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Supplements Based On Probiotic Cultures In The System Of Increasing Meat Productivity Of Farm Animals.

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ABSTRACT

Promising for the livestock industry is the use of probiotic additives that contribute to the normalization of microbiocenosis of the animal body, as well as their resistance to pathogenic microflora, which ultimately affects the increase in meat productivity. The purpose of the study was to investigate the influence of probiotic preparation "Enzimsporin" on the productivity and qualitative parameters of meat and rabbits in conditions of industrial technology. To evaluate the effect of probiotic preparation "Enzimsporin" when fattening young rabbits was selected 30 rabbits (males) hybrid rabbits of new Zealand red and Soviet chinshilla breeds, who at the age of 60 days according to the principle of the groups – analogues were divided into 3 groups with 10 heads. The studies were conducted in vivarium conditions of VGPU (on rabbits) and on the resulting number of young rabbits in the private sector of the Voronezh region in 2018. Rabbits of group 1 (control) received only feed PK-90, rabbits of group 2 and 3 were received in addition to the main diet probiotic preparation "Enzimsporin" as part of the feed in a dosage of 0.3 g /kg of feed (rabbits of the 1st experimental group) and 0.4 g/ kg of feed (rabbits of the 2nd experimental group). The dynamics of live weight reflects the nature and level of feeding of young rabbits. Upon reaching the age of 120 days, rabbits of the 1st group (control) were characterized by live weight, which was less than the mass of individuals of the 1st experimental group by 218.3 g, or 6.61 % (P < 0.05), the 2nd experimental group-by 344.9 g, or 10.45 %. The morphological data showed that the highest pre-slaughter weight was in the 2nd experimental group of rabbits and amounted to 3275 g. Compared with the control group of rabbits, the pre-slaughter mass 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). The level of profitability of rabbit meat production was higher in the experimental groups compared to the control group by 1.8% and 2.6%. Thus, the preparation "Enzimsporin" is a promising product from a number of probiotics used in animal feeding and allows to obtain ecologically pure products of rabbit production in improving economic performance.

Keywords: probiotic preparation, number of young rabbits, hybrid young rabbits, meat productivity.

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INTRODUCTION

In modern conditions, serious attention is paid to food safety [18, 19]. In order to maintain its position in the domestic highly competitive market and for Russian producers to enter the external market, it is necessary to introduce a food safety system that meets international standards. Generally recognized quality and safety management system that ensures compliance of products with established Russian and international criteria is considered HACCP (Hazard Analysis and Critical Control Points) [2]. The basis of this system is a systematic approach that covers the parameters of food safety from receiving of raw materials to the use of the finished product by the consumer, and involves knowledge of the critical points of the process that most affect the safety of products.

One of the main biological risks at the rabbit breeding enterprises is the high sensitivity of livestock to pathogenic microflora. This factor is largely due to the high concentration of livestock per area unit. Therefore, minimizing the reproduction of microflora in the animal's body is the main task of growing and fattening young animals in conditions of intensive technologies. To this aim, antibiotics are widely used as feed additives. The mechanism of action of such additives is that they are able 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 [3]. But when using feed antibiotics in addition to the predictable effect, we also get side effects, the effect of which is difficult to evaluate. In the context of the struggle for food safety, the use of antibiotics in animal husbandry is unacceptable.

At present, probiotic preparations for feed purposes, as a potential replacement for antibiotics, and as a biological corrector of homeostasis are widely studied [4]. Probiotics are now widely used in animal husbandry as an alternative to enzyme preparations not only to maintain the microbial balance of the gastrointestinal tract, but also to increase the productivity of animals [5, 6,7, 20].

Studies of the authors [8 – 12, 17] noted that the positive results show probiotics, which are based on spore-forming bacteria of the genus *Bacillus*. On the basis of strains of bacteria *B. Subtilis* strain B-2998D, B-3058 and *B. Licheniformis* strain B-2999D with the addition of dry whey was created the preparation "Enzimsporin", which has a pronounced antagonistic activity against *Clostridium perfringens*, *Escherichia coli*, *Salmonella typhimurium*, *Salmonella enteritidis*, *Staphylococcus aureus*, *Shigella* SP. and other;

They have immunomodulatory effects (activate macrophages, stimulate the production of interferon, synthesize immunoglobulins, antibodies during vaccination) – which contributes to biological protection; produce digestive enzymes – amylase, lipase, protease, pectinase, endogluconase, xylanase and phytase, which increase the digestibility of feed; and produce Riboflavin and amino acids, including essential; have antitoxic effect, including direct metabolism of mycotoxins.

