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The Performance of Egg Hens When Using a Prebiotic Preparation

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Abstract. The relevance of this study is conditioned upon the active introduction of prebiotic preparations into the practice of feeding poultry and the need to determine the impact of their use on quantitative and qualitative indicators of productivity. In this regard, this study is aimed at determining the effect of the introduction of the prebiotic preparation Actigen in the diet of laying hens on their level of productivity and morphological parameters of eggs. Using an integrated approach, the level of egg productivity of chickens was investigated for the introduction of the preparation into the mixed feed in the amount of 500 g/t for 6 weeks. Assessment of poultry at 52 weeks of life indicates a slightly higher level of egg production of chickens of the experimental group – 198.6 pcs against 196.2 pcs in the control group (the difference is 1.22%) and the safety of livestock – 97.50% against 97.00% in the control group. It was found that the mass of eggs obtained from chickens of the experimental group was higher by 1.09 g ($p<0.05$). A lower level of variation (Cv) of the "egg mass" trait of the poultry of the experimental group (3.05%) than in the control group (3.51%) is positive, and indirectly indicates the level of uniformity of the herd in live weight. It was established that the weight of egg white and yolk of hens in the experimental group was 1.04 g and 0.37 g higher, respectively, than in the control group. The difference between groups is not statistically significant, but it shows the direction of their changes. In the eggs of the experimental group, the large diameter of the egg white was smaller compared to the control group by 1.93%, and the small diameter by 3.56%. The height of the dense layer of white and yolk, which are objective indicators of egg quality, were greater in the experimental group ($p<0.001$) compared to the control group, which is positive, this difference was 21.54% and 20.00%, respectively. According to the indicators of the energy value of eggs, no substantial differences were found between the experimental groups. The obtained data (increase in the level of egg production of poultry, preservation of livestock, egg weight, improvement of egg quality indicators of chickens of the experimental group) indicate a positive effect of the introduction of the prebiotic preparation Actigen on the level of egg productivity of poultry. The materials of this paper are of practical value for the work of poultry enterprises specialising in the production of food-grade chicken eggs

Keywords: prebiotic, egg production, laying hens, Actigen, egg mass, white, yolk

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Introduction

In the countries of the European Union, during the production of livestock products, antibiotics and growth stimulants have been abandoned for more than a decade, being replaced with alternative products [1]. The use of pro- and prebiotics in animal feeding is becoming increasingly relevant, especially after the ban on the use of antibiotics as growth promoters in the EU, starting in 2006 [2]. To minimise infectious diseases in animal husbandry and reduce the use of antibiotics, manufacturers make efforts to improve the health of animals through improving sanitary and hygienic conditions, ensuring biosafety and a high culture of technological process, as well as preventing diseases through the use of vaccines and other preventive means, namely the use of beneficial bacteria contained in various feeds (probiotics), indigestible feed, promoting the growth and reproduction of probiotic bacteria (prebiotics) or replacement preparations (intestinal bacterial flora, etc.).

Poultry producers in Ukraine are actively implementing the technology of producing eggs and poultry meat without antibiotics in their farms, replacing them with alternative products [3; 4; 5], in particular, they use prebiotic preparations.

Prebiotics are carbohydrates that are not digested by endogenous enzymes but form a fermenting substrate for the intestinal microflora. Their use is aimed at supporting the development of such favourable microorganisms as lacto- and bifidobacteria, which have a positive effect on the intestinal microflora [6].

The greatest prebiotic activity is inherent in non-starchy oligo- and polysaccharides, whose molecules are bound by beta-glycosidic bonds. Without beta glycosidases in the enzyme system (due to the impossibility of splitting these bonds), oligo- and polysaccharides are not digested and contribute to the creation of an environment favourable for beneficial microorganisms [7].

Prebiotic activity can be described by individual substances of egg white origin, vitamins, and their derivatives [6].

Numerical studies [8; 9; 10] have confirmed the effectiveness of using prebiotic preparations in the production of poultry products – in terms of livestock safety, feed costs, growth rate of young animals, indicators of overall body resistance.

According to the results of the studies [8; 11; 12], the use of probiotics and immunomodulatory preparations is one of the ways to correct the functional state of the central and peripheral organs of immunogenesis of broiler chickens, which provides an increase in the specific resistance of the bird's body during the formation of the immune response and the intensity of post-vaccination immunity.

The introduction of prebiotic preparations (mannan oligosaccharides and fructooligosaccharides) into the diets of broiler chickens contributes to the development of internal organs, an increase in average daily gains in live weight, and quality indicators of meat [9]. It was found [10] that the use of a prebiotic and its combination with a probiotic contributed to an increase in egg production, egg quality, and improvement of biochemical and haematological parameters of egg chickens. It was shown [13] that the use of yeast biomass in the production of poultry products increases the efficiency of nutrient use and poultry productivity, suppresses the growth of opportunistic and pathogenic intestinal microflora, stimulates immunity, improves economic production results, and guarantees environmental safety of products.

One of the prebiotic preparations is Actigen, which was developed by Alltech specialists based on the achievements of nutrigenomics. Actigen is a mannan-enriched fraction – these are specific carbohydrates that are isolated from the outer layer of the cell wall of the yeast *Saccharomyces cerevisiae*. For the use of the drug [14; 15] confirmed the improvement of indicators of growing broiler chickens (live weight, average daily gains, feed conversion), improvement of slaughter indicators, positive changes in biochemical indicators of blood, immune status [15]. In studies [16], there is a correction of the composition of the intestinal microflora of chickens towards reducing the amount of opportunistic microflora with an increase in safety indicators, average daily growth, and feed conversion. The use of Actigen in duck breeding [17] promotes the activation of normal intestinal microflora, does not affect the concentration of LFA, lactate, and the pH level of the contents. Under production conditions, a hygienic assessment of the effect of the preparation on productivity is given: an increase in live weight of ducks, average daily weight gain, and bird safety.

