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Use of biologically active substances in feeding young animals

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***Abstract*—An important problem of cattle breeding in Russia is the creation of a solid fodder base. Due to its absence, the genetic potential of dairy and beef cattle in our country is realized only by 30-50%.**

This work is devoted to the study of the influence of the belotine feed additive on the productivity of meat young animals. The studies have shown that in the case of the addition of 10% of the dry matter requirement, experimental groups surpass the control groups.

Keywords—young animals, feeding, feed additives, biologically active substances, mixed fodder – starters, protein belotine

I. INTRODUCTION

In recent years, the agricultural sector of the Russian Federation has seen positive trends in meat production. The country is almost completely self-sufficient in poultry and pork. However, beef production volumes and its quality do not fully meet the population needs.

A promising direction of solving the problem of increasing production and improving the beef quality is the intensification of specialized beef cattle breeding based on increasing the level of animal productivity and providing conditions for its implementation, in particular, full feeding.

It should be noted that animal productivity has increased significantly in recent years. Thus, the milk yield of cows in developed countries is in the range of6,000-8,000kg, the best farmers get 12,000-13,000 kg per head. The average daily gain of live weight at beef cattle fattening exceeds 1,300 g, for pigs – 600-800 g [1].

Unfortunately, in Russia, the numbers are low. The average yield per cow in Russia is over 3,000. The average daily increase in the live weight of cattle is400-600 g/day. Low live weight gain is also noted in pig breeding. Repeated attempts to bring highly productive foreign animals to different country zones did not contribute much to productivity growth. The reason is the failure to comply with basic feeding standards. Negative consequences of poor nutrition are metabolic diseases, reduced body resistance and death of animals. It should be noted that 99% of diseases in livestock are caused by improper feeding.

According to many authors, complete feeding is one of the most important conditions that form the productivity[2].

A very important link in the formation of healthy young animals with a strong constitution, prepared for intensive fattening schemes at industrial complexes, is the dairy breeding period.

The existing intensive livestock production technologies suppose the use of necessary volumes of milk or its substitutes, high-protein mixed fodder-starters, vitamin-mineral additives, and high-quality bulk feed during this period [3].

There are several ways to supplement the diet with protein, includingincreased production of high-protein fodder and legume crops, the use of non-protein nitrogen compounds (for ruminants), as well as animal feed, oil extraction products and protein microbiological synthesis.

It is considered that it is advisable to balance the protein diets of farm animals with the help of mixed fodder. It makes it possibleto lower expenses of grain feed per unit of production by 17-20%.

However, due to the shortage of high-protein plant components, it is not always possible to strictly follow the recipes. For example, mixed fodder composition shall contain at least 12% of legume grain, whilethedemand for it is provided only by 3%;therefore, the solution to the feed protein issue by plant feed is currently unrealistic[4].

The current situation defines the needfor studies aimed at working out mixed fodder recipes with the use of less scarce and rather inexpensive components without food value for humans.

Obtaining and breeding healthy offspring is the most important task of modern livestock production, as the subsequent growth, development, adaptation to adverse environmental factors and the maximum realization of the genetic potential of productivity depend on the state of health. Young animals in the starting period have a tense metabolism

and are very sensitive to nutrition quality, especially to the provision of high-grade protein and energy[5].

In connection with the above-stated, the purpose of work is studying the influence of feeding factors on the productivity of young growth of meat breeds of agricultural animals.

Tasks:

- study feed intake and nutrient consumption per unit of live weight gain of experimental animals;

- study the growth intensity;

- study meat productivity and quality;

- calculate economic efficiency.

It is possible to grow healthy, well-developed, environmentally resilient, high-productivity animals that are able to use feed rationally, if the growth and development specifics of individual age groups are taken into account in the growing process.

In order to stimulate the rapid development of all parts of the digestive system, animals are accustomed to starter mixed fodder for 3-4 days. This early inurement to eat concentrated energy feed promotes the development of microvilli and increases the absorption surface of the farding bag, and as a consequence, the intensive development of the skeleton and muscles. Feed entering the farding bag due to the products of its biological fermentation contributes to the thickening of its mucous membrane with simultaneous stimulation of the papillae development. This increases the surface of the farding bag walls and the suction area. Therefore, in order to create conditions to stimulate the growth of farding bag microvilli, it is necessary to include 10-12% of structural fiber in the diet of young animals. Feeding young animals in the dairy period with only hay and haylage increases the farding bag volume, but not the growth of villi. In the first week, these feed typesare almost non-digestiblein the farding bag[6].

