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The Effect Of A Complex Probiotic Additive On Reproductive Qualities Of The Parent Flock Hens Of The Ross 308 Cross.

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ABSTRACT

The research results presented in this article show the effect of the complex probiotic feed additive "Acid-Pack-4-Way" on the egg production of parent flock hens of the ROSS 308 cross and quality indicators of hatching eggs. The additive studied has a unique combination of bile-resistant lactic acid bacteria *Lactobacillus acidophilus*. It has been found that feeding the preparation at a dosage of 1 g/l of water for 5 days with a four days pause has a positive effect on increasing the egg productivity of the parent flock hens by 1.3% and eggs by 0.96 g and reducing feed costs for obtaining 10 eggs by 0.07 kg. The peak of productivity was reached at the age of 27 weeks and made 95.7%. The egg protein index in Test group exceeded the control values by 0.42%, the Haugh unit value by 1.44% and shell thickness by 3.78%. The Test eggs' chemical composition that determines their value has improved. There has been registered a significant difference in the level of dry matter, protein and fat in the yolk of the eggs in Test group by 1.30, 0.77 and 0.48%. The vitamin composition of the egg yolk that indicates a more intensive accumulation of vitamins A, E and B₂ in Test group has been studied. The hatching rate in Test group was 80.77%, which was higher than in Control group by 3.08%.

Keywords: feeding, parent flock hens, ROSS 308 cross, production, quality of hatching eggs.

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INTRODUCTION

Obtaining a healthy parent flock that is able to produce high quality hatching eggs is increasingly important in the conditions of modern industrial poultry farming. Uninterrupted provision of the incubation workshop with the necessary amount of high-quality low-cost hatching eggs is the main purpose of the parent flock. The solution of this problem is possible under the condition of balanced feeding the breeder flock and using biologically active feed additives in their rations (Gorlov I.F. et. all, 2015, Gorlov I.F. et. all,2016, Makarenko M.S. et. all,2018,Mazanko M.S. et. all,2017).

The poultry egg production depends on the hereditary properties, physiological state of the body, feeding and housing conditions and is the main indicator characterizing laying hens (Ivanov I.S. et. all,2016, Komarova Z.B. et. all,2011, Ivanov I.S. et. all,2011).

In this regard, the task was set to study the effect of the new “Acid-Pack-4-Way” preparation on the egg production and quality indicators of hatching eggs of the ROSS 308 cross chickens.

MATERIALS AND METHODS

The objects of the research were the parent flock chickens of the ROSS 308 cross and complex probiotic feed additive “Acid-Pack-4-Way” having a unique combination of bile-resistant lactic acid bacteria *Lactobacillus acidophilus*. The bacteria are contained in large quantities, very tenacious of life and enclosed in microcapsules. Along with probiotics, the preparation contains enzymes (cellulase, protease and amylase), a set of essential biological electrolytes and organic acids.

For the experiment, there were 2 groups formed with parent flock chickens at the age of 25 weeks, 70 chickens each. The Test group was fed with the preparation in a dosage of 1 g/l of water for 5 days with a four days pause. In Control group, the preparation was not used. The duration of the experiment was 12 weeks. The feeding and housing conditions for the poultry were the same. The studies were conducted in the conditions of the AO ROSKAR poultry farm in the Leningrad region.

In all experiments, the rations for Test chickens were compiled in the “Feed Optima” program taking into account the feeding norms developed by the VNITIP (2004). The production of the parent flock hens and yield of hatching eggs were registered daily by collecting eggs laid. The chemical composition and results of the egg incubation were determined according to the OST 10321-2003 Industry Standard. Chicken hatching eggs. Technical conditions.

RESULTS AND DISCUSSION

The research found that the complex preparation “Acid-Pack-4-Way” had a positive effect on the egg production of the parent flock hens (Table 1).

Table 1: Egg production for the period of experiment

Parameters under study	Group	
	Control	test
Average number of chickens, heads	70	70
Eggs obtained:		
Total, pcs	4788	4872
Per a hen, pcs	68.4	69.6
Egg production, %	81.4	82.7
Production peak, %	93.4	95.7
Average weight of eggs, g	65.73	66.69
Feed costs for 10 eggs, kg	1.59	1.52
Livability, %	100	100

Throughout the record period, the production of hens in Test group was higher than in Control group. Test group gave more eggs compared with Control group by 84 pcs. The egg production increased by 1.3%, the egg weight increased by 0.96g, and feed costs for producing of 10 eggs decreased by 0.07 kg. The peak production of Test group hens was reached at the age of 27 weeks and amounted to 95.7%; the peak production in Control group was registered in hens at 28 weeks of age and was lower by 2.3%. The livability of poultry in both groups was high throughout the experiment and amounted to 100%.

