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# Valuable Effect of Using Probiotics in Poultry Farming

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### Authors' contributions

This work was carried out in collaboration between all authors. Authors FK, AK, RA and MR designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors GT, KT, SG and KI managed the analyses of the study. Authors GM, FG and ZY managed the literature searches. All authors read and approved the final manuscript.

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## ABSTRACT

In this paper the effects of different probiotic, such as "Vitafort", "Lactobifadol" and "Batsispecin" on turkey, ducklings and goslings growth were evaluated. The studies were carried out at different poultry farms of the Republic of Bashkortostan. Using of "Vitafort", "Lactobifadol" probiotics in poultry nutrition showed a positive dynamic of live weight gain by 9.2 and 12.5% in turkeys, 5,0 and 5,2% in ducklings and 3.7 to 10.5% in goslings live weight. The optimal dose of "Lactobifadol" probiotics in turkey nutrition was 0.5 ml (10<sup>7</sup> CFU/g) per 1 kg of live weight and at a dose of 0.2 g per 1 kg of live weight in the diets of ducklings. In addition, for goslings the probiotic "Bacispecin"

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was used with  $10^8$  CFU/ml at a dose of 1 ml per 1 kg of live weight. These doses proved to increase the full value of rations as well as the growth and development of birds. There was a positive economic effect of using the probiotics in rations of birds.

**Keywords:** Turkey; duckling; gosling; probiotic; live weight; fodder.

## 1. INTRODUCTION

Improving the nutritional quality and digestibility of compound feed is the most vital task of modern agro science and can be performed by using new type of bio-preparations. Developing of bio-preparation is mostly related with isolation and study new microbial strain [1]. Extensive use and study of new probiotic drugs has become a new trend in livestock science. List of probiotics registered in Russia includes about 80 domestic and foreign items. Probiotics are used in the formulation of food (especially fermented milk products) and animal fodders. Probiotics are preparations containing living microorganisms which are the part of normal physiologically and evolutionarily developed flora of the intestinal tract [2,3]. Probiotics include lactic acid bacteria such as *L. acidophilus*, *L. planarum*, *L. bulgaricus*, *L. rhamnosus*, *L. fermentum*, bifidobacteria *Bifidobacterium adolescentis*, *B. bifidum*, *B. langum*, *B. globosum*, *B. thermophilus*, *Streptococcus faecium*, *S.lactis diastaticus*, spore-forming bacteria *Bacillus subtilis*, *B. licheniformis*, *B. cereus van Toyi*, *Ruminococcus albus*, *Bacillus panthothenicus*, which are safe for human and animal body [4].

Probiotics "Vitafort", "Lactobifadol" and "Batsispecin" were used in our studies. Probiotic of the new generation "Vitafort" is developed on the basis of antagonistic bacteria of *B. subtilis* (strain 11B) [5]. The probiotic "Lactobifadol" includes a mixture of live acidophilus and bifidobacteria, that are dried by the sorption method on a natural plant carrier: *Lactobacillus acidophilus* - not less than 1 million/g and *Bifidobacterium Adolescentis* - not less than 80 million/g [6]. A new biological substance of probiotic action "Batsispecin BM, ZHP" (titer not less than  $2 \times 10^8$  CFU/g) is intended for the use in livestock as a feed additive to improve digestion of feed, prevent digestion disorders, increase the safety and productivity of farm animals and poultry [7-9]. The basis of the substance are live cells and spores of the strain *Paenibacillus ehimensis* IB 739 (former strain *Bacillus sp. IB-739*); metabolic products - phytohormones; extracellular enzymes and antibiotic substances; nutrient media residues; filler with a titer of dry

(P) powder - not less than  $1 \times 10^8$  CFU/g; liquid substance (G) - not less than  $1 \times 10^9$  CFU/ml at the rate of application: 1 ml (1 g) of the substance with a titer of  $10^7$  CFU/ml (CFU/g) per 1 kg of live weight - daily throughout the growing period; 1 ml of the substance with a titer of  $10^8$  CFU/ml per 1 kg of live weight - fractional - once every two days or for 7 days with a 7-day break during the entire growing period. The strain of *Paenibacillus ehimensis* IB 739 is not virulent, non-toxic. It does not disseminate into internal organs, has no significant dysbiotic effect on the microflora of the organism [10-12].

