

Effect of probiotics on height and weight parameters of young cattle

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Abstract. The main direction of agriculture is the search for effective methods of production to provide the population with the provision and to ensure the food independence of the Russian Federation. The purpose of this study was to determine the effect of feed yeast produced in Russia and abroad on the growth of calves up to six months of age. The scientific and production experiment was carried out on the dairy farm of "Gigant" Agricultural Production Cooperative Collective Farm of the Stavropol Territory. Four groups of ten heads of black-and-white calves were formed according to the principle of analogues. The animals were ten days old. Together with the main diet the calves of the 1st experimental group received I-SAK1026 drug in the amount of 11 g per animal per day, the animals of the second experimental group were fed with "Levisil SC+" drug in the amount of 5 g per animal per day, and the calves of the third experimental group received "Optisaf" drug in the amount of 15 g per animal per day. Changes of linear measurements of growth rate with age were different. The animals of the third experimental group had an advantage in most of the measurements. Compared to the control, they showed more significant results. Based on the results of the study, the following was established. Calves of the third experimental group that received "Optisaf" probiotic were characterized by more significant activity of metabolic processes. The calves of this group were ahead of the control calves in terms of development and growth.

1 Introduction

Advanced cattle breeding plays an important role in providing the population with food in accordance with the Priority Directions for the Development of the Agro-Industrial Complex (livestock farming). At the present stage of development of industrial livestock

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farming, the process of rumen digestion is becoming an object of increased attention during the raising of young cattle. Rumen digestion is facilitated by balanced feeding and the prevention of gastrointestinal diseases at the early stages of animal development. [1,2,3].

During livestock production, the choice of a reasonable system for raising young cattle is very significant. It contributes to the formation of economic longevity, normal growth, future productivity and the formation of large stature [4,5].

Today, livestock farming has an industrial character. The advantages of this form of development are presented, among other things, in the form of maximum return on feed from livestock products, their most optimal use and targeted feeding of animals [6].

At the same time, industrial livestock farming is characterized by a lack of choice of feed, concentration of a significant number of animals in small areas, limited freedom of movement, frequent regrouping of animals according to various parameters - productivity, age, etc.

The external environment accumulates a significant number of microorganisms of all types when animals are concentrated in small areas. The formation of conditions for rapid transition between microorganisms is determined by the uniformity of the animals included in the groups and close contacts between them. In such a situation, the risk of disease increases. There is also a decrease in the safety of young animals and animal productivity [7,8].

Preservation of offspring and reproduction of the herd are issues related to the intensification of livestock farming. An integrated approach is needed to solve these issues, so the number of researches, focused on the search for feed additives that stimulate the growth and development of animals, as well as on studying the features of digestive development and identifying effective therapeutic and preventive measures, has increased [9].

Probiotics, which are new substances with biological activity, are considered to be the most effective means for complex solving of the problem. Probiotics are feed additives of microbial origin that help normalize intestinal balance and include lactic acid bacteria of one or several species [10].

Today, probiotics are widely used in dairy products, including yoghurts and nutritional supplements. In medicine, probiotics are not regarded as medicinal drugs. They are considered to have a positive effect on health. The microorganisms present in probiotics are characterized by high viability during storage and passage through the gastrointestinal tract, and by the absence of toxic and pathogenic features.

An increase in the digestibility of nutrients, positive changes in secretory activity, an increase in the digestibility of feed components and their consumption are ensured by probiotic bacteria. These bacteria help inhibit the development of pathogenic and conditionally pathogenic strains and regulate the relationship between the body and microflora presented in the digestive tract [11].

Even in small doses, probiotics perform functions related to immunomodulation in the body. This is manifested in the form of the connection between microflora of the gastrointestinal tract and the immune status of the body.

Probiotics are used for prevention of diseases and their treatment. Probiotics intake may lead to anti-cancer, anti-cholesterolemic, growth-stimulating effects, increased safety of calves and activation of the immune system. The use of probiotics for young animals is a promising mean of prevention and treatment of different diseases, as well as of stimulating of growth. In this regard, scientific and practical interest in research related to the development of technology for the use of appropriate drugs when feeding young animals has been intensifying over recent years [12].

The purpose of this study was to determine the effect of feed yeast produced in Russia and abroad on the development and growth of black-and-white heifers up to six months of

age.

