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Process of Digestion of a Diet Enriched with the “Probiokorm” Food Supplement in Rabbits

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Abstract

This study investigated the effect of a diet enriched with the feed additive “ProBioKorm” on the digestion process in rabbits. During the experimental period, this probiotic additive was incorporated into the basal diet of rabbits, and its effects on nutrient digestibility, the functional activity of digestive organs, and the intestinal microflora were evaluated. The obtained results demonstrated that the use of a diet enriched with “ProBioKorm” activates digestive processes in rabbits and significantly increases the biological utilization of nutrients. In addition, normalization of the intestinal microflora, enhancement of enzymatic activity, and improvement of the overall physiological condition were observed. The results of the study indicate that the “ProBioKorm” additive can be effectively used as a dietary supplement in rabbit nutrition and justify its promising application in agricultural practice.

Keywords: Rabbits, “ProBioKorm” feed additive, digestive process in rabbits, basal diet, biological value of meat, efficiency.

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1. Introduction

Probiotics can strengthen the immune system against harmful bacteria in the large intestine. Probiotics improve the fermentation process in the stomach. In this process, the bacteria contained in probiotics mainly break down food properly. In addition, the improvement of the digestive process with probiotics is associated with the prevention of inflammation of the stomach. The inflammatory process

leads to increased gas in the intestines, in which case the use of probiotics is the most effective method.

One of the best strategies to improve the digestion of rabbits is to add probiotics to their diet, which facilitate the digestion process and contribute to increased productivity. Probiotics consumption improves the intestinal microflora of rabbits and prevents various pathogenic factors. Probiotics help maintain the health of the intestines involved in the digestive process, preventing intestinal obstructions that slow down the digestion process.

2. Literature Review

When studying the effect of probiotics on the digestive process of rabbits, we can conduct scientific analyses based on the feed ration consumed by rabbits, the amount of residual feed, and the amount of excreted feces. Rabbits are animals with a very complex gastrointestinal tract. The stomach makes up 10-20% of their body weight. The stomach walls are simple and thin, and food is always present in it and is never empty [Chong, E. S. et al., 2014; Setiaji, A. et al., 2022]. In adult rabbits, the low pH of the stomach (1-2) during food intake helps to effectively break down food. Food usually stays in the stomach of rabbits for 3-6 hours, then gradually passes into the small intestine [Miloslav, M.N. et al., 2010].

In increasing the productivity of rabbits, their diet, feeding environment and the process of digesting food are of great importance. Several factors can affect the digestion of food in rabbits and the normal functioning of the gastrointestinal tract. These include stress factors, the composition of the diet, the habitat of rabbits, environmental conditions, genetic factors, the sanitary conditions of the rabbit cage, etc [Phuoc, T.L. et al., 2017]. Adrenal hormones in rabbits, the sensitivity of the nervous system, stress factors negatively affect their digestion and slow down the digestion process [Liu, D. M. et al., 2017; Ngoula, F. et al., 2017]. According to Jehl. N and his co-authors, probiotics stimulate the intestinal microflora and are of great importance in the normal physiological development of the intestine [Jehl, N. et al., 1996]. Probiotic products are effective agents that positively influence the physiological parameters of the rabbit organism, prevent diseases, and serve as potential growth-promoting tools for use in the rabbit production industry [2005; Reque, P. M. et al., 2021; Shahverdi, E. et al., 2016]. Rabbit farming enterprises and physiologists recommend the use of various probiotics when changes are observed in the physiological state of rabbits or in cases of disease. In this regard, probiotic feed additives, due to their nutritional as well as therapeutic properties, exert a beneficial effect on the physiological condition of the animal organism and contribute to disease prevention [Mingmongkolchai, S., et al., 2018; Nami Y. et al., 2019]. Therefore, the application of probiotics in rabbit production and the study of certain morphophysiological indices in rabbits under the influence of probiotics are of both theoretical and practical significance [Shehata, A. A., et al., 2022].