The aim of the research was to study the effect of probiotics such as "Vitafort", "Lactobifadol" and "Batsispecin" on the growth intensity and development of turkeys, ducklings and goslings, as well as peculiarities of probiotics on metabolic processes in their body was monitored.

## 2. MATERIALS AND METHODS

LLC "Bashkir poultry breeding complex named after M. Gafuri" of Meleuzovsky district of the Republic of Bashkortostan is where studies were carried out on the use of the probiotic "Vitafort" and "Lactobifadol" in the diets of Broad Breasted White turkeys. The duration of the experiments was 42 days, starting from October 1 to November 10, 2013 (6 weeks). For the experiment, 3 groups of turkey-analogue pairs were formed at a diurnal age without division by sex in each group of 50 head, the first group served as control, the second group received the probiotic "Vitafort" at a dose of 0.5 ml ( $10^7$  CFU/g) per 1 kg of live weight, and the third group received probiotic "Lactobifadol" in a dose of 0.2 g number of live probiotics/g per 1 kg of live weight. The turkeys of all groups were kept on the floor on deep bedding in accordance with the technology adopted at the complex; the technological parameters corresponded to the recommendations. The turkeys were given compound feed produced at the compound feed mill with a content of 100 grams of compound feed having 285 kcal of exchange energy and 27.5% of crude protein for the age of 1 to 21 days, and 295 kcal of exchange energy and 27.5% of crude protein for 21 to 42 days of age

turkeys. The probiotics were given daily throughout the study period. The probiotic "Vitafort" was given to the turkeys with boiled then chilled drinking water. "Lactobifadol" was distributed manually after the stepwise preliminary mixing with compound feed,

A poultry farm GUP "PPZ Blagovarskiy" was used for experiments carried on hybrid ducklings of "Agidel" type. To conduct scientific and economic experiments, three groups having 40 ducklings each were formed according to the principle of analogue pairs. The first group of ducklings served as a control group, and, like the experimental groups, received daily full-feed feed. Ducklings of the second test group, in addition to drinking water, received a probiotic "Vitafort" at a dose of 0.5 ml per 1 kg of body weight for 7 days, followed by a weekly break. The ducklings started to receive probiotics from daily age until the end of cultivation. The ducklings of the third test group received additionally with the mixed feed the probiotic "Lactobifadol" in a dose of 0.2 g per 1 kg of body weight for 7 days, followed by a weekly break. The duration of feeding is from the daily age until the end of cultivation. Composition and nutritional value of compound feed for young ducks complied with the requirements of GOST P 18 221-99 to the quality of compound feed for poultry with a dry type of feeding of ducks with the recommended nutrition level by age. The average daily intake of compound feed and nutrients by the ducklings corresponded to the adopted program of feeding at the poultry farm. The technological parameters of keeping and feeding the ducklings corresponded to the requirements adopted in the conditions of the poultry farm.

A poultry farm "Bashkirskaya ptitsa" of Blagovarskiy district of the Republic of Bashkortostan served as a base for experiments for studying the influence of probiotics "Vitafort" "Lactobifadol" in rations of goslings in 2012-14. For the conduct of scientific and economic experience, three groups of 30 goslings in each were formed according to the principle of analogue pairs. The first group of goslings served as a control group, receiving daily full-feed just like the experimental groups. Goslings of the second test group, in addition to drinking water, received the probiotic "Vitafort" at a dose of 0.05 mg per 10 kg of body weight for 7 days, followed by a weekly break from the daily age until the end of the cultivation. The goslings of the third test group additionally received, along

with the feed, the probiotic "Lactobifadol" in a dose of 0.2 g per 1 kg of body weight for 7 days, followed by a weekly break from the daily age until the end of the cultivation. Another experiments on the influence of probiotics "Batsispecin" in rations of goslings were also conducted in the conditions of "Bashkirskaya ptitsa". With the principle of analogue pairs geese of the week-old age were chosen for the experiment, one control group and three experimental groups of 30 goslings in each were formed. The goslings of the first control group received the main diet without including the study drug.

