Influence of Vitafort and Lactobifadol Probiotics on Excremental Microbiocenoses of Turkey Poults

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Abstract

The article presents the results of research on the use of probiotics "Vitafort" at a dose of 0.5 ml (107 CFU / g) and "Laktobifadol" at a dose of 0.2 g per 1 kg of live weight in the turkeypoults breeding, which ensured the development of beneficial intestinal microflora, increased preservation turkey poults, an increase in the digestibility of raw protein and nitrogen-free extractive substances, nitrogen absorption, improvement of hematological and biochemical blood parameters and, ultimately, an increase in live weight and intensity of turkey poults by 9.2 and 12.5%.

Key words: *turkey poults; Vitafort and Laktobifadol probiotics; intestinal and excremental microbiocenosis; live weight, growth rate; blood*

Introduction

In modern conditions of livestock and poultry development, complex biologically active substances, prebiotics and probiotics are widely used mainly to stimulate the growth and development of young farm animals and poultry[1-3]. Specifically, probiotics, being cultures of microbes that are symbiotic with respect to the normal microflora of the gastrointestinal tract [4], suppress the vital activity of pathogenic and conditionally pathogenic bacteria of the intestine, increase the resistance of the animal's organism, improve digestibility and assimilation of nutrients of food, activate metabolic processes [5,6], produceanantiallergic action in a number of cases [7-10]. The new probiotic "Vitafort" investigated by us on the basis of the antagonistic bacteria Basillussubtilis of strain 11B is produced by OOO Research and Production Enterprise "Biofort "(Ufa)[4, 11]. Preliminary doses and safety of probiotic "Vitafort" are established on the basis of experimental data obtained on experimental laboratory animals (white mongrel mice), in which 109 colony-forming units (CFU) were the optimal dose for an organism per animal. Probiotic Lactobifadol contains live microorganisms of the L. acidophilus lactobacterium (not less than 1 million/g) and B. adolescentisbifidobacteria (not less than 80 million/g). Lactobifadol is a probiotic preparation for veterinary use[12-14]. Its use improves metabolism, feed conversion, increases daily average gains, reduces the time of growing and fattening.

The aim of the research is to study the effect of probiotics "Vitafort" and "Lactobifadol" on the quantitative composition of microorganisms: lactobacteria, bifidobacteria, E. coli, Staphylococcus aureus, enterococci and clostridia contained in feces of poults.

Material and Method

The study of the influence of probiotics "Vitafort" and "Laktobifadol" on the formation of intestinal microbiocenosis conducted studies of excrements of turkey poultry in the framework of the experiment carried out according to the scheme presented in Table 1. The scientific and economic experience was conducted in the conditions of the "Bashkir poultry breeding complex M. Gafuri" Meleuz district of the Republic of Bashkortostan on broad breasted white turkey poults during 42 days (6 weeks). For the experiment, 3 groups of pairs-analogues

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of turkey poults were formed at a day old without division by sex. The poults of all groups were kept on deep litter in accordance with the technology adopted at the complex, and the technological parameters corresponded to the recommended ones. The poults were fed with feeds produced at the feed mill complex with a content of 100 g of feed 285 kcal of exchange energy and 27.5% of crude protein in the period from 1 to 21 days old, 295 kcal of exchange energy and 27.5% of raw protein in the period from 21 to 42 days of age (table 2). Probiotic intake was daily throughout the study period. Probiotic "Vitafort" was given to turkey poults with boiled chilled drinking water, "Lactobifadol" was distributed manually after the step of pre-mixing with compound feed. Bacteriological examination of feces was carried out according to the methodological guidelines "Isolation and identification of bacteria in the gastrointestinal tract of animals", approved by the Veterinary Department of the Ministry of Agriculture of the Russian Federation No. 13-5-02 / 1043 from May 11, 2004. Weights of feces weighing 1 g were homogenized in 9 ml of sterile buffer solution (content of inoculum 10–1 g / ml). From the main dilution, by transferring 1 ml of the suspension, a series of ten-fold serial dilutions was made in a sterile buffer solution containing native seed material from 10–2 to 10–10 g / ml. For the indication of pathogenic enterobacteria, a sowing from the main breeding was carried out on Levin and Ploskirevmedium. In order to study the cultural and biochemical properties of Escherichia coli, nutrient media were used: Endo, meat infusion agar-agar, meat infusion broth, beef-extract gelatin, Simmons agar, Gissmedium; indole formation and production of hydrogen sulfide was studied. On 5% blood agar, morphologically different colonies with hemolytic properties were counted, counting their percentage of the total number of specified microorganisms of this family. Isolation of Staphylococcus aureus was performed on yolk-salt agar in Petri dishes with subsequent microscopy of the grown colonies. Bacteria of a round shape with a characteristic grape-likearrangement were attributed to the genus Staphylococcus. After a day of incubation, colonies with golden pigment were taken into account, the ability to ferment mannitol (+) was determined from the isolated microorganisms, tested in the plasma-coagulation reaction (+), and the lecithinase activity (+) was determined. To isolate anaerobic spore-forming bacteria, Wilson-Blair medium was used. The presence of clostridia was judged by the detection of black colonies in the depth of the medium at the bottom of the tube. Gram-positive rods with slightly rounded edges were detected by microscopic examination – Gram stain. The population level of each group of microorganisms was expressed in decimal logarithms. For this, the number of colonies was transferred to the decimal logarithms and, taking into account the appropriate dilution, the population level was calculated in lg CFU / g of feces.

