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Probiotic Preparation To Increase Meat Productivity And Physiological Status Of The Rabbits.

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ABSTRACT

In the livestock industry, the use of probiotic additives that contribute to the normalization of microbiocenosis of the animal body, as well as their resistance to pathogenic microflora is perspective, which ultimately affects the increase in meat productivity. The aim of the work was to increase the meat productivity of young rabbits using the probiotic preparation "VetKor" and evaluation of its impact on the quality and morphological characteristics of the internal organs of animals. The influence of the probiotic additive "VetKor" on the morphological composition of carcasses, chemical composition and biological value of rabbit meat, as well as morphological and functional characteristics of the stomach and liver of rabbits has been studied. To study the effect of the probiotic preparation "VetKor" 30 rabbits at the age of 60 days were selected. The control group of rabbits received the basic diet consisting of feed PK-90, rabbits of 1 and 2 experimental groups additionally administered probiotic preparation at a dosage of 75 and 100 mg / kg of live weight, respectively. Meat quality was evaluated at the age of 120 days after control slaughter in the amount of 3 heads from each group. Morphological composition data showed that the mass of the muscular tissue of the rabbits of the experimental groups was superior to the rabbits of the control groups. Compared with the control group of rabbits, the pre-slaughter mass of 2nd experimental group of rabbits was higher by 134.9 g or 4.29%, compared with 1st experimental group by 69.3 g, or 2.20 % (P < 0.05). In the 2nd experimental group of rabbits the carcass yield was 62.33 %, that is more than in the control and 1st groups by 6.8 and 4.89%, respectively. The study of the histological characteristics of the stomach and liver of rabbits, allow a positive evaluation of the effect of the probiotic drug on the growth and development of the animal. Analysis of the chemical, amino acid and fatty acid composition of muscle tissue showed that the use of probiotic preparation "VetKor" in a dosage of 100 mg per 1 kg of live weight improves the balance of amino acid, fatty acid and chemical composition, which is confirmed by the evaluation of physical, chemical and organoleptic characteristics of meat raw materials.

Keywords: probiotic preparation, number of young rabbits, meat productivity, biological value, morphological and functional characteristics

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INTRODUCTION

In the livestock industry in recent years due to the active economic activity there has been an increase in negative physical and chemical factors that adversely affect the physiological processes occurring in the body of animals. In this connection, there is a need to develop scientific approaches and recommendations on the technology of feeding farm animals, including young rabbits using environmentally friendly additives to ensure the production of high-quality and safe raw materials.

Rabbit breeding is an industry that allows obtaining a wide range of animal products and requires special attention and development of scientific approaches for rational regulation and balancing of rabbit diets with a wide range of nutrients and feed probiotic additives that contribute to the preservation of livestock by normalizing the microbial balance in the digestive tract, stimulating growth, increasing the growth of live weight [1, 12, 14].

The productivity of rabbits is influenced by a number of factors. First of all, heredity, physiological state, feeding rations. As a rule, special attention is paid to the balance of diets on basic nutrients, which in turn affect the productivity of animals [7, 11, 20].

One of the important biological risks on rabbit farms is the high sensitivity of livestock to pathogenic microflora. To reduce the susceptibility of livestock to pathogenic infections, the antimicrobial growth promoters are used – antibiotics as feed additives, the mechanism of action of which is to reduce the competition of microorganisms in the fight for nutrients with the body and reduce their metabolites that inhibit the growth of the animal [1, 2]. The use of this group of preparations often gives side effects, therefore, results in the necessity of finding alternative means of contributing to the stimulation of animal growth. Such drugs primarily include probiotics feed purposes, contributing to the increase of resistance of the animal organism, the normalization of microbiocenosis of the intestine, to improve the processes of assimilation of nutrients of feeds [9, 15, 16, 19]. The use of probiotic preparations allows to obtain safe and high-quality raw meat, which is associated with the demand for dietary meat, which includes rabbit meat. In this aspect, attention should be paid to both quantitative indicators of meat yield and qualitative characteristics, which are confirmed by histomorphological assessment.