Probiotics activate the immune system of rabbits and promote the digestion and absorption of nutrients. Through the production of enzymes and vitamins, as well as by improving the beneficial intestinal microflora, they exert a positive effect on the rabbit organism. Probiotics also reduce the population of pathogenic microorganisms in rabbits and lower intestinal pH through the production of lactic acid [Chong, E. S., et al., 2024; Shehata, A. A. et al., 2022].

3. Methodology

The experiments were conducted in vivo. The rabbits were fed under standard rational vivarium conditions according to their age. The health, growth and development, productivity, fertility and genetic potential of the rabbits in the experiment, and the digestive process depend on the method of timely and full-value feeding.

To conduct the study, a special compound feed recipe was created and feeding standards were developed for the rabbits of the control and experimental groups (Table 1).

Table 1.

Accelerate compound feed recipe for rabbits, %

Types of feed	Quantity
Oatmeal	20
Barley grain	18

Wheat bran	11
Sunflower meal	18
Fish meal	3
Clover flour	31
Premix “Universal”	1
Total	100
100 g kombicorm saturation	
Metabolizable energy, kcal	272,9
Nutritional unit, g	0,84
Dry matter, g	88,4
Crude protein, g	22,3
Crude fat, g	4,3
Cellulose, g	16,8
Starch, g	20,3
Calcium, g	7,4
Phosphorus, g	6,7
Sodium, g	4,4
Vitamin A, mg	21,5
Vitamin D, thousand IU	14,3
Vitamin E, mg	9,5

The nutritional value of the compound feed formula presented in Table 1 meets the physiological requirements of rabbits. 100 g of the developed compound feed contains 272.9 kcal of metabolizable energy, 22.3 g of crude protein, 16.8 g of crude cellulose, 7.4 g of Ca2+ and 6.7 g of P. The Ca 2+: P ratio is 1.1:1. The nutritional value of the feed is taken from the data of the A.P. Kalashnikov formula. In the research experiments, mother rabbits were fed a standardized diet. The rabbits of the control group were fed on the basis of the diet adopted on the farm.

The rabbits of the experimental group were fed the probiotic “ProBioKorm” in addition to the main diet (Table 2).

Table 2.

Special bacterial strains contained in the feed additive "ProBioKorm"

Microorganisms and their strains present in the dry and liquid form of the probiotic "ProBioKorm"	
1.	*- Bacillus subtilis;*
2.	*- Lactobacillus plantarum;*
3.	*- Lactobacillus paraplantarum;*
4.	*- Lactobacillus acidophilus;*
5.	*- Pediococus pentosaceus;*
6.	*- Weissella viridescens;*
7.	*- Propionibacterium freudenreichii;*
8.	*- Bifidobacterium animalis;*
9.	*- Saccharomyces cerevisiaye.*

The standard for the use of lyophilized biomass of the universal feed additive "ProBioKorm" is 2 g of biomass per 1 kg of feed, and it is recommended to use 2 kg of biomass per 1 ton of feed. In liquid form, it is recommended to use 1-2 l per 1 ton of water. The local probiotic "ProBioKorm" is added to water at the rate of 2 g per 1 rabbit.

The feed additive "ProBioKorm" was developed by employees of the Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan in order to improve and enrich the quality of animal feed, improve digestion and absorption of nutrients, prevent various bacterial diseases in animals, and increase productivity.

4. Results and Discussion

In our experiments, we studied the process of digestion of food in the digestive organs of 120-day-old mother rabbits and 90-day-old rabbit babies that consumed a feed ration enriched with the universal nutritional supplement "ProBioKorm". In the experiments, the main goal of our selection of 90-day-old rabbit babies is that at this age, the metabolic process of rabbits is accelerated. In this process, the body directly requires more food, and therefore the amount of food consumed by rabbits increases. 120-day-old mother rabbits are physiologically mature and reproductively fully formed. These physiological indicators also increase the body's tendency to consume more food.