Table 1. Scheme of scientific and economic experience in growing turkey poults using probiotics "Vitafort" and "Lactobifadol" (n = 50)

Group	Feedingfeatures
Control	Basicdiet (BD)
Experimental 1	BD + probiotic "Vitafort" in a dose of 0.5 ml (107 CFU / g) per 1 kg of live weight
Experimental 2	BD + probiotic "Laktobifadol" in a dose of 0.2 g per 1 kg of live weight

The turkey poults of all groups were kept on the floor on deep litter, in accordance with the technology adopted at the complex, the technological parameters were consistent with those recommended. The poults were fed with feeds produced at the feed mill complex containing in 100 g of feed 285 kcal of exchange energy and 27.5% of crude protein from 1 to 21 days old, 295 kcal of exchange energy and 27.5% of crude protein from 21 to 42 days of age (Table 2).

Table 2.The average consumption of feed and nutrients of turkey poults

Indicator	Daily Consumption	
	from 1 to 21 days of age	from 21 to 42 days of age
Compoundfeed PK-11-2-75, г	44,3	-
Compoundfeed PK-11-2-76, г	-	138,0
Exchange energy, kcal	126,3	407,1
Crude protein, g	12,2	35,88
Crude fiber, g	1,71	6,27
Lysine, g	0,85	2,30
Methionine + cystine, g	0,52	1,50
Threonine, g	0,49	1,42
Calcium, g	0,58	1,71
Phosphorus, g	0,39	1,19
Iron, mg	2,22	6,90
Copper mg	0,89	2,76
Zinc, mg	4,43	13,80
Manganese, mg	5,32	16,56
Iodine mg	0,13	0,41
Vitamin A, 1000 IU	0,53	1,66
Vitamin D3, 1000 IU	0,11	0,35

Statistical data processing was performed by generally accepted methods of variation statistics using the statistical analysis package for Microsoft Excel. An assessment of the significance of differences in arithmetic averages was performed using Student's t-test, the differences were considered statistically significant at $P < 0.05$.

Results and Discussion

The results of microbiological studies of turkey poultry feces are presented in Table 3. Research has established that the use of probiotics Vitafort and Laktobifadol in diets of turkeypoults of all ages led to an increase in lacto-and bifidobacteria, i.e. there occurred an increase in the acidity of the intestinal contents due to lactic acid bacteria, which naturally prevented the development and further reproduction of pathogenic microorganisms. At 14 days of age, the number of lactobacilli in experimental groups 1 and 2 was 6.68 and 7.44 lg KOE / g, which is 1.7 and 1.9 times more, and the number of bifidobacteria was about 2 times higher (6.32 and 6.42 lg KOE / g and the number of E. coli significantly decreased by 42.6 and 41.2% ($P < 0.05$) correspondingly compared with the control group. The number of Staphylococcus aureus, enterococci and clostridia in the experimental groups showed a tendency to decrease without significant differences. At the 28-

day age, the same tendency was observed as in the 14-day age. By the 42-day age, along with an increase in the proportion of lacto-and bifidobacteria and a decrease in E. coli, a significant decrease in Staphylococcus aureus and enterococci was found in the experimental groups, except for clostridia. Thus, throughout the entire period of scientific and economic experience in the experimental groups, more useful and less pathogenic microflora were observed, which naturally affected the safety and growth rate of the poults. During the 42-day cultivation period, the safety of the population of turkey poults in the control group was 92.0%, which is 6.0% less than in the experimental group 1, and 7.0% less than in the second. The increase in live weight and growth rate of turkey poults was higher by 9.2% and 12.5%, respectively (P <0.01 and P <0.001). Consumption offeed also decreased by 7.9–11.0%per 1 kg gain in live mass in the experimental groups compared to the control group.