The purpose of the research is to study the influence of probiotic preparation "Enzimsporin" on the productivity and qualitative parameters of meat and rabbits in conditions of industrial technology.

OBJECTS AND METHODS OF RESEARCH

To evaluate the effect of probiotic preparation "Enzimsporin" when fattening young rabbits were selected 30 rabbits (males) hybrid rabbits new of Zealand red and Soviet chinchilla breeds, who at the age of 60 days according to the principle of the groups – analogues were divided into 3 groups. In each group 10 heads were picked up. Rabbits of all groups were kept in the same conditions and received the same basic diet. The research was conducted in vivarium conditions of VGU (on rabbits) of private farm of Voronezh region in 2018 (on young animals of cross-bred rabbits). As the main diet we used feed PK-90, obtained on the basis of grain crops, sunflower meal, 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 probiotic preparation "Enzimsporin" in the composition of feed in a dosage of 0.3 g/ kg of feed (rabbits of the 1st experimental group) and 0.4 g / kg of feed (rabbits of the 2nd experimental group). The diet is designed in full for the need for nutrients and the consumption of complete feed in the amount of 3.9 feed units per 1 kg of live weight gain [13].

To determine the meat efficiency the slaughtered at the 3 heads of the rabbits from each group according to the method of CABINDA, the meat quality was valued according to standard procedures [11, 16]. Studies were carried out using the material and technical base of the Institute of pathology, pharmacology and therapy (Voronezh). Carcasses were kept at 2°C for 24 hours and evaluated the chemical composition and biological value, physical and chemical parameters of the obtained meat raw materials in accordance with the recommendations [15]. Determination of amino acids was performed by HPLC method on the chromatograph "Stayer" by the method of reversed-phase chromatography in gradient mode. Column 250 mm long, filled with reversed-phase sorbent with 5 µm grain. Amino acid analysis of muscle tissue was carried out by hydrolysis of samples according to GOST 13496.21-2015 for all amino acids except methionine and cysteine, in 6 n HCl at 110°C for 24 hours, during initial sample preparation: the sample was placed in a glass vial of 20 ml ± 10 ml 6 n HCl, then rolled with an aluminum cap on a rubber stopper. For methionine the same, but further-according to GOST 13496.22-90. Then it was filtered and brought 6 n HCl to 10 ml. After removing chromatograms comparing the peak areas of standard amino acid solutions of the company "Sigma" with areas of peaks of the sample. The calculation was carried out taking into account all dilutions and sample weight, which is not constant.

Sulfur-containing amino acids (methionine and cysteine) were determined by oxidation of the sample with hydrogen peroxide and formic acid. The biological value of the protein is presented as an index of essential amino acids [15].

RESULTS AND THEIR DISCUSSION

In vivarium conditions of the Voronezh State Agrarian University it was held the scientific-economic experience on in-kindle rabbits with the aim of studying the influence of probiotic preparation "Enzymsporin" on their productivity and health. For the experiment we formed 3 groups (8 females in each). The scheme of the experiment was as follows: females of group 1 received feed PK-90, females of group 2 and 3 were administered in addition to the main diet probiotic preparation "Enzymsporin" in dosage (5,7·10⁴KOE/g) and (8,6·10⁴KOE/g), respectively, dissolving in water.

It was found that in the first period (the 1st day of succulence-weaning) with an increase in the concentration of the drug, there is a clear tendency to improve the productivity of females (fertility, large) and reduce the number of large baby-rabbits rabbits (table 1).

Table 1 - Dynamics of growing rabbits from the 1st day of succulence to weaning

A group of rabbits	Received an average of 1, the rabbit, the head		Average litter weight at birth, kg	Obtained the living of young rabbits at weaning head
	live	stillborn		
1 group (control)	7.7	2.0	0.5	6.2
Group 2 (experimental 1)	9.6	0.4	0.6	8.6
Group 3 (experimental 2)	10.1	0.6	0.7	8.9

The number of baby rabbits weaning is an important indicator of economic efficiency, as it will largely depend on the volume of production. In this experiment, when weaning in the 2nd and 3rd groups, we additionally received 3 rabbits per female. On the growth of baby rabbits during their cultivation under the female probiotic had no significant effect.