Goslings of the second experimental group received the probiotic "Batsispecin" with a titer of microorganisms  $10^7$  CFU/ml in a dose of 1 ml per 1 kg of live weight once a day for seven days. The cycle is repeated after a week. The third test group received  $10^8$  CFU/ml in a dose of 1 ml per 1 kg of live weight once a day for 7 days, the cycle is repeated after a week and the fourth test group has  $10^7$  CFU/ml dose of 1 ml per 1 kg of live weight, periodicity - daily. The probiotic "Batsispecin" was prescribed once a day with pre-boiled chilled drinking water. The birds were kept in identical conditions in a poultry house in separate sections for each group. During the course of the experiment the goslings received feeds of the same daily diet balanced with the main nutrients and macro, microelements

Generally accepted methods of assessing the productive qualities were adopted during the course of the study, including the level of digestibility of nutrients, the use of calcium and phosphorus, the clinical and biochemical indicators of young animals and birds [13,14]. Bacteriological study of the litter was carried out according to the methodological recommendations "Isolation and identification of bacteria of the gastrointestinal tract of animals", approved by the Department of Veterinary Medicine of the Ministry of Agriculture of the Russian Federation No. 13-5-02 / 1043 of 11 May 2004.

## 2.1 Statistics

Statistical processing of the data was carried out by conventional methods of variation statistics using the Microsoft Excel statistical analysis package. The significance of differences in arithmetic mean was estimated using the Student's t-test, the differences were considered statistically significant at  $p < 0.05$ .

### 3. RESULTS AND DISCUSSION

The introduction of probiotics "Vitafort" and "Lactobifadol" into diets of daily to 42 days age turkeys showed an increase in their live weight and growth rate by 9.2 and 12.5%, respectively, compared to the control group 1 ( $p < 0,01$  and  $p < 0,001$ ).

Using probiotics "Vitafort" and "Lactobifadol" in the diets of broiler ducklings, showed that the live weight and average daily growth of the second and third test group increased significantly compared to the first control group for the daily age and the six-week ducklings, respectively, by 5,0 and 5,2% ( $p < 0.05$ ) (Table 1).

The use of probiotics "Vitafort" and "Lactobifadol" in rations of goslings from diurnal to 63 days of age showed that the second experimental group had the average daily gain at day 63 that was significantly higher by 10.5% ( $p < 0.01$ ), and in the third experimental group there was only a tendency of grow in the average daily increase (by 3.7%), compared with the first control group.

There was a positive influence of using "Batsispecin". The evaluation of the live weight gain dynamics during 56 days of the experiment (for one week age) showed that in the second and third trial groups, the average daily gain was 15.8 and 17.4% higher, and the fourth experimental group only showed a

tendency to increase the average daily increase (by 6.1%) in comparison with the first control group.

The results of poultry breeding are consistent with the digestibility data of nutrients (Table 2).

The study on digestibility of nutrients in the diet of turkey at the age of 42 days showed (Table 3) that the use of probiotics "Vitafort" and "Lactobifadol" contributed to an increase in the digestibility of crude protein by 3,6-4,3 abs. % and NFE - by 4.2-5.0 abs. % ( $p < 0.05$ ). Ducklings of second and third experimental groups showed a significant increase in the digestibility of protein and NFE, respectively, by 2,2-2,6 and 4,3-4,9 abs. % ( $p < 0.05$ ), compared to the control group of ducklings.

Certain increase in digestibility of protein and NFE was established in the goslings of the second experimental group, which received the probiotic "Vitafort" as part of the ration. A protein digestibility coefficient and NFE were 87.5 and 75.6%, respectively, which is higher by 3.2 abs. % of the same value in the goslings of 1 control group - 84.3 and 72.4% ( $p < 0.05$ ).

