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Expediency of "FITOS" BAA Nutritional Intervention in the Diet of Laying Hens

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***Abstract*—The influence of "FITOS" BAA on the natural resistance of laying hens and their productivity was studied. It was found that it improves the physiological state of the chickens and increases egg production.**

Keywords— laying hens, egg production, protein metabolism, amino acids, red blood cells, feed conversion, "Fitos" BAA

I. INTRODUCTION

The current state of poultry farming development is at a high level all over the world. Modern technologies providing comfort and good nutrition and aimed at achieving the genetic potential for productivity are used for poultry farming [1, 2].

The dry type of poultry feeding is applied in the companies of the Belgorod region. The recipes of feed are composed on feed factories depending on the age, physiological and productive state of poultry and the stock is fed with it both in crumbled or pelleted forms.

Different dietary supplements are used in livestock breeding and poultry farming to balance the rations according to the nutritive value established by crosses breeders [3- 5].

To improve the nutrients intake of feed, as well as to strengthen the health of poultry, new fodder preparations are developed and introduced into production: probiotics, prebiotics, immunostimulators, enzymes, etc. as well as complex supplements based on them [6-9].

For example, "Fitos" biologically active additive (BAA), produced by OOO "Research and development center BIO" of the Shebekinskii district of the Belgorod region, is a complex preparation that belongs to the group of organic phytosorbents. It is intended to prevent the development of primary digestion dysfunction of animals and poultry and their mycotoxication. The probiotic effect is achieved due to the presence of Bacillus subtillis and lactic acid bacteria strains, as well as products of their metabolism. The basis of the supplement is pectin and other complex polysaccharides, yeast autolysates having sorption capacity, which together with a complex of enzymes are able to deactivate toxins [10].

It is known that in the process of growing forage crops, storage of grain and feed may decrease their quality due to mold fungi growth on the surfaces. The accumulation of mycotoxins in the body of poultry against the background of weakened immunity will lead to a decrease in productivity.

The work objective was to study the possibility and expediency of using a new biologically active additive "Fitos" in the diet of laying hens to increase the natural resistance and productivity of poultry.

II. EXPERIMENTAL

The research was conducted on the basis of academic and research innovation center "Agrotechnopark" of Federal State Budgetary Educational Institution of Higher Education Belgorod State Agricultural Univerisity.

The objects of research were laying hens of the "Hisex white" cross of 106-321 days age. The studied groups of poultry were placed for management in triple-deck cages with a stock density of 10-11 heads per 1 m^2.

As the basic diet (BD), used ready-made feed produced at the feed factory of AO "Belgorod Center of Grain Production:" PK-4, PK1-1, PK 1-2. Their nutrition corresponds to the recommendations of the All-Russian Research and Technological Poultry Institute for poultry feeding.

The laboratory study of feed samples revealed the presence of mycotoxins, which may have been formed as a result of prolonged storage in a poultry house. Thus, the content of aflatoxin B_1 was 0.001-0.007 mg/kg, zearalenone – 0.001-0.006, T-2 toxin – 0.001-0.002, ochratoxin A – 0.002-0.003 mg/kg, which slightly exceeds the maximum permissible level. According to the manufacturer's recommendations, the rate of input of biologically active additive "Fitos" for animals and poultry for the prevention of mycotoxicosis should be 1-2 kg/t of feed. Therefore, in the first experimental group, in addition to the basic diet for

laying hens, "Fitos" BAA was added in an amount of 0.05% (0.5 kg/t of feed), in the second, third, and fourth groups – 1%, 1.5%, 2%, respectively (Table I).

III. RESULTS AND DISCUSSION

Present-day poultry production in Russia is based on the use of highly productive poultry crosses; therefore, the diets for them should be highly nutritious. Biological full-value of diets is determined with the amount of protein, the ability of poultry body to use nitrogen of the diet at a certain amount and the ratio of certain nutrients.

The nature of protein metabolism in laying hens when feeding them feeds with different amounts of "Fitos" BAA was determined during the study of nitrogen balance. As can be seen from the data in Table II, the use of nitrogen from the feed differed in groups: more of it was consumed with feed by laying hens of the control group – 3.31 g, which is by 0.03 g and 0.04 g (0.9% and 1.2 %) more than in the first and second experimental groups and 0.11 g (3.4%) than in the third and fourth experimental groups. Undigested nitrogen of feed excreted from the body with droppings. In the control group, the indicator was 3.31 g, which is by 0.03 g and 0.04 g (0.9 % and 1.2 %) more than in the first and second experimental groups and 0.11 g (3.4%) than in the third and fourth experimental groups. Nitrogen digestibility by quantity in all groups was almost at the same level – 1.70-1.73 g, and in percentage terms the greatest (53.4 %) was in laying hens of the third experimental group, slightly lower in the fourth (0.3% difference) and in the second (0.8 %) experimental groups, while in the first experimental group was at the same level with the control group (the difference was only 0.1 %).