In the second period (weaning – slaughter) the use of probiotic "Enzymsporin" in the diet of rabbits fattening has led to increased average daily gain and reduced feed conversion (table 2). The dynamics of live weight reflects the nature and level of feeding of young rabbits. At the stage of the experiment, the weight of rabbits of the control and experimental groups was almost the same and averaged 40.5 g. Upon reaching the age of 120 days, rabbits of the 1st group (control) were characterized by live weight, which was less than the

mass of individuals of the 1st experimental group by 218.3 g, or 6.61 % ($P < 0.05$), the 2nd experimental group by 344.9 g, or 10.45 % ($P < 0.01$) (table 2).

Table 2 - dynamics of live weight of rabbits, g and feed conversion, kg ($\bar{x} \pm S$) (n=3)

Age, days Group	Group		
	1 (control) group	2 nd group (1 experimental group)	3 rd group (2 experimental group)
1	41.58 ±0.12	40.60 ±0.16	40.78 ±0.15
60	1587.14 ±22.67	1597,43 ± 18,54	1591.29 ±21.27
120	3300.5±20.17	3518.8±22.24	3645.4±21.09
Average daily increase	28.55±0.75	32.02±0.86	34.23±0.74
Safety, %	90.0	90.0	100.0
Number of heads	49.0	50.0	61.0
Feed conversion, kg	4.52±0.17	4.10±0.16	3.84±0.21

Conversion decreased in group 2 by 9.30%, and in group 3-by 15.04% compared to the control. Moreover, the effect of the use of probiotics in young rabbits growth during the period of cultivation had a clear dose-dependent character.

Indicators of slaughter of animals give an idea of the quantitative side of meat productivity of the animal [21-24]. But such indicators as pre-slaughter weight, mass of steamed carcass and its yield 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 tissues [16, 17].

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 carcasses of rabbits can more precisely characterize the changes that occur on a background of application of probiotic preparation "Enzymsporin".

The analysis of the morphological composition of the cooled carcasses of rabbits showed that the inclusion in the diet of rabbits the probiotic supplements "Enzymsporin" has had a favourable influence on the output of the muscle tissue (table 3).

Table 3 morphological composition of carcasses (n=3)

Indicator	1 group (control)	2 group (1 experimental group)	3 group (2 experimental group)
Pre-slaughter live weight, g	3140.5±21.17	3209.8±25.64	3275.4±18.57
Weight of paired 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
Flesh output, %	71.82±2.45	73.25±2.49	76.86±3.18
Index of meatiness	3.26±0.78	3.55±0.62	4.49±0.55

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

The highest pre-slaughter weight was in the 2nd experimental group of rabbits and amounted to 3275 g. compared with the control group of rabbits, the pre-slaughter weight of the 2nd experimental group of rabbits was 134.9 g or 4.29% more than in the 1st experimental group by 69.3 g or 2.20 % ($P < 0.05$). In the 2nd

experimental group of rabbits carcass yield was 62.33 %, which is more than in the control and 1st groups by 6.8 and 4.89%, respectively.

Rabbits of the 1st experimental group surpassed the control group of animals on 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 regularity pattern was observed in the output of muscle tissue obtained after boning. Rabbits of the control group were inferior to contemporaries of the experimental groups by 92.0 and 213.0 g (7.12 and 16.49%, respectively; P<0.01).

The calculated index of meatiness showed that rabbits that received the probiotic Supplement "Enzymsporin" at a dosage of 0.4 g /kg of feed (the 2nd experimental group) have a greater index of meatiness - of 4.49, compared to the rabbits of the experimental group 1 (feed with the probiotic additive "Enzymsporin" at a dosage of 0.3 g /kg of feed) and control of 3.55 and 3.26 units, respectively.