There was also an increase in the digestibility of protein and NFE in the goslings of the second group (probiotic "Batsispecin" in a concentration of  $10^7$  CFU/ml at a dose of 1 ml per 1 kg of live weight once a day for seven days, a cycle

**Table 1. Effect of probiotics product on the growth of birds ( $X \pm Sx$ )**

Group	Live weight, kg		Daily average gain, g	In % to control group
	At the beginning	At the end		
<b>Turkey, n=50 (probiotics Vitafort and Lactobifadol)</b>				
Control group 1	56,1±0,95	2441,0±54,14	56,8±1,67	-
Experimental group 2	55,8±1,52	2659,5±38,50**	62,0±0,88**	109,2
Experimental group 3	59,4±1,92	2743,5±26,71***	63,9±0,61***	112,5
<b>Ducklings n=40 (probiotics Vitafort and Lactobifadol)</b>				
Control group 1	57,3±1,23	2681,6±44,3	62,5±1,22	-
Experimental group 2	56,4±1,77	2810,4±46,3*	65,6±0,84*	105,0
Experimental group 3	57,2±1,86	2757,6±44,2*	65,7±0,84*	105,2
<b>Goslings, n=30 (probiotics Vitafort and Lactobifadol)</b>				
Control group 1	94,6±2,77	2803,2±71,30	43,0±1,12	-
Experimental group 2	94,0±2,89	3085,4±78,80**	47,5±0,98**	110,5
Experimental group 3	95,9±2,19	2906,6±92,60	44,6±0,66	103,7
<b>Goslings, n=30 (probiotic Bacispecin)</b>				
Control group 1	135,2±11,39	3609,1±179,3	62,0±3,05	-
Experimental group 2	146,8±14,79	4166,4±185,8*	71,8±3,26*	115,8
Experimental group 3	136,9±16,15	4214,6±189,1*	72,8±3,72*	117,4
Experimental group 4	146,8±19,91	3828,9±126,2	65,8±2,62	106,1

**Table 2. Digestibility indexes of ration nutrients, % (X ± Sx)**

Group	Indicators			
	protein	fat	fibre	NFE
<b>Turkeys 42 days of age (n=3)</b>				
Control group 1	72,6±0,84	61,4±0,72	20,7±0,74	80,9±0,92
Experimental group 2	76,2±0,88*	63,6±0,86	22,2±0,82	85,1±0,98*
Experimental group 3	76,9±0,99*	63,7±0,94	22,8±0,96	85,9±1,14*
<b>Ducklings 42 days of age (n=3)</b>				
Control group 1	80,6±0,42	53,6±0,52	17,3±1,26	90,3±0,92
Experimental group 2	82,8±0,44*	54,8±0,84	17,9±1,68	94,6±0,94*
Experimental group 3	83,2±0,66*	55,2±1,32	18,1±1,42	95,2±0,96*
<b>Goslings 63 days of age (n=5)</b>				
Control group 1	84,3 ± 0,86	83,8 ± 0,74	21,0 ± 1,65	72,4 ± 0,85
Experimental group 2	87,5 ± 0,90*	86,0 ± 0,93	27,3 ± 2,60	75,6 ± 0,94*
Experimental group 3	85,2 ± 0,77	85,4 ± 0,81	25,7 ± 2,05	74,1 ± 0,68
<b>Goslings 56 days of age (probiotic Batsispecin, n=5)</b>				
Control group 1	84,9±0,78	84,1± 0,66	22,5±1,22	73,5±0,78
Experimental group 2	88,1±0,94*	85,2±0,76	24,6±1,34	76,2±0,86*
Experimental group 3	88,3±0,89*	86,3±0,98	24,8±1,44	76,8±0,92*
Experimental group 4	85,6±1,02	85,6±0,88	23,8±1,26	75,8±0,88

is repeated in a week) and a third group (probiotic "Batsispecin" in a concentration of 10<sup>8</sup> CFU/ml at a dose of 1 ml per 1 kg of live weight once a day for 7 days, a cycle is repeated in a week). They had a protein digestibility coefficient and NFE, 88.1 - 88.3, 76.2 - 76.8%, respectively, which is higher by 3.2 - 3.4 and 2.7 - 3.3 abs. % of the values in goslings of the first control group (p<0.05).

Morphological and biochemical parameters of the poultry blood of all groups were within a

physiological norm, however, the experimental groups that received the probiotics in optimal amounts, showed an increase in the concentration of hemoglobin, total protein, calcium, phosphorus and gamma globulins along with decrease in the level of urea.