A study of the digestibility of nutrients in the diet of poults at 42 days of age showed that the use of probiotics Vitafort and Laktobifadol contributed to an increase in the digestibility of crude protein by 3.6–4.3 abs. % and nitrogen-free extractive substances - by 4.2–5.0 abs. % (P <0.05). We found that turkey poults of the first and second experimental groupsactively digested and actively transformedthe nitrogen of feed into the protein of the muscle tissue; accordingly, the nitrogen utilization ratio was higher by 8.8–9.2 abs. % than in control. According to the balance of calcium and phosphorus, we established a tendency for their better assimilation in the body of the poults of the first and second experimental groups compared to the control group, however, no significant differences were found.

Table 3. Microbiological analysis of turkey poultsfeces, lgKOE/ g (n = 3)

Indicator	Group		
	Control	Group 1	Group 2
14-day aged (X ± Sx)			
Lactobacteria	3.88 ± 0.68	6.68 ± 0.59*	7.44 ± 0.78*
Bifidobacteria	3.12 ± 0.72	6.32 ± 0.71*	6.42 ± 0.69
Coliform bacterium	6.84 ± 0.63	4.06 ± 0.66*	4.02 ± 0.67*
Staphylococcus aureus	3.47 ± 0.74	1.45 ± 0.78	1.76 ± 0.76
Enterococcus	5.48 ± 0.75	4.18 ± 0.69	4.14 ± 0.81
Clostridia	2.46 ± 0.78	1.69 ± 0.72	1.48 ± 0.75
28-day aged (X ± Sx)			
Lactobacteria	5.44 ± 0.69	8.28 ± 0.67*	8.48 ± 0.72*
Bifidobacteria	5.16 ± 0.64	7.92 ± 0.62*	7.96 ± 0.65*
Coliform bacterium	6.98 ± 0.65	4.01 ± 0.64*	3.98 ± 0.68*
Staphylococcus aureus	3.67 ± 0.56	1.95 ± 0.59	2.28 ± 0.74
Enterococcus	5.78 ± 0.68	4.22 ± 0.62	4.33 ± 0.61
Clostridia	2.96 ± 0.37	2.39 ± 0.31	2.22 ± 0.38
42-day aged (X ± Sx)			
Lactobacteria	6.78 ± 0.73	9.69 ± 0.74*	9.96 ± 0.69*
Bifidobacteria	5.98 ± 0.65	8.78 ± 0.68*	8.99 ± 0.67*
Coliform bacterium	5.64 ± 0.51	3.36 ± 0.52*	3.22 ± 0.55*
Staphylococcus aureus	4.58 ± 0.53	2.42 ± 0.49*	2.49 ± 0.51*
Enterococcus	5.96 ± 0.52	3.82 ± 0.54*	3.78 ± 0.55*
Clostridia	3.52 ± 0.33	2.36 ± 0.32	2.14 ± 0.28

Positive changes also occurred in the blood composition, an increase in the number of erythrocytes by 12.8–15.8% was noted; 17.2–21.8% and hemoglobin by 7.0–8.7%; 7.1–8.8% at 28 and 42 days of turkey poult life compared with the control group ($P < 0.05$). It is quite logical that only in the first 14 days of use of probiotics "Vitafort" and "Laktobifadol" there was a significant increase in the content of leukocytes by 13.7 and 14.7% ($P < 0.05$) as compared with the turkey poults of the control group.

It is well known that an increased level of leukocytes in the blood can be in cases where the body takes probiotics for foreign organisms. Within the physiological norm, as the poults of all groups grew and developed, an increase in the concentration of total protein was observedin the serum, especially in turkey poults who received the probiotics Vitafort and Laktobifadol, respectively, 9.67% and 9.89% compared to the control group. With an increase in the content of total protein in the serum of turkey poults, especially at 42 days of age, a redistribution of serum protein fractions was observed towards the reduction of the amount of albumin (by 11.4–11.8%) and towards the increase of the amount of globulins mainly due to β- (by 7.1 –8.1%) and γ-globulins (by 5.0–5.7%) as compared with the control, which is usually characteristic of intensively growing animals and birds.

Conclusion

The use of probiotics "Vitafort" in a dose of 0.5 ml (107 CFU / g) and "Laktobifadol" in a dose of 0.2 g per 1 kg of live weight when growing turkey poults ensured the development of beneficial intestinal microflora, increase ofthe safety of turkey poults, increase of digestibility of crude protein and nitrogen-free extractive substances, nitrogen digestibility, improvement of hematological and biochemical blood parameters and ultimately an increase in live weight and growth rate of turkey poults from 1 to 6 weeks by 9.2 and 12.5%.

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