2 Materials and Methods

The experiment was carried out in accordance with the recommendations and instructions of Russian Regulations, 1987. The study was performed with minimal number of samples and suffering of experimental animals. "Gigant" Agricultural Production Cooperative Collective Farm of the Stavropol Territory formed 4 groups of ten heads of black-and-white heifers. The animals were ten days old. Origin, body weight and age of animals were taken into account.

The feeding scheme corresponded to the scheme for heifers adopted at the "Gigant" Collective Farm to obtain an average daily gain of 800-900 g, in accordance with the standards of the Russian Academy of Agricultural Sciences. The scheme was changed every ten days based on live weight.

During the dairy period, calves in the experimental groups were provided with a yeast supplement - a probiotic. It was fed from the age of 10 days to the age of 4 months in accordance with the feeding schedule until the milk period ended.

Together with the main diet, the calves of the 1st experimental group received I-SAK1026 drug in the amount of 11 g per animal per day, the animals of the second experimental group were fed with "Levisil SC+" drug in the amount of 5 g per animal per day, and the calves of the third experimental group received "Optisaf" drug in the amount of 15 g per animal per day.

The feed additives were a strain of live yeast *Saccharomyces cerevisiae*. "Levisil SC+" contained a live yeast *Saccharomyces cerevisiae* (strain CNCM-1077), intended for the rumen of ruminants, at a concentration of 2.0×10^9 CFU/g, coated with a microcapsule of fatty acids and with limestone grains used as filler.

"Optisaf" drug was a culture of live dried yeast *Saccharomyces cerevisiae* (strain NCYC Sc 47), 1.5×10^9 CFU, with 15% calcium carbonate and 80% wheat flour used as filler.

I-SAK1026 (YEA-SACC1026) was a live yeast culture of a specially selected strain of *Saccharomyces cerevisiae* 1026, lyophilized along with a growth medium of corn, molasses, malt and trace elements. One g of I-SAK1026 contained 5×10^9 live yeast cells. According to the feeding scheme, the heifers of the experimental groups (for each head) were given 320 kg of whole milk and 392 kg of skim milk.

From the 5th day of age, animals began to be accustomed to concentrated feed. Over the entire six-month period of the experiment, the calves were fed with 155 kg of grain mixture, 35 kg of sunflower cake, 138 kg of hay, 500 kg of vetch-oat haylage.

To analyze the dynamics of live weight of calves, we performed weighting at birth and at the end of each month. Based on weighing data, relative and absolute growth rates were determined. To evaluate the exterior, measurements were taken at the age of six months. We determined girth of the pastern, height at the withers, width at the hips, height at the sacrum, girth and width of the chest behind the scapula, oblique length of the body. Measuring compasses, tape and a stick were used when taking measurements. VT-8908-1000CX scales were used to determine the weight of animals. Biometric processing of numerical material was carried out. For statistical processing Student's T-test with significance value $P < 0.05$ was used.

3 Results and Discussion

The development and growth of animals are associated with individual changes during ontogenesis. The influence of environmental conditions, internal factors, age and genetics

determine the growth of animal's body. Growth depends on an increase in live weight, development and enlargement of organs, cells and tissues.

During the research significant differences in terms of live weight were noted in each of the age periods depending on feeding conditions (Table 1).

Table 1 - Changes in live weight of black-and-white calves during the experimental period

Parameter	Group			
	Control	First experimental	Second experimental	Third experimental
At birth	34.88±0.84	34.88±0.80	34.01±0.79	34.87±0.91
1 month	55.15±0.85	55.41±1.00	55.81±0.90	55.50±1.01
2 month	76.74±1.05	77.40±1.24	78.04±0.66	77.81±0.81
3 month	98.71±1.55	100.04±1.71	101.04±1.12	100.91±1.25
4 month	122.94±1.44	125.12±1.84	126.50±1.30	126.50±1.08
5 month	147.88±1.55	151.64±1.35	152.91±1.55	153.21±0.87
6 month	173.31±1.81	178.94±1.31	180.48±1.61	182.07±1.18
Absolute gain over 6 months, kg	137.24±2.17	143.11±1.55	144.31±1.67	146.10±1.52

The live weight of calves from experimental and control group was 35.84-36.07 kg at the start of the experiment. The growth in comparison with the control was higher by 0.78%. The average value was 56.6 kg. By the 2nd and 3d months the difference in this parameter increased by 1.34% and 2.2%, respectively.

Then the above trend continued. At the end of the experiment, the highest live weight was 183.8 kg in the third experimental group. Compared with the control, the value was greater by 5.03% ($P<0.01$), i.e. by 8.78 kg.