Thus, the additional inclusion of "Fitos" BDAS in the diet of laying hens contributes to an increase of nitrogen digestibility, which has a positive effect on protein metabolism and viability of poultry [11, 12].

Amino acid nutrition takes a special place in the physiology of highly productive poultry. Two essential amino acids – lysine and methionine are considered to be limiting. Our studies revealed that the inclusion of additional organic "Fitos" BAA in the diet of laying hens contributed to better absorption of both amino acids by the body (Fig. 1). In the control group, the availability of lysine was 85.5 %, methionine – 85.4 %. In the experimental groups, these indicators are slightly higher. The best results were obtained in the third experimental group at the additive dose "Fitos" BAA 0.15% – the availability of lysine was 86.5%, methionine – 86.6%.

The laboratory study of the morphological composition of blood samples obtained data indicating a positive effect of "Fitos" BAA addition to the main diet. As for blood corpuscles – the content of red cells increases (Table III). And if in the first group the increase was only 0.04 l^{-12} (1.0 %), in the second, fourth and third experimental groups it significantly increased by 1.6%, 2.2% and 3.3% respectively. A similar pattern was observed in the concentration of hemoglobin – an increase in the content of the experimental groups, respectively, 1.79 g/l (1.8%), 4.88 g/l (4.9%), 4.63 g/l (4.6 %) and 7.52 g/l (7.6 %) in the first, second, fourth and third groups. A decrease in leucocytes may indicate greater mobility and activity of immunocompetent cells.

All experimental groups showed an increase in crude blood protein. These changes are expressed mainly among poultry in the third experimental group. Thus, the crude protein content of this group exceeds the control by 3.14 g/l, or 6.3 % (Fig. 2).

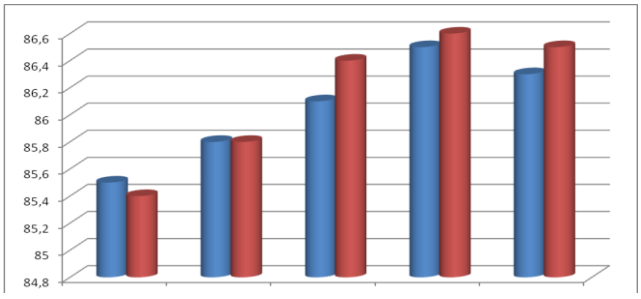
Improvement of protein metabolism and changes in the morphological composition of laying hens blood had a positive impact on the indicators of their resistance to various harmful factors. Thus, the experimental groups of poultry showed an increase in lysozymic, bactericidal and phagocytic activity of blood serum.

TABLE I. EXPERIMENTAL DESIGN.

Group	**Characteristics of feeding**
Control	***BD***
Experimental	
I	BD + 0.05 % Fitos BAA
II	BD + 0.1 % Fitos BAA
III	BD + 0.15 % Fitos BAA
IV	BD + 0.2 % Fitos BAA

TABLE II. NITROGEN BALANCE AND USE BY LAYING HENS, G (M±M)

Indicators	**Groups**				
	control	***experimental***			
		I	***II***	***III***	***IV***
Swallowed with feed	3.31 ±0.67	3.28 ±0.42	3.27 ±0.31	3.20 ±0.48	3.20 ±0.74
Excreted with droppings	1.58 ±0.19	1.56 ±0.22	1.55 ±0.14	1.49 ±0.25	1.50 ±0.23
Digested:					
by weight	1.73 ±0.34	1.72 ±0.28	1.72 ±0.22	1.71 ±0.24	1.70 ±0.42
%	52.3	52.4	52.6	53.4	53.1



Lysin – Methionine

Fig. 1. Amino acids availability from feed to laying hens, %. Control – Experimental-I – Experimental-II – Experimental-III – Experimental-IV

TABLE III. TABLE 3. MORPHOLOGICAL COMPOSITION OF LAYING HENS BLOOD (M±M)

Indicators	**Groups**				
	control	***experimental***			
		I	***II***	***III***	***IV***
Red blood cells, 1012/l	3.65 ±0.07	3.69 ±0.14	3.71 ±0.11*	3.77 ±0.09**	3.73 ±0.13*
Leucocytes, 109/l	30.61 ±0.58	30.16 ±0.44	30.52 ±0.72	29.79 ±0.65	30.33 ±0.61
Hemoglobin, g/l	99.39 ±2.28	101.18 ±2.35	104.27 ±1.98	106.91 ±2.04*	104.02 ±2.71
* $P \leq 0.05$, ** $P \leq 0.01$.					