Rabbit meat refers to dietary raw meat, characterized by pale pink color, rather delicate texture and different fine-fiber muscle tissue. Connective tissue in rabbit meat is small, so it is characterized by a delicate texture. Rabbit meat contains a lot of nitrogen, mineral (acid salts of phosphorus (246 mg%) and potassium (364 mg%)). The presence of extractive substances gives the meat a specific smell and taste. The cholesterol content of rabbit meat is 25 mg per 100 g of meat [6, 13, 17, 18].

With balanced feeding, the body of rabbits accumulates a large number of biologically active substances contained in grain raw materials, such as polyunsaturated fatty acids, dietary fibers, vitamins, minerals, as well as minerals and vitamins necessary for humans: iron, selenium, fluorine, cobalt, vitamins B, vitamin C, which determines the use of this type of meat in therapeutic and preventive nutrition.

The aim of the work is to increase the meat productivity of young rabbits using the probiotic preparation VetKor and evaluation its impact on the quality and morphological characteristics of the internal organs of animals.

OBJECTS AND METHODS OF RESEARCH

To conduct the experiment, 30 rabbits (males) of the Soviet chinchilla breed were selected, which at the age of 60 days were divided into 3 groups according to the principle of groups – analogues. In each group was picked up 10 heads. Rabbits of all groups were kept in the same conditions and received the same basic diet. The research was conducted in the private sector of the Voronezh region in 2018. As the main diet we used feed PK-90, obtained on the basis of grain crops, sunflower cake, wheat bran, herbal flour and premix KVP P90-1K. Rabbits of group 1 (control) received only feed PK-90, rabbits of group 2 and 3 were administered in addition to the main diet the probiotic preparation VetKor in the amount of 75 and 100 mg per 1 kg of live weight according to the scheme: within 8 days after separating (1-8) day and 21 days (30-38 day). The dynamics of live weight was taken into account by individual weighing. To determine the meat efficiency was

made the slaughter at the 3 heads of the rabbits from each group according to the method of CABINDA, evaluation of meat quality was carried out according to standard methods [8]. Studies were carried out using the material and technical base of the Institute of pathology, pharmacology and therapy (Voronezh).

Amino acid composition was determined according to GOST 13496.21-2015 using hydrolysis and amino acid determination by high-performance liquid chromatography. Fatty acid composition was determined according to GOST R 55483 – 2013 the use of gas chromatography. The quality of rabbit meat was evaluated according to GOST 20235.0-74. Evaluation of chemical composition and biological value, physical and chemical parameters of rabbit meat was carried out in accordance with the recommendations [8].

The material for histological examination was the stomach and liver of rabbits. For histological examination, tissue samples were fixed in a 10% solution of neutral formalin. The recorded samples after washing in running water were dehydrated by placing the test material in alcohols with increasing concentration and poured into paraffin according to the generally accepted technique. Histological cross sections 4-5 μm thick were stained with hematoxylin-eosin. Microscopy was performed using a light microscope "Biomed-5" (Russia) [2]. The scheme of the experiment provided for a comparative evaluation of the histological structure of the stomach and liver of young rabbits.

RESULTS AND THEIR DISCUSSION

The dynamics of live weight reflects the nature and level of feeding of young rabbits. At the stage of the experiment the weight of the rabbits of control and test groups was similar and amounted to an average of 39.6 g. At the age of 120 days, the rabbits of the 1st group (control) were characterized by live weight, which was less than the mass of animals of the 1st experimental group on 138,0 g, or 4,33 % ($P < 0.05$), 2nd experimental group - 244,9 g, or of 7.74 % ($P < 0.01$) (table 1).