The results of the research allowed establishing that the additive studied in the diets of the parental flock hens of the ROSS 308 cross contributed to a more intensive increase in egg production in Test group compared with Control group, to an earlier achievement of its peak and production over the period of experiment. The increase in the parameters studied can be explained by the effect of biologically active substances in the feed additive “Acid-Pack-4-Way” on the metabolic processes in the chickens’ organisms.

One of the main factors determining the incubation results, livability of the chicks hatched, production and breeding value of the hens is the quality of the hatching eggs.

The egg production of the chickens is characterized by the number of eggs laid and their weight that is the second component of the chicken's egg productivity. Before incubation, the eggs were selected according to external features, taking into account their weight, shape, condition and quality of the shell. The best incubation qualities have been established to be peculiar to eggs, if their weight is at the average level characteristic of this chicken cross-breed. Too small and large eggs are not suitable for incubation.

The findings obtained suggest that all parameters were at the level of physiological norm, while the test preparation having a positive effect on the quality of hatching eggs by improving the metabolism of hens (Table 2).

Table 2: Morphological indicators of hatching eggs (n=10)

Parameters under study	Group	
	control	control
Weight of eggs, g	65.73±0.21	66.69±0.19**
Weight of component parts, g:		
White	38.16±0.27	38.35±0.13
Yolk	20.08±0.14	20.59±0.12*
Shell	7.49±0.19	7.75±0.11
The ratio of parts in the egg, %		
White	58.06±0.21	57.50±0.18
Yolk	30.55±0.14	30.87±0.17
Shell	11.40±0.08	11.62±0.06
The ratio between white/yolk	1.90	1.87
Form index, %	75.84±0.17	75.32±0.15
Protein index, %	83.7±0.79	87.9±0.81**
Yolk index, %	48.19±0.32	48.51±0.51
Haugh units	80.12±0.43	81.56±0.39*
Elastic deformation, µm	21.57±0.29	20.94±0.43
Shell thickness, µm	344.0±3.15	357.0±2.81

In our experiment, an increase in the weight of eggs was observed in Test group by 0.96 g (1.46%; P<0.01) compared with Control group.

The weight is known to determine the reserves of nutrient and biologically active substances in the egg. In our experiment, the biologically active substances of the “Acid-Pack-4-Way” feed additive contributed

to a more efficient transformation of the nutrients of the feed into the egg, which affected the increase in the yolk weight in Test group by 0.51 g (2.54%; $P < 0.05$) as against Control group. The white and shell weight in Test group tended to increase by 0.19 g or 0.49% and 0.26 g or 3.47%, compared with Control group. However, the relative weight of the white decreased slightly by 0.56% with respect to Control group. The ratio between the weight of the white and yolk in both groups was within the physiological norm.

The quality parameters of the shell are closely related to the quality of the white. The shell of eggs protects them from damage and penetration of microorganisms, preserves the integrity of the white and yolk and creates conditions for homeostasis during the embryo's development.

The research study showed that the shell thickness of eggs in Test group exceeded the control values by 13 μm or 3.78%, and the elastic deformation decreased by 0.63 μm or 3.01%, which was consistent with the data of (Kochish I. et. al, 2011 and Okolelova T., Egorov I., 1985), who claimed that according to the parameters of elastic deformation, it is possible to indirectly control the availability of vitamin D₃ to the chicks.

The white quality was assessed by the parameters of protein index and Haugh units value (Fisinin V.I. et. al, 2005). The research established that the egg protein index in Test group significantly exceeded Control group by 0.42% ($P < 0.01$) and the Haugh units value by 1.44 ($P < 0.05$).

In the research, the incubation of eggs of Test chickens at the age of 35 weeks was carried out. Before incubating the eggs, we determined their chemical composition (Table 3).