It is necessary to pay special attention to the mineral nutrition of young animals, as in many regions of Russia there is a typical lack of Mg, Co, J, Se, Ca, P, i.e. microelements that limit the animal productivity. Therefore, during the starting period, it is necessary to feed special standard premixes.

One of such additives, obviously, can be belotine, which is a mixture of the biomass of yeast grown on products of enzymatic hydrolysis of plant raw materials.

A comparative analysis of the composition of belotine and skimmed milk powder shows that they differ slightly in chemical composition.

One kilogram of belotine contains more raw and digestible protein than skimmed milk powder by 3.7 and 4.1%, respectively.

The concentration of raw fat in the unit mass ofskimmed milk is 3.4 times less than inbelotine.

Belotine contains a significant amount of raw fiber, while skimmed milk powder is completely free of it.

Both belotine and skimmed milk powder are completely free of starch and virtually of sugar, although the total amount of nitrogen-free extractive substances is quite large in both products. At the same time, their content in skimmed milk powder exceeds that of belotine by 26.3%.

The amount of calcium inbelotine is 3.6 times less than in skimmed milk powder, while the amount of phosphorus is 31.1% less. The amount of potassium in skimmed milk powder is 26.5% lower than in belotine, and sulphur – 2.9 times higher. Magnesium is absent in skimmed milk, while one kilogram of belotinecontains1.5 g of it. At the same time, belotine contains 12.5 times more iron than skimmed milk, manganese – 44.0, and iodine – 2.3 times. The cobalt content in 1 kg of skimmed milk powder is 1.8 mg, which is 1.28 times higher than in belotine. In terms of the copper and zinc levels, these feeds differ slightly.

Typically, they do not contain vitamin A, although the content of vitamins D and E in belotineis 1,000.0 and 4.7 times higher than in skimmed milk, respectively.

The content of water-soluble vitamins in 1 kg of skimmed milk powder, except for B_5, is higher than inbelotine.

Based on the above, it is possible to conclude that belotine,in terms of the basic characteristics of nutritive efficiency, does not concede to dry skimmed milk and is attractive from the point of view of use in recipes of starter mixed fodders for young agricultural animals.

II. EXPERIMENTAL

When tested at 12 months of age, the young control group hadalmost the same live weight as peers from groups III and IV, while peers from groups II and V were0.03% inferior.

This meets the existing requirements for the formulation of scientific and economic livestock experiments, where the difference in the average live weight of animals between groups should not exceed 5.0%.

Monthly control individual weighing showed that the use of belotinehada positive effect on the increase in the live weight of young animals of the experimental groups.

At 13 months of age, animals in groups II, III, IV and V (experimental) outperformed control animals by 0.7%, 0.8% 1.4% and 1.2% respectively.

At the age of 14 months, the difference in live weight between the control animals and their peers from groups II, III, IV and V groups (experimental) was1.3, 1.7, 2.1 and 2.2%, respectively.

In the period from 12 to 13 months of age, the animals from the productivity control group were6.8% less productive than their peers from group II (experimental).

They werealready 11.2% behind their peers in the third group, while the animals in the fourth and fifth groups were12.4% and 12.9% behind.

In the period from 13 to 14 months of age, the difference in the average daily increase between the control animals and those from group II was7.3%. At the same time, bulls from groups III, IV and V outperformed youngsters from the control group by 11.1, 13.0 and 13.2%, respectively.

In the period from 14 to 15 months of age, the difference in favor of the experimental groups that received protein was6.5, 12.5, 12.9 and 12.7%.

In the study of productivity during the period from 15 to 16 months, it was established that the average daily gain of animals of groups II, III, IV and V (experimental) exceeded that oftheir peers form the control group by 5.3, 11.8, 11.8 and 11.8%, respectively.

During the penultimate month of the scientific and economic experiment, the average daily increase in live weight in the control group was985 g, while in groups II, III, IV and V (experimental) – by 4.6, 10.9, 11.5 and 11.1%.

In the period from 17 to 18 months of age, the control animals showed growth energy at the level of 974 g of average daily growth. Young animals of groups II, III, IV and V (experimental) had higher rates by 5.3, 11.7, 10.9, 11.9%.

As a whole, during the experimental period, whenbelotine was used in doses of 5.0; 10.0; 15.0 and 20.0% of the amount of dry matter, animals from the experimental groupsoutperformed the control analogs in terms of productivity by 6.1, 11.6, 12.2, and 12.4%, respectively.