Table 1: Dynamics of live weight of rabbits, g ($x \pm SX$)

Age, days	Group		
	Group 1 (control)	group 2 (experienced 1)	3rd group (experimental 2)
1	39.58 \pm 0.12	39.60 \pm 0.16	39.78 \pm 0.15
60	1587.14 \pm 22.67	1597.43 \pm 18.54	1591.29 \pm 21.27
120	3180.5 \pm 20.17	3318.8 \pm 22.24	3425.4 \pm 21.09
Average daily increase	26.55 \pm 0.75	27.02 \pm 0.86	29.23 \pm 0.74
Safety, %	90.0	90.0	100.0

Indices of slaughter of animals give an idea of the quantitative side of the meat productivity of the animal. But such indicators as pre-slaughter weight, weight of hot carcass and its output, do not give a complete picture of the nutritional value. Important is the morphological composition of carcasses, which reflects the quantitative ratio of muscle, fat, bone and connective tissue [3, 4, 8-10].

High biological plasticity and adaptability to a variety of conditions distinguishes rabbits from all farm animals. It should be noted that insufficient and unbalanced feeding leads to a delay in the growth of individual parts of the body of animals, especially reduced output of muscle tissue and increases the proportion of bone and connective tissue. Therefore, the results of the study of the morphological composition of rabbit carcasses allow us characterize more accurately e the changes that occur against the background of the use of the probiotic preparation "VetKor" (TU 9337-004-57879516-2006). Probiotic preparation "VetKor" derived on the basis of immobilizovannoi dried spore biomass of bacteria Bacillus Subtilis VGNKI 01.12.01 DEPT and VGNKI 01.12.02 DEP , Bacillus Licheniformis VGNKI 01.12.03 DEP, and fillers: starch, glucose, calcium stearate is, used to improve resistance of the agricultural animals, contributes to the normalization of microbiocenosis and increases liveweight gain [3].

The analysis of the morphological composition of the cooled carcasses of rabbits showed that the inclusion in the diet of rabbits with probiotic supplements "VetKor" has had a favourable influence on the output of the muscle tissue (table 2).

The pre-slaughter live weight, as well as the mass of the hot carcass of rabbits of the experimental groups, was higher compared to the weight of the animals of the control group.

The highest pre-slaughter weight was in the 2nd experimental group of rabbits and was 3275 g compared with the control group of rabbits, the pre-slaughter weight of 2 experimental group of rabbits was higher by 134.9 g or 4.29%, compared with 1 experimental group by 69.3 g, or 2.20 % (P < 0.05). In the 2nd experimental group of rabbits the carcass yield was 62.33 %, which is more than in the control and 1st groups by 6.8 and 4.89%, respectively.

Table 2: Morphological composition of carcasses (n=3)

Index	Group 1 (control)	Group 2 (experienced 1)	Group 3 (experimental 2)
Pre-slaughter live weight, g	3140.5±21.17	3209.8±25.64	3275.4±18.57
Weight of hot carcass, g	1798.0±21.17	1889.5±21.17	2085.0±21.17
Slaughter output, %	58.36±0.15	59.42±0.21	62.33±0.17
Boneless meat yield, %	71.82±2.45	73.25±2.49	76.86±3.18
Meat index	3.26±0.78	3.55±0.62	4.49±0.55

Rabbits of the 1st experimental group surpassed the control group of animals mass of steam carcass by 91.5 g (5,08%; P<0.05), experimental group 2 – 287 g (of 15.96%; P<0.01). A similar pattern was observed in the output of muscle tissue obtained after boning. Rabbits of the control group were inferior in this indicator to peers of the experimental groups by 92.0 and 213.0 g (7.12 and 16.49%, respectively; p<0.01).

The calculated index of meat showed that rabbits that received the probiotic Supplement "VetKor" at a dosage of 100 mg/kg body weight (experimental group 2) have a greater index of meat - of 4.49, compared to the rabbits of the experimental group 1 and control of 3.55 and 3.26 units, respectively.