Table 3: Chemical composition of the white and yolk of hatching eggs of chickens in experimental groups, % (n=5)

Parameters under study	Group	
	control	control
White		
Moisture	88.46±0.27	88.09±0.19
Dry matter	11.54±0.15	11.91±0.11
Protein	11.03±0.13	11.38±0.9
Inorganic substances	0.51±0.017	0.53±0.014
Vitamin B ₂ , $\mu\text{g/g}$	4.05±0.09	4.47±0.12*
Yolk		
Moisture	48.90±0.28	47.60±0.23
Dry matter	51.10±0.21	52.40±0.27**
Protein	16.72±0.24	17.49±0.19*
Fat	33.30±0.16	33.78±0.13*
Inorganic substances	1.08±0.07	1.13±0.08
Carotenoids, $\mu\text{g/g}$	14.50±0.19	15.20±0.21*
Vitamin A, $\mu\text{g/g}$	8.80±0.18	9.70±0.25*
Vitamin E, mg/100 g	87.42±1.25	94.54±2.57*
Vitamin B ₂ , $\mu\text{g/g}$	4.46±0.10	4.98±0.11**

The research has established that the test feed additive influenced the composition of the hatching eggs of Test group chickens, which determined their value. The chemical composition of the egg white in Test group exceeded the absolute values of Control group in all the parameters studied. So, the dry matter content increased by 0.37%, including protein by 0.35% and inorganic substances by 0.02%. However, the difference was not statistically significant. A significant difference was obtained in the vitamin B₂ content in the egg white in Test group, which exceeded the control values by 0.42 $\mu\text{g/g}$ ($P < 0.05$).

The nutrient content in the yolk of the eggs in Test group changed more significantly as against Control group. There is a significant difference in the levels of dry matter, protein and fat by 1.30 ($P < 0.01$), 0.77 ($P < 0.05$) and 0.48% ($P < 0.05$). The content of inorganic substances tended to increase by 0.05%.

The study of the vitamin composition of hatching eggs is extremely important, since the lack of one or another vitamin leads to a decrease in hatchability of eggs and livability of chicks, embryogenesis of which takes place in the enclosed space of the egg, where the flow of nutrients from the body is impossible.

In our experiment, the vitamin composition of the yolk of the eggs in Test group changed positively compared with Control group. The content of carotenoids exceeded the control values by 0.7 µg/g (4.83%; P<0.05), which contributed to a more intensive accumulation of vitamin A in the yolk of the eggs in Test group by 0.9 µg/g (10.23%; P<0.05).

The level of vitamin E in the yolk of the eggs in Test group was significantly higher than in Control group by 8.14% (P<0.05) and B₂ by 11.66% (P<0.01).

The relationship between the content of carotenoids, vitamins A, E and B₂ and hatchability of eggs that ultimately determines the quality of hatching eggs has been established.

The results of eggs incubation are presented in Table 4 and indicate the usefulness of the morphological and chemical compositions of eggs in both groups studied.

Table 4: The results of the eggs incubation

Parameters under consideration	Group			
	control		control	
	Pcs	%	pcs	%
Eggs laid in the incubator	260	100	260	100
Fertilized eggs	236	92.69	239	93.46
Incubation losses, incl.:				
unfertilized eggs	24	9.13	21	8.08
blood ring	13	5.00	10	3.85
dead-in-shell	12	4.62	11	4.23
late dead	9	3.46	8	3.08
Chicks hatched, heads	202	–	210	–
Hatching rate, %	–	77.69	–	80.77
Hatchability of eggs, %	–	85.59	–	87.87

However, the hatching rate in Test group was 80.77%, which was by 3.08% higher than in Control group. A higher hatching rate in Test group was obtained due to increasing the number of fertilized eggs and reducing the number of embryos' deaths for the first seven days of incubation (the "blood" ring). The biological control of the incubation losses showed that the number of dead-in-shell and late dead embryos in both groups was at the level of the normative parameters of the egg incubation for meat crosses. The day old young growth resulted from incubation was standard; however, the chicks in Test group were more active.

CONCLUSIONS

Based on the above, it can be concluded that biologically active substances that are part of the "Acid-Pack-4-Way" feed additive created conditions for more complete absorption of nutrients in the body of chickens and contributed to the biologically complete feeding of the parent flock hens as a whole.

Authors contribution

IFG, MIS carried out the preparation of the experiment, ZBK and IVT conducted a literary and patent search, formed an article for publication, VGF control and testing of optimal premix technology, SMI, DNN, OEK accounting and processing of the results, AVR conducted laboratory studies on the morphological composition of eggs.

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