Meat quality indicators directly depend on the chemical composition and energy value. The use when feeding rabbits the probiotic supplement "Enzymsporin" contributed to the increase of mass fraction of protein in muscle tissues. 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 "Enzymsporin" in a dosage of 0.4 g per 1 kg of feed in accordance with the selected scheme.

Table 4 Physico-chemical composition of rabbit muscle tissue (n=3)

Indicator	Quantitative indicator		
	1 group (control)	2 group (1 experimental group)	3 group (2 experimental group)
pH	5.73	5.72	5.70
The coefficient of painting, ed	0.70	0.72	0.75
Bound water, %	66.70	67.90	68.20
Mass fraction of moisture, %	72.60	72.70	71.80
Protein crude mass fraction, %	22.10	22.80	23.88
Mass fraction of crude fat, %	3.90	3.05	2.82
Mass fraction of crude ash, %	1.40	1.45	1.50
Tryptophan, %	0.36	0.39	0.42
Hydroxyproline, %	0.77	0.78	0.81
Inorganic elements, mg/kg			
Potassium	337.0	336.0	337.0
Calcium	66.0	68.0	70.0
Phosphorus	170.0	172.0	174.0
Magnesium	386.0	388.0	391.0
Sodium	159.0	157.0	154.0
Manganese	0.015	0.015	0.015
Cobalt	0.022	0.021	0.022
Copper	4.15	4.12	4.14
Zinc	26.92	26.92	26.92
Iron	34.96	35.92	36.76
Selenium	0.24	0.24	0.24
Iodine	0.020	0.020	0.020

The highest protein content was observed in the meat of rabbits of the 2nd experimental group. The fat content rabbits of the experimental groups differed slightly between themselves and the control group. The maximum amount of mineral substances was observed the 2nd experimental group. The results of the chemical analysis of rabbit muscle tissue are presented in table 4. It should be noted that the meat of the rabbit- hybrid of new Zealand red and Soviet Shinshilla breeds contains more protein (23.88%) than on the average of rabbit meat (21,0 %) [16, 21, 25].

The results of amino acid analysis of rabbit muscle tissues are presented in table 5. Favorably differs in the direction of increasing the content of lysine-9.97 %, leucine, valine, histidine, phenylalanine.

Table 5 Amino acid content of rabbit muscle tissue, in g / 100 g of crude protein, (n=3)

Amino Acids	Group		
	1 group (control)	2 group (1 experimental group)	3 group (2 experimental group)
Protein, %	18.50	21.00	23.8
Valine	4.80	4.50	6.30
Leucine	7.50	7.30	9.20
Isoleucine	5.70	3.60	5.30
Threonine	3.90	3.80	3.30
Phenylalanine	3.90	2.20	4.40
Lysine	7.70	9.20	9.97
Methionine	2.7	2.10	2.02
Cysteine	1.10	1.10	1.10
Histidine	2.5	2.60	4.40
Arginine	6.8	6.20	6.20
Tyrosine	3.1	1.90	2.80
Tryptophan	1.1	1.40	1.45

Carried out organoleptic evaluation of the meat and broth of control groups of rabbits and experimental groups showed a positive effect of probiotic feed additive "Enzymsporin" on the formation of the taste and aroma both boiled meat and broth. The highest score was characterized by samples of boiled meat and broth obtained from the carcasses of the 2nd experimental group (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).

CONCLUSION

Thus, the inclusion of "Enzymsporin" into the all-mash of the feeding livestock of rabbits has helped to improve productivity, fattening characteristics and had a positive impact on qualitative characteristics of raw meat.

It should be borne in mind that probiotics do not by themselves provide nutrients for additional products. But their biological potential helps to improve animal health, increase productivity, improve feed conversion. The use of this preparation contributed to a decrease in the cost of live weight gain of the experimental group of rabbits, compared with the control. The level of profitability of rabbit production was higher in the experimental groups of rabbits by 1.8% and 2.6% higher compared to the control group of rabbits. The use of probiotic preparation "Enzymsporin" the diet of in-kindle rabbits allow to increase the rate of young of rabbits weaning, and in the diet of young rabbits (during the growing period) has a positive effect on the value of the gain and reduces feed conversion.

Thus, the preparation "Enzymsporin" is a promising product from a number of probiotics used in animal feeding, which allows to obtain ecologically pure products of rabbit production at improving economic indicators.

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