Meat quality indices directly depend on chemical composition and energy value [5, 7]. Table 3 shows the chemical composition of rabbit meat. The use of probiotic Supplement "VetKor" in feeding rabbits helped to increase the mass fraction of protein in muscle tissue. The content of the mass fraction of fat in the muscle tissue of rabbits of the control group and the experimental groups differed slightly, no significant differences were found, although the least amount of fat was observed in rabbits of the 2nd experimental group receiving the probiotic preparation "VetKor" in a dosage of 100 mg per 1 kg of live weight in accordance with the selected scheme.

Table 3: Chemical composition of rabbit meat, m±

Index	Group		
	group 1 (control)	group 2 (experienced 1)	group 3 (experimental 2)
Moisture mass fraction, %	73.40±0.55	72.80±0.66	72.30±0.58
Protein mass fraction, %	19.40±0.29	20.02±0.32	20.55±0.40
Mass fraction of fat, %	6.17±0.46	6.14±0.42	6.10±0.41
Ash mass fraction, %	1.03±0.05	1.04±0.03	1.05±0.04

The highest protein content was observed in the meat of rabbits of the 2nd experimental group. According to the content of fat rabbits of experimental groups did not significantly differ from each other and the control group. The maximum amount of mineral substances was observed in rabbits of the 2nd experimental group.

The value of meat as a protein component is determined by a set of amino acids, both non-essential and essential, determining the biological value of the products. The biological value of rabbit meat proteins was evaluated by the amino acid composition, in which the presence of all essential amino acids was established. The research data are given in table 4.

Table 4: The Content of essential amino acids in muscle tissue, mg/1 g protein

Amino acids	Studied groups			
	Ideal protein FAO/who, mg/g protein (2011) [10]	group 1 (control)	group 2 (1 experimental group)	3 group (2 experimental group)
Valine	40,0	39,7	41,6	43,2
Isoleucine	30,0	35,4	36,3	39,8
Leucine	61,0	66,9	67,8	72,0
Lysine	48,0	44,5	45,2	46,7
Methionine+ cystine	23,0	21,8	23,4	25,2
Threonine	25,0	34,7	35,4	37,0
Tryptophan	6,6	3,1	3,4	3,5
Phenylalanine+tyrosine	41,0	37,2	38,5	39,8
Histidine	16,0	29,5	29,8	32,0

Rabbit meat grown with the use of the probiotic preparation VetKor (table 4) contains valine, isoleucine, leucine, lysine, methionine+cystine, threonine, tryptophan and phenylalanine in significant quantities, indicating the protein value of rabbit meat of the experimental groups.

Data on fatty acid composition of rabbit carcasses against the background of the probiotic preparation "VetKor" are shown in table 5.

Fatty acid content of rabbit meat is characterized by a high content of polyunsaturated fatty acids: linoleic, linolenic, arachidonic, and there is a decrease in cholesterol during the use of probiotic preparation.

Table 5: Fatty Acid composition of rabbit meat against the background of the probiotic preparation "VetKor"

Index	Content, g per 100 g of product		
	group 1 (control)	group 2 (1 experimental group)	3 group (2 experimental group)
Cholesterol	0.06	0.05	0.03
Fatty acids	2.30	2.30	2.33
Saturated, including:	1.19	1.08	1.05
myristic	0.04	0.05	0.08
pentadecanol	0.02	0.02	0.03
palmitic	0.65	0.56	0.52
margarine	0.02	0.02	0.02
stearic	0.46	0.43	0.40
Monounsaturated, including	1.00	1.07	1.09
myristoleic	0.10	0.13	0.15
palmitoleate	0.07	0.08	0.07
oleic	0,83	0,86	0,87
Polyunsaturated, including	0.11	0.15	0.19
linoleic	0.05	0.07	0.08
linolenic	0.06	0.05	0.06
arachidonic	0.05	0.05	0.05

Rabbits of the 2nd experimental group surpasses other studied groups of rabbits in the content of monounsaturated and polyunsaturated fatty acids, which indicates the advantages of using probiotic preparation VetKor in a dosage of 100 mg/kg of live weight. Carcasses of rabbits of the 2nd experimental group also have the lowest cholesterol content compared to the control and rabbits of the 1st experimental group.