The experiments have scientifically proven that the universal feed additive "ProBioKorm" has a positive effect on the digestive process of rabbits of different ages. In particular, 90-day-old rabbit babies were given a feed ration in the same ratio for the control and experimental groups (the initial feed amount was 210±2.2 g in the control group and 211±2.6 g in the experimental group) and fed. Then were studied the amount of feed actually consumed by rabbits in both age groups, the amount of residual feed, and the amount of feces excreted by the rabbits (Figure 1).

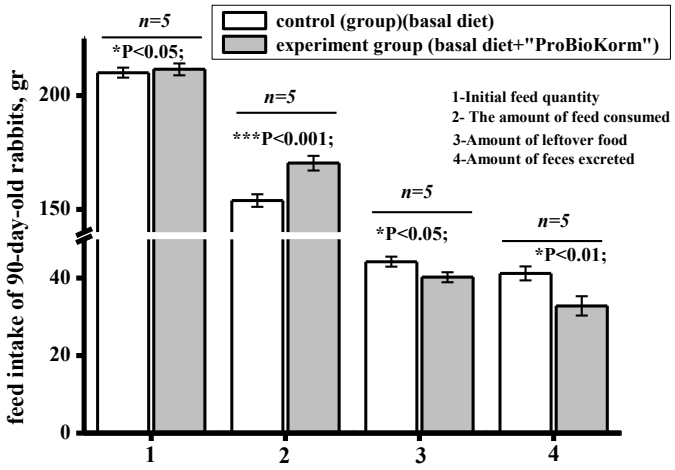

Figure 1. Feed consumption of 90-day-old rabbit babies

Note: The ordinate axis shows the feed consumption of rabbits in grams, and the abscissa axis shows the experimental groups. The number of replicates was n=5. *P<0.05; **P<0.01; **P<0.001.

In the experiments, the feed intake of rabbits fed the universal feed supplement "ProBioKorm" was observed to be more active than in the control group. The actual amount of feed consumed by the representatives of this group was 170.3±3.2 g, which was 16.4 g more than in the control group. Accordingly, the amount of residual feed was measured. The amount of residual feed in the control group was 44.2±1.3 g, and in the experimental group II it was 40.2±1.3 g. These indicators clearly demonstrate that the universal feed supplement "ProBioKorm" had a positive effect on the digestive processes of rabbits and their appetite. In order to reliably study these data, the amount of feces excreted by the experimental animals was analyzed. In the experiments, the amount of feces in the animals of the control group I was 41.2±1.8 g, and in the experimental group II was 32.8±2.5 g (Figure 1).

Based on the above experiments, the feed consumption of 120-day-old rabbits was studied. In these experiments, we can see that the universal supplement "ProBioKorm" had a positive effect on the digestive system of both the baby rabbits and the mother rabbits (Figure 2).

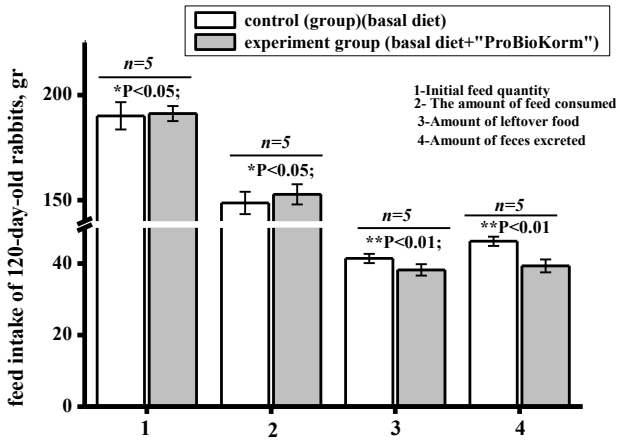

Figure 2. Feed consumption of 120-day-old mother rabbits

Note: The ordinate axis shows the consumption of rabbit feed rations (g), and the abscissa axis shows the experimental groups. The number of replicates of the experiments was n=5. *P<0.05; **P<0.01.

