

The anabolic nature of metabolism during the period of rapid growth leads to changes and redistribution of major metabolic flows towards tissue-building processes [13, 14]. When tissue biostimulators are used, there is an activation of metabolic processes. This occurs because the primary point of action of tissue preparations is the reception of conversion of mechanical, chemical, and other irritants into nervous signals, directly related to the central nervous system and all links of the neurohumoral apparatus, which determine the diversity of physiological manifestations of the stimulating substrate's action [15].

CONCLUSION

The use of tissue biostimulators in the technology of rearing replacement heifers contributed to the increase in their growth intensity. The best results were achieved by the heifers of the 2nd experimental group, to which the tissue biostimulator was administered at a dose of 3.0 ml/head from the 1st to the 5th month of growth, 6.0 ml/head from the 6th to the 11th month, 12.0 ml/head from the 12th to the 15th month, and 15.0 ml/head from the 16th to the 18th month. This led to an increase in live weight by 14% ($p < 0.001$), average daily weight gain by 33% ($p < 0.001$), absolute weight gain by 23% ($p < 0.001$), and relative weight gain by 2% ($p < 0.05$).

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