The organoleptic evaluation of meat and broth of rabbits of the control and experimental groups showed a positive effect of the probiotic feed additive "VetKor" on the formation of the taste and aroma profile of both boiled meat and broth. The highest score was characterized by samples of boiled meat and broth obtained from the carcasses of the experimental group 2 (8.5 and 8.2 points, respectively). Samples of boiled meat and broth obtained from the carcasses of rabbits of the control and the first group did not differ significantly (7.8 – 8.0 and 7.4 - 7.6 points, respectively).

Table 6: Indies of veterinary and sanitary examination of meat and products of slaughter of rabbits

Index Показатель	Group		
	group 1 (control)	group 2 (1 experimental group)	3 group (2 experimental group)
Physical and chemical parameters			
the pH	5,82±0,03	5,86±0,04	5,83±0,02
Reaction to peroxidase	+	+	+
Reaction with CuSO ₄	-	-	-
Volatile fatty acids	2,12±0,01	2,18±0,02	2,15±0,01
Amino-ammoniac nitrogen	0,91±0,02	0,94±0,04	0,95±0,03

The veterinary and sanitary examination of meat and products of slaughter of rabbits of control and experimental groups (table 6) deviations from the existing norms did not reveal.

Physical and chemical parameters of meat corresponded to indicators for fresh meat with normal course of autolytic processes and maturation.

Also, the microstructural characteristics of the stomach and liver of rabbits, the control group and the experimental group receiving the probiotic drug VetKor at a dosage of 100 mg/kg of live weight were evaluated.

It was found that in the experimental group of rabbits the glandular part of the stomach is represented by the mucous membrane, submucosa, muscle and serous membrane. The surface of the gastric mucosa is represented by a single-layer prismatic epithelium located on the entire surface, including the fossa, with no erosion. The mucous membrane forms multiple folds covered with a single layer of columnar epithelium. Iron cells are presented in the form of continuous folds, which are tightly adjacent to each other. The nuclei in the cells occupy a central position and have a spherical shape (Fig.1). Compared with the experimental group of rabbits the amount of mucus is much less. It was noted the eccentric location of the nuclei of glandular epithelium cells.

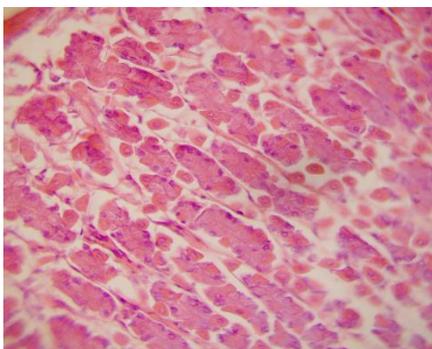


Fig. 1. Architectonics of the stomach of rabbits (experimental group). Stained with hematoxilin-eosin. Eye-lens. 10 × object 40

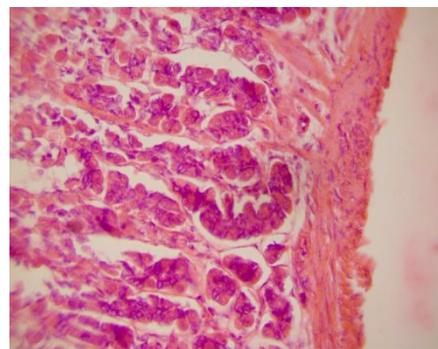
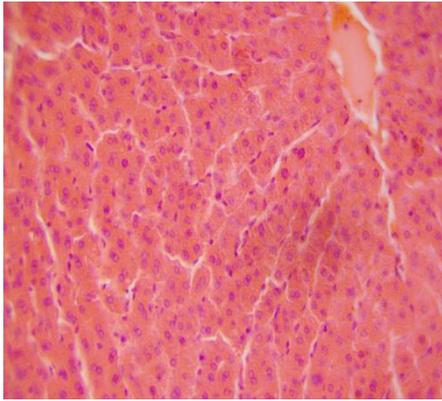