The digestibility coefficients of feed were analyzed based on the introduction of the universal additive “ProBioKorm” into the feed ration of rabbits and its consumption rates.

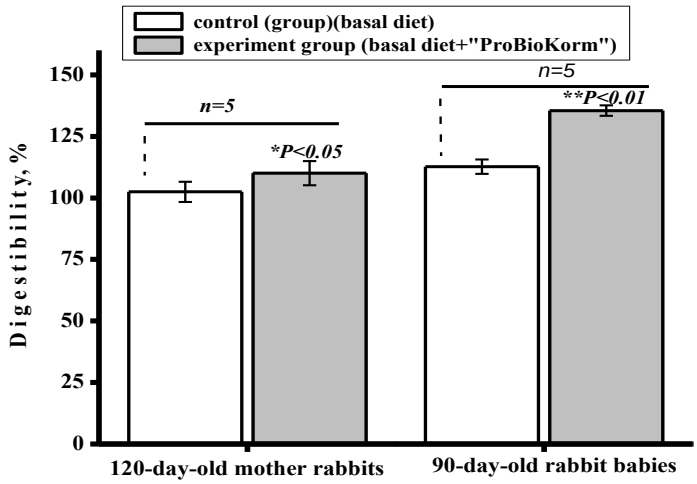

Figure 3. Amount of feed digested in rabbits

Note: The ordinate axis shows the digestibility of feed in rabbits in (%), the abscissa axis shows the experimental groups. The repetition of experiments is n=5. *P<0.05; **P<0.01.

In the experiments, the digestibility of feed in 90-day-old baby rabbits under the influence of probiotics was 112.7 ± 2.9 g in the control group rabbits, 135.5 ± 2.1 g in the experimental group II, 102.4 ± 4.1 g in the control group rabbits, 110.1 ± 4.9 g in the experimental group II. The digestibility coefficient of the feed, in accordance with the above results, was 73.2% in the control group of 90-day-old rabbits and 79.5% in the experimental animals of group II, and 68.9% in the control group of 120-day-old mother rabbits and 74.2% in the experimental animals of group II.

The experiments conducted showed a positive physiological effect of the universal feed additive “ProBioKorm” on the digestion process of rabbits of different ages.

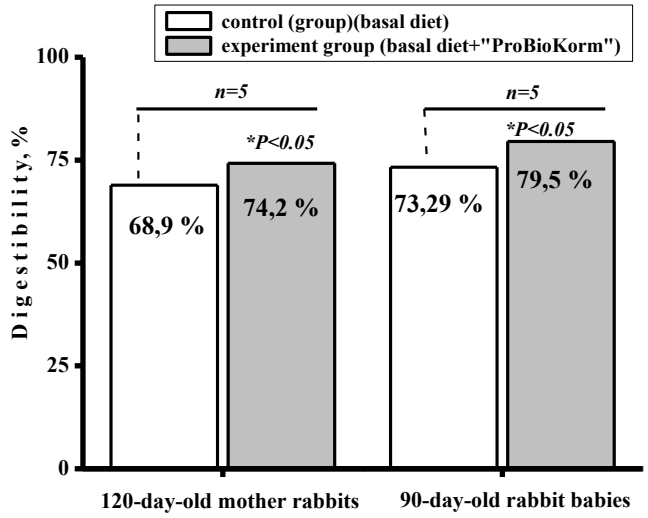

Figure 4. Feed digestibility coefficient in rabbits

Note: The ordinate axis shows the feed digestibility in rabbits in (%), the abscissa axis shows the experimental groups. The repeatability of the experiments is n=5. *P<0.05.

The experiments confirmed that the use of these probiotics in the feed ration is a physiologically active supplement that increases the productivity of rabbits. The use of the universal feed additive "ProBioKorm" is recommended for use in the rabbit breeding industry.