At 15 months of age, the average live weight of the control group was383.3 kg, which was1.7, 2.6, 3.2 and 3.1% less than in the animals of groups II, III, IV and V (experimental), respectively.

When weighed at the age of 16 months, the positive difference in favor of animals that received belotineremained.

Animals in groups II, III, IV and V (experimental) outperformed their peers by 2.0, 2.5, 3.0, and 2.9%.

At 17 months of age, the advantage of the experimental groups in terms of live weight over the control analogs increased to 2.2, 3.3, 3.9, and 3.7%, respectively. Eighteen-month-old bulls from groups II, III, IV and V (experimental) outperformed control bulls by 2.2, 3.3, 3.9 and 3.2% in terms of live weight.

As a result of the stable exceedance of the experimental groups over the control in terms of live weight in all periods under study, at the end of the experiment it amounted to 11.3, 17.0, 19.5 and 19.1 kilogramsin absolute terms.

The use of protein in diets hada positive effect on the relative growth of experimental animals, starting with a dose of 10.0% of the dry matter weight of the control diet.

According to this indicator, the animals of group II that received an additive in the amount of 5.0% of the dry matter level in their dietsexceeded the control level by only 4.4%.

The relative increase in live weight in group III was7.3% higher than in the control group peers, and in groups IV and V animalsit was higher by7.5% and 7.9%, respectively.

The results obtained are fully consistent with the data on the live weight of the experimental young animals and their productivity obtained during the experiment.

In order to determine the unit cost of feed, it is necessary to know the amount of basic nutrients consumed by animals during the study period.

The animals of experimental groups II, III, IV, V exceeded the animals of the control group by 1.1, 1.3, 1.9 and 2.4% in terms of energy consumption of fodder units.

The animals in the control groupwere1.1, 1.3, 1.9 and 2.4% inferior to the experimental groups in terms of metabolic energy.

During the experiment, young experimental groups using belotine in their diets consumed slightly more dry matter, fat and nitrogen-free extractive substances than the control analogs.

The crude protein intake of group II bulls was1.4% less than in the control group, and the animals of groups III, IV, V werein favor of the control group by 2.7, 7.9 and 13.3%; the digestible protein intake ingroup II animals was1.1% less than in group I; in groups III, IV, V (experimental),it wasmore than in the control group by 5.3, 12.9, 20.8%. Bulls in the control group were1.1, 1.3, 1.9 and 2.4% inferior to the control group in terms of metabolic energy.

During the experiment, control group bulls using belotine in their diets consumed slightly more dry matter, fat and nitrogen-free extractive substances than the control analogs.

The crude protein intake of group II animals was1.4% less than in the control group, and the animals of groups III, IV, V werein favor of the control group young animals by 2.7, 7.9 and 13.3%; the digestible protein intake ingroup II was1.1% less than in group I; in groups III, IV, V (experimental), it wasmore than in the control group by 5.3, 12.9, 20.8%.

The results of the calculations show that the use of belotine leads to a significant increase in the content of raw and digestible protein in the diet, but does not provide a complete balance of other required indicators.

This does not make it possible to fully realize the protein potential of the diets and leads to the overuse of raw and digestible protein for the increase in the live weight of bulls.

Analyzing the data obtained, it can be concluded that from the point of view of the efficiency of the use of feed nutrients, the optimal dose of belotine can be considered 10% of the amount of dry substances in the main diet.

For a more complete understanding of the effect of protein use on the growth and development of the experimental young animals at the age of 12 and 18 months, the main exterior statistics were measured.

Based on the obtained data, it was concluded that at the age of 12 months there was no difference between the control and experimental groups of bulls.

The bulls' height in the withers variedby 0.7-0.8%.

Approximately the same difference was observed for other exteriors of animals of different groups.

This seems quite logical, because for the study of linear growth, bulls with age and live weight corresponding to the average values in the groups were selected, and the groups themselves practically did not differ in these parameters.

At 18 months of age, differences in the composition of the control and experimental groups of bulls remained generally unchanged.

Since a slight difference in the individual intervals was also observed at 18 months of age, it is obviously more correct not to compare the studied measurements between groups of animals, but to increase them within each group.

Therefore, the use of belotine does not lead to changes in the growth of the skeleton of young animals, at certain points of which the corresponding exterior points are measured, and the increase in the total body weight is due to an increase in muscle mass.

At the end of the experiment, a control culling was carried out, for which 3 bulls with a live weight corresponding to its average values in the group were selected from each group.