Fig. 2. Architectonics of the stomach of rabbits (control group). Stained with hematoxilin-eosin. Eye-lens. 10 × object 40



Rice. 3. Histological structure of rabbit liver (experimental group). Stained with hematoxylin-eosin. Eye-lens. 10 × object 40

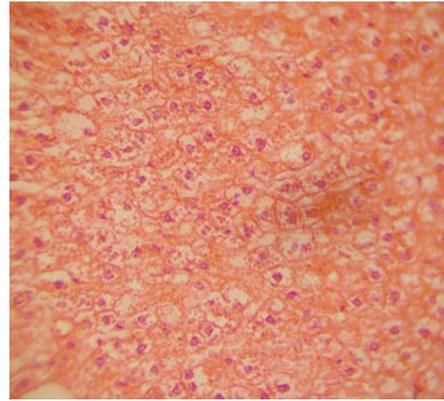


Fig. 4. Architectonics of the liver of rabbit (control group). Stained with hematoxylin-eosin. Eye-lens. 10 × object 40

Histological examination of rabbits liver of the experimental group revealed the radial arrangement of the beams. Hepatocytes form folds that are tightly adjacent to each other.

Nuclear apparatus of liver cells is expressed without dystrophic changes. The nucleus is basophilic painted. The appearance of dual-core hepatocytes was revealed. In places in vessels blood filling was noted (Fig.3).

The histological structure of the liver was preserved in the control group of rabbits (Fig.4). The beam structure is not disturbed and radiates radiantly from the central vein. In hepatocytes degenerative changes of both the cytoplasm and nuclear apparatus are diagnosed.

In the cytoplasm revealed are voids both large and small, which sometimes merge into one large vacuole, which shows the dissolution of the nucleus. Under the capsule of the organ, hepatocytes are oxyphilic small grains, which also, in turn, adversely affect the nuclear apparatus of cells.

CONCLUSIONS

Rabbit meat is regularly consumed in many European countries and its importance in human nutrition is growing, it is considered to be a product of a balanced diet.

Productive indices of rabbits and their quality of meat largely depends on adequate, balanced energy, nutritious and mineral substances feeding, but at present, in the rabbit breeding, the best studied breeding and keeping these animals, and feeding issues has been studied relatively less, even less explored application of various feed additives in feeding rabbits.

The most difficult period for young rabbits is weaning from rabbits. At this time, the rabbit body is a subject to severe stress, increases the risk of infection, resulting in reduced growth intensity. The most common diseases in this period are diseases of the gastrointestinal tract, therefore, to restore and maintain the microflora of the digestive tract, as well as for the treatment and prevention of gastrointestinal diseases are actively used preparation containing natural intestinal microflora-probiotics.

In our studies, for rabbits of all experimental groups have been created optimal conditions for feeding and maintenance, contributing to the normal growth and development of animals.

Enrichment of feed rations of young rabbits with probiotic microorganisms, which are part of the probiotic preparation VetKor, has a positive effect on meat productivity, safety, increasing the biological value of rabbit meat, as well as the structural organization of the stomach and liver. Inclusion in the diet of the probiotic preparation "VetKor" allowed to increase the productivity of rabbits, as well as to increase their growth. As a result of the research, data were obtained confirming that the rabbits of the experimental groups had a large live weight, compared with peers of the control group. The established differences in the live

weight of rabbits of the experimental and control groups were the result of the favorable influence of the probiotic. In the control group of rabbits it was observed vacuolar and granular degeneration in the cells of the stomach and liver. The studied probiotic preparation "VetKor" had a positive influence on the chemical composition and biological value of rabbit meat. Analysis of the chemical, amino acid and fatty acid composition of meat obtained from rabbits of the control and experimental groups showed that the use of probiotic preparation "VetKor" promotes the accumulation of protein substances in muscle tissue, while balancing the composition of unsaturated fatty acids.

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