Rabbit meat is a dietary product with high biological value, and its quality is determined by its chemical composition, physicochemical properties, organoleptic indicators, and zootechnical factors. It is known that the main factors determining the biological value and quality of rabbit meat include the analysis of the main quantitative and qualitative indicators that determine the quality of its meat. Important factors determining the biological value include protein, fat, moisture, ash content and pH of meat. In our further studies, the quality indicators determining the biological value of rabbit meat from the control and experimental groups were analyzed (Figure 3.18). In order to determine the biological value and quality of rabbit meat, as well as its energy content, the chemical composition of rabbit meat from the groups was studied in our experiments (Figures 3 and 4).

Differences were observed in the chemical composition of meat samples from the experimental groups. In particular, it was found that the protein content of group II (experimental) rabbits was 0.92% higher than that of group I (control), the water content was 0.16% higher, and the ash content was 0.01% lower, and the fat content was 0.98%.

Another indicator of the biological value of rabbit meat is the protein quality index of meat. It is known that the higher the tryptophan content in meat, the higher the biological value of the meat, the better its quality and economic efficiency. Oxyproline is a factor that determines the degree of hardness of meat. The amount of oxyproline in rabbit meat can be high or, conversely, low depending on the physiological age of the rabbit. For example, if the amount of tryptophan in the body of a young rabbit is high, then their ratio decreases in old organisms. In addition, the amount of oxyproline in rabbits exposed to stress is high. Therefore, in our subsequent experiments, we studied the amount of tryptophan and oxyproline amino acids in meat when assessing the quality of the meat of the rabbits participating in the experiment (Table 3).

Table 3.11.2 shows that in the control group (basal diet) animals, the tryptophan content was 325.2±6.65 mg, the oxyproline content was 68.5±3.01 mg, and the protein quality index was 4.74±0.08.

Table 3: Biological value of meat

Indicators	Group I (basal diet)	Group II (basal diet+"ProBioKorm")
Triptofan, mg	325,2±6,65	338,9±9,17
Oxyproline, mg	68,5±3,01	67,1±1,57
Protein quality index	4,74±0,08*	5,05±0,14**

Note: *P≥0,05 ** P≥0,01. n=4

These indicators indicate that in the experimental group II (basal diet +"ProBioKorm"), the tryptophan content was 338.9±9.17 mg, the oxyproline content was 67.1±1.57 mg, and the protein quality index was significantly increased by 5.05±0.14. According to the results obtained, the protein quality index of the meat of rabbits of group II was higher (5.05), since in their meat, compared with group I, the tryptophan content was 4.2% higher and the oxyproline content was 9.9% lower (P≥0.99).

At the end of the research work was studied the effect of enriching the feed ration with the probiotic "ProBioKorm" on the meat productivity of rabbits. Studies have shown that under the influence of this probiotic, the weight of the rabbit's ration was 121.6 g, the amount of meat in the meat was 75.0%. Under these conditions, the amount of meat in the rabbit increased by 2.09% compared to the control group. Therefore, enriching the rabbit's ration with the feed additive "ProBioKorm" led to the economic efficiency of using rabbits.

5. Physiological Recommendations

It has been established that the feed additive "ProBioKorm" has high nutritional value and exerts a positive physiological effect on the organism of rabbits, demonstrating biological activity. The use of the "ProBioKorm" feed additive in rabbit farming enterprises has led to economic efficiency. The potential characteristics of the probiotic "ProBioKorm" can be effectively used for commercialization purposes to increase the productivity of farm animals.

6. Conclusion

It is recommended to include the universal probiotic "ProBioKorm" in the feed ration of rabbits of all ages. The feed additive "ProBioKorm" has a positive effect on the morpho-physiological indices of the rabbit organism and reliably increases the growth rate and productivity of the animals.

The high nutritional value of the feed additive "ProBioKorm" indicates that it has biologically active properties with a positive effect on the physiology of rabbits. The use of the "ProBioKorm" feed additive in rabbit farming enterprises leads to economic efficiency.

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