Based on the data obtained, it can be concluded that feeding belotine5.0-20.0% of the dry matter level in the diets has almost no effect on the relative culling characteristics of young animals. In terms of carcass yield, internal fat yield, culling yield and skin yield, the animals of the experimental groups are virtually identical to their peers in the control group.

In terms of the absolute content in chilled carcasses, young animals of groups II, III, IV and V outperformed their peers from the control by 2.6, 4.2, 4.5 and 4.3%, respectively.

The yield of the fleshy part of the body per 1 kg of bone (meat content factor) does not differ significantly from that of the control young animals with belotine diets.

Studies of the longest back muscle samples showed that most of the difference parameters between the control and experimental groups of animals were not observed.

Thus, in terms of dry matter, the longest back muscle of the experimental groups was0.48, 0.05, 0.35 and 0.63% inferior to the control group peers.

In terms of fat, the animals of the experimental group exceeded the control group by 0.01-0.85%.

The total longest back muscle nitrogen showedthat the experimental groups were0.37, 0.05, 0.13, 0.08% inferior to the control group.

The non-protein experimental group nitrogen was0.05-0.07% less than the control group nitrogen.

The protein parameters of the longest back muscle of the experimental group wereless than in the control group by 0.45-0.48%; 0.33-0.44%.

In terms of tryptophan, the animals of the experimental group outperformed the animals of the control group by 0.11-0.13%.

In terms of the moisture content, the control group of young animals outperformedthe experimental peers by 2.0-4.9%.

Approximately the same pattern wasobserved in the content of other studied parameters in the longest back muscle.

The unsystematic content of indicators of the longest back muscle of animals in the meat of the control and experimental groups indicates that the use of belotine during the fattening period does not lead to significant changes in its nutritional status and qualitative characteristics.

III. RESULTS AND DISCUSSION

Based on the conducted studies, it wasestablished that there wasno essential difference in the consumption of milk replacer and mixed fodder-starters between the control and experimental animal groups. At the same time, in terms of green chopping consumption, there wasa tendency to increase in the groups of dairy calves that received the maximum amount of belotine in the composition of KP-I. Thus, the average daily consumption of green chopping of groups IV and V exceededits consumption by peers from the control group by 3.1 and 7.6%, respectively.

Due to the slightly higher consumption of alfalfa chopping, the average daily nutrient intake of diets hadsome advantage over the control animals of groups IV and V.

Thus, in terms of dry matter feed intake, the difference between young animals of groups IV, V and the control group was1.4% and 3.0%. This seemingly insignificant difference led to the fact that the main indicators characterizing the nutrient intake of feed during the dairy period hadalready a bigger difference in comparison with the control. The raw protein consumption in groups IV and V was higher than inthe control groupby2.5 and 8.6%; the consumption ofstarch – by 8.4-11.6%, and fiber –by 4.3-8.6%. The amount of fat consumed in the control animal group averaged177.17 g per animal per day. This wasless than for groups II-V by 0.8-2.5%, respectively.

The maximum difference in favor of the experimental groups wasnoted in the consumption of vitamins and trace elements. This is due to the fact that the composition of belotine includes premix, consisting of a set of salts of scarce trace elements and vitamins. At the same time, the introduction of belotine to the base KP-I, which already has a premix in its recipe, contributes to a significant increase in the content of vitamins and trace elements in experimental mixed fodder-starters.

These data characterize the consumption of feed nutrients on average per day of the dairy growing period. For a more objective view of the ratio of nutrients entering the body of animals with feed, the amount of nutrients per unit of nutrition wascalculated in the average diet.

The results obtained indicate that the concentration of raw and digestible protein per feed unit was slightly higher in the actual average daily diets of the experimental animal groups than in the control group, yielding to it only in terms of the number of nitrogen-free extractive substances. There wasno

difference between the control and experimental groups' average daily rations in terms of the sugar and protein and calcium to phosphorus ratio. These indicators werewithin the physiological norm.

In order to study changes in live weight during the experiment, monthly control weighing of animals was carried out in the morning before feeding.

These data showed that the use of belotine in diets hada positive effect on the fattening qualities of young animals.

IV. CONCLUSION

As a result of the carried out studies,new data on the influence of feeding of belotine on the growth and development of animals, on their physiological reactions and, as a whole, the economic expediency of use of this additive in diets of young animals werereceived. In general, the data of the production inspection confirmed the results obtained during the scientific and economic experiment.

In terms of productivity and economic efficiency of meat production, animals that received 10.0% belotine of dry matter requirements outperformed the control ones.

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