The increase in the corresponding parameter in animals of this group was more significant over six months on average. The result exceeded the control by 6.29% ($P<0.01$), 8.71 kg in absolute terms, and was equal to 137.11 kg. Table 2 shows how the average daily gains changed during the experiment. Calves of the 2nd group, that received Levisil SC+, showed more significant average daily gains over the course of 1-2 months.

Moreover, calves belonging to the third group demonstrated more active growth over the following months. These animals received "Optisaf". For the entire period the daily weight gain exceeded the control results by 6.28% ($P<0.01$) and amounted to 817.2 g.

Table 2 - Average daily live weight gain by months

Parameter	Group			
	Control	First experimental	Second experimental	Third experimental
At birth	674.40±43.44	685.10±54.21	692.35±32.21	683.64±47.60
1 month	717.01±41.31	731.50±65.11	738.61±33.65	741.88±24.51
2 month	733.70±38.46	755.20±55.21	765.81±31.60	774.91±34.81
3 month	806.30±28.46	843.30±17.42	847.67±44.21	851.61±30.61
4 month	830.10±24.37	873.60±29.53	880.94±22.60	897.55±11.20
5 month	846.10±29.88	908.50±24.70	913.92±11.30	958.11±40.68
6 month	767.80±11.15	801.50±8.41	806.61±8.41	816.27±7.43
Absolute gain over 6 months, kg	100.0	102.0	104.01	106.11

The growth of the body, skeleton, individual tissues and organs occurs unevenly during development. It leads to age-related changes occurring in the physique. There is a need to

take into account the features of the exterior along with live weight, because assessment of the development and growth of young animals on the basis of live weight only is considered to be insufficient.

Study of changes in key parameters, as well as analysis of these changes in animals from different groups, revealed the following. The formation of the physique was influenced by the feeding conditions of the animals in a certain way. With age, there was an increase in the measurements of animals in each group (Table 3).

Table 3 - Measurements at six months of age, cm

Parameter	Group			
	Control	First experimental	Second experimental	Third experimental
Oblique torso length	111.60±2.71	112.15±2.14	114.00±2.21	115.93±2.31
Chest depth	47.01±1.90	47.80±1.70	48.33±1.81	51.28±1.80
Height at withers	110.33±2.18	111.30±2.11	112.60±1.70	113.01±1.79
Chest width	30.23±1.01	29.77±1.11	30.41±1.19	30.31±1.31
Chest circumference behind scapula	126.10±1.81	127.60±1.35	128.20±1.58	130.31±1.80
Height at the sacrum	115.06±1.48	116.66±1.77	117.26±1.71	117.55±1.41
Width at the hips	28.15±1.31	28.31±1.22	28.55±1.51	29.22±1.42
Pastern girth	13.85±0.40	13.90±0.21	14.01±0.35	13.90±0.21

Changes in growth rates of linear measurements with age were different. The animals belonging to the third experimental group were characterized by an advantage in most of the measurements. Compared to the control, they showed more significant results. An excess was also revealed in terms of width at the hips, height at the sacrum, and chest circumference behind the scapula. An advance was also revealed in the following parameters: height at the withers - by 2.67 cm (2.40%), chest depth - by 4.15 cm (8.64%); oblique length of the body - by 4.32 cm (3.84%).

Daily use of "Optisaf" at a dose of 10 g per head had a positive effect on linear growth measurements in particular and physique development in general; the increase in live weight was 6.29% higher and amounted to 8.71 kg.

The results of the experiment corresponded to the results obtained by V.N. Nikulin, I.A. Babicheva. These researchers revealed an increase in live weight by 4.3 and 4.5 percent during fattening of bulls when using Lactobifadol, Lactoenterol.

Studies in the Bashkir State Agrarian University revealed an increase of 10.6% in average daily gains when using Vitafort probiotic in the diets of dairy calves at a dose of 0.1 ml per ten kilograms of live weight. Similar results were obtained by R.Z. Mustafin, V.I. Levakhin, L.Yu. Topuria, I.A. Babicheva and others.

4 Conclusion

Based on the results of the study, the following was established. Calves of the third experimental group, that received yeast probiotic "Optisaf" daily, were characterized by more significant activity of metabolic processes. The result was that the calves of this group were ahead of the control calves in terms of development and growth.

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Conflict of interest. The authors declare that there is no known conflict of interest associated with this publication.

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