The use of probiotics influenced the most the degree of colonization of gastrointestinal tract of animals by bifido- and lactobacilli, some indicators of feces microflora of young animals and poultry are presented in Table. 3.

**Table 3. Microbiocenosis of bird feces (X±Sx), lg CFU/g**

Group	Indicator		
	<i>Lactobacillus</i>	<i>Bifidobacteria</i>	<i>Escherichia</i>
<b>Turkeys 42 days of age (n=3)</b>			
Control group 1	6,78±0,73	5,98±0,65	5,64±0,51
Experimental group 2	9,69±0,74*	8,78±0,68*	3,36±0,52*
Experimental group 3	9,96±0,69*	8,99±0,67*	3,22±0,55*
<b>Ducklings 42 days of age (n=3)</b>			
Control group 1	3,6±0,62	3,7±0,44	2,8±0,34
Experimental group 2	6,8±0,68*	5,6±0,42*	1,2±0,36*
Experimental group 3	6,9±0,66*	5,8±0,32*	1,3±0,28*
<b>Goslings 40 days of age (n=5)</b>			
Control group 1	3,4±0,33	3,7±1,62	1,7±0,48
Experimental group 2	6,7±1,30	5,4±0,33	0,7±0,30
Experimental group 3	5,8±1,63	4,8±2,10	1,3±0,26
<b>Goslings 56 days of age (probiotic Batsispecin, n=5)</b>			
Control group 1	4,4±0,52	4,7±0,42	2,4±0,32
Experimental group 2	6,8±0,56*	6,2±0,44	1,2±0,24*
Experimental group 3	6,9±0,64*	6,8±0,52*	1,1±0,28*
Experimental group 4	6,8±0,62*	6,7±0,52*	1,2±0,26*

Thus, the next dosage increased the number of lacto- and bifidobacterium in the intestine and inhibited the growth of pathogenic and opportunistic microflora: for turkeys, the use of 0.5 ml ( $10^7$  CFU/g) per 1 kg of live weight (group 2) and the probiotic "Lactobifadol" (3rd group) at a dose of 0.2 g per 1 kg of live weight; for ducklings - 0.5 ml per 1 kg of body weight (group 2) and probiotics "Lactobifadol" in a dose of 0.2 g per 1 kg of body weight (group 3), goslings - probiotic "Batsispecin"  $10^8$  CFU/ml at a dose of 1 ml per 1 kg of live weight (group 3). When using probiotics "Vitafort" and "Lactobifadol" in rations of goslings, there were no reliable differences in microflora of their litter, but only a tendency for improvement. The results of the production inspection showed that the use of probiotics in the diets of the poultry contributed to an increase in the level of profitability of their cultivation by 5.1-14.7%.

The use of probiotics "Vitafort" in rations of goslings from experimental groups ensured the highest economic effect with 41.2% of level of profitability which was higher by 9.3% compared with control group. Using of probiotic "Lactobifadol" in rations of goslings showed less economic effect: the level of profitability was 34.8% which was higher by 2.9% compared with control group.

There was a positive economic effect of using the probiotics "Vitafort" and "Lactobifadol" in rations of turkeys. The calculations showed that the economic effect from feeding of one turkey by probiotics "Vitafort" was \$1,2 USD and \$1.50 USD by probiotic "Lactobifadol".

Using of probiotic "Batsispecin" in the rations of poultry increased the business profit by 12.69% in experimental group I, 13.54% in experimental group II and by 8.29% in experimental group III compared with control group of gouslings.

#### 4. CONCLUSION

Using of probiotics in poultry nutrition initiates prevention of gastrointestinal, lung and other infectious diseases as well as reduction of costs on purchasing expensive veterinary drugs and treatment expense. The optimal dose of "Lactobifadol" probiotics in turkey nutrition was 0.5 ml ( $10^7$  CFU/g) per 1 kg of live weight and at a dose of 0.2 g per 1 kg of live weight in the diets of ducklings. In addition, for goslings the probiotic "Bacispecin" was used with  $10^8$  CFU/ml at a dose of 1 ml per 1 kg of live weight. These doses

proved to increase the full value of rations as well as the growth and development of birds.

#### ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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