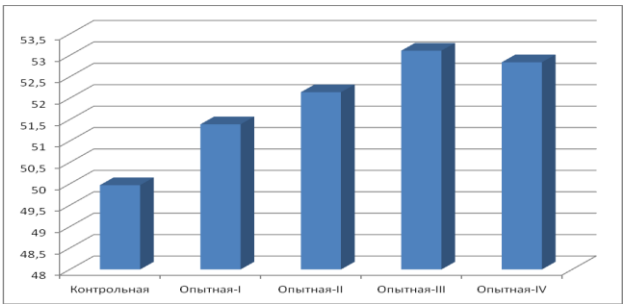


Fig. 2. Crude protein content in laying hens blood, g/l: Control – Experimental-I – Experimental-II – Experimental-III – Experimental-IV

In the experimental groups, the increase in serum lysozymic activity was: in the first – by 0.6 %, in the second – by 0.8, in the fourth – by 1.2 and in the third experimental group – by 1.7 % (the difference is reliable). The same pattern, but less expressed, can be observed for bactericidal activity: it increased slightly in the first (by 0.1 %), slightly more (by 3.6 %) in the second and significantly – by 5.5% in the fourth and 6.9% in the third experimental groups. The difference is reliable as well (Table IV).

The presentation of the phagocytic activity of pseudoeosiniphils repeats the bactericidal activity pattern: a slight increase in the first experimental group – only by 0.7 %, more significant (by 2.4 %) in the second experimental and significant – 4.1% in the fourth and 4.3% in the third experimental groups. The difference in them is reliable.

Thus, the inclusion "FITOS" BAA to the diet increases the body viability of laying hens, as evidenced with the increase in the main indicators of natural resistance. The greatest impact has high doses of "FITOS" supplements – 0.15-0.2 % (1.5-2 kg/t of feed).

Strengthening the body natural resistance of poultry receiving "FITOS" as a supplement, obviously, associated with a decrease of the toxic load on the body due to sorption processes and an increase of body weight (the toxic elements content for the weight unit is reduced).

The most important indicator of productivity is the egg production of hens, which depends on the influence of various factors, and the main of them, perhaps, is a full-fledged balanced feeding of poultry with benign feeds, contributing to the manifestation of poultry genetic potential and its ability to egg laying.

During the study period, laying hens produced 281 eggs per an animal unit in the control group and 296 in the third experimental group, which is by 5.3% higher (Table V). The

TABLE IV. THE LEVEL OF NATURAL RESISTANCE OF LAYING HENS BODIES, %

Indicators	Groups				
	control	*experimental*			
		I	*II*	*III*	*IV*
Blood serum lysozymic activity	10.4 ±0.4	11.0 ±0.5	11.2 ±0.6	12.1 ±0.4*	11.6 ±0.7
Blood serum bactericidal activity	47.6 ±0.5	47.7 ±0.5	51.2 ±0.6	54.5 ±0.8*	53.1 ±0.6*
Pseudoeosinophils phagocytic activity	40.2 ±0.6	40.9 ±0.4	42.6 ±0.5	44.5 ±0.8*	44.3 ±0.4*
* $P \leq 0.05$.					

TABLE V. EGG PRODUCTIVITY OF LAYING HENS

Indicators	Groups				
	control	*experimental*			
		I	*II*	*III*	*IV*
Laying hens stock, animal units	30	30	30	30	30
Eggs received, pcs.:					
total	4,740	4,725	4,749	4,946	4,760
Egg production, %	77.3	75.0	82.2	88.5	79.2
Egg weight, g	50.4 ±1.2	50.4 ±1.6	50.7 ±2.2	52.2 ±0.8	51.6 ±2.4
Feed costs per 10 eggs, kg	1.59	1.57	1.58	1.53	1.59

egg production was slightly lower in the second experimental group – 294 pcs., which is by 4.6 % more than in the control and 0.7% less than in the third experimental group. A small dose of the supplement, as well as a high did not have a significant effect on egg production. For example, in the first experimental group, it was at the level of 284 pcs., which is only by 1.1% higher than in the control group, in the fourth – by 2.8%. According to the weight of eggs, the indicators were by 0.6 %, 3.6% and 2.4% higher in the second, third and fourth experimental groups, respectively, than in the control and the first experimental group.

The increase in poultry productivity was observed with approximately the same feed conversion. For example, the feed costs per 10 eggs in groups ranged from 1.53 to 1.59 kg [13].

Thus, the best group was the third experimental, in which the diet of laying hens included "Fitos" BAA at a dose of 0.15 %, that is, 1.5 kg/t of feed.

IV. CONCLUSION

After analyzing the use of "Fitos" BAA in laying hens feeding, it can be said that laying hens of the experimental groups compared to the control group had higher rates of productivity and body natural resistance, which was facilitated with the improvement of protein metabolism and changes in the blood morphological composition, since the preparation stimulates digestion by restoring the gastrointestinal tract microflora, has a high sorption ability to remove biogenic toxins and other metabolic products and biologically harmful substances from the body. This helps to prevent the development of dysbacteriosis, mycotoxicosis, stimulation of metabolic and immune processes in the body.

In researching all indicators, the best experimental group was the third, where in addition to the basic diet of laying hens added 1.5 kg/t of feed or 15% "Fitos" BAA.

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