Given the positive effect of prebiotic preparations on the intestinal microflora of poultry, the question of the influence of the above-mentioned preparations on quantitative and qualitative indicators of poultry productivity remains relevant.

The purpose of this study was to investigate the level of poultry productivity and the morphological parameters of eggs obtained from laying hens of the "Dekalb White" cross with the use of the prebiotic preparation Actigen in the diet of poultry, which is an active concentrate of mannan oligosaccharides (MOS) isolated from the cell walls of the yeast *Saccharomyces cerevisiae*.

Materials and Methods

The study was conducted in the conditions of a poultry enterprise to produce food eggs in the Zaporizhzhia Oblast in 2019-2020. In the experiment, a control and experimental groups of poultry were formed, 200 heads of laying hens of the Dekalb White cross. Chickens were kept in cage batteries, the microclimate parameters met the standards, according to the recommendations of this cross [18]. For feeding the bird, mixed feed was used, which in terms of nutritional value corresponded to its age, physiological state, and recommendations of the originator company. Actigen (Alltech Ink.) was added to the compound feed of the experimental group's poultry from 46 weeks of age. According to the instructions of the manufacturer Alltech, Actigen should be introduced into the mixed feed at the rate of 400 g/t. Based on previously conducted comprehensive studies of the quality of feed of the grain group on the Ukrainian market, it was recommended to increase the dosage of Actigen to 500 g/t. After 6 weeks of using the preparation, 100 eggs were selected from the chickens of the experimental groups for morphological studies. The mass of eggs was determined by individual weighing on a scale with an accuracy of up to ±0.01 g.

The egg shape index was determined as the ratio of a small diameter to a large one, expressed as a percentage, measurements were made using the IM-1 indexometre. After breaking the egg, large diameters of dense white and yolk were determined on a horizontal surface with a calliper – along the hailstones, small diameters – across them. The height of the yolk and dense white layer was determined using a micrometre. The mass of the shell, white, and yolk of eggs were determined after they were broken – by individual weighing on a scale with an accuracy of 0.01 g, followed by determining their relative mass to the mass of the egg.

At the age of 52 weeks, the birds were determined to lay eggs for the initial laying hen, and the preservation of the flock was assessed.

The energy value of eggs was calculated according to Equation 1 [19]:

$$EV=M\times(1.911-0.268\times Cw/y), \quad (1)$$

where *EV* is the energy value of eggs, kcal; *M* is the mass of eggs, g; *Cw/y* is the ratio of white and yolk mass; 1.911 and 0.268 are constant coefficients.

The results were statistically processed using MS Excel software using variational statistics methods.

Results and Discussion

When conducting the experiment in a poultry farm, the egg production of chickens for 52 weeks of life was higher in the poultry of the experimental group – 198.6 pcs against 196.2 pcs in the control group (the difference is 2.4 eggs, or 1.22%).

In terms of the level of survival of the flock up to 52 weeks of age, the advantage of the birds of the experimental group by 0.50% was noted (97.50% versus 97.00% in the control group).

Morphological parameters of eggs obtained from laying hens of experimental groups are presented in Table 1.

***Table 1**. Morphological parameters of chicken eggs*

Indicator	Control group	Research group
Egg weight, g	65.05±0.417	66.14±0.372*
Egg shape index, %	75.29±0.395	76.00±0.404
Weight, g: shells	8.30±0.068	8.51±0.083*
egg white	35.87±0.433	36.91±0.911
egg yolk	18.46±0.290	18.83±0.634
Ratio of white mass to yolk mass	1.96±0.041	2.02±0.068
Content, %: shells	12.88±0.115	12.76±0.103
egg white	55.80±1.335	55.21±0.756
egg yolk	28.48±0.952	28.39±0.428
Large diameter, cm: white	9.34±0.164	9.16±0.106
egg yolk	4.14±0.041	4.17±0.043
Small diameter, cm: white	8.14±0.144	7.85±0.102
egg yolk	3.99±0.033	3.96±0.044
Height, mm: white	4.08±0.109	5.20±0.213***
egg yolk	14.04±0.429	18.00±0.386***

***Note:** * – p<0.05, *** – p<0.001 – probability of difference between the experimental groups and the control group*

Analysing the results of the studies (Table 1), it was found that the mass of eggs obtained from chickens of the experimental group was higher by 1.09 g (the difference is statistically significant p<0.05), which in terms of 1,000 eggs is 1.090 kg. The authors of this study note a lower level of variation (Cv) of the "egg mass" characteristic of birds of the experimental group (3.05%) than in the control group (3.51%), which is positive for industrial production.

According to the analysis of individual egg components, it was found that the egg white mass was 1.04 g higher in the experimental group, the same dependence was observed for the yolk mass, where the difference was 0.37 g. The difference between groups is not statistically significant, but it shows the direction of their changes. According to the weight of the shell, the difference was 0.21 g for a probable difference between the groups (p<0.05).

No substantial differences were found in the relative content of egg components; a slightly higher content of shell, white, and yolk was noted in the poultry of the experimental group (by 0.12%, 0.59%, and 0.09%, respectively).

According to the state of the egg contained, poured on a horizontal surface, it can be concluded that the egg is fully functional. An inferior egg is described by a flattened yolk, blurred borders of liquid and dense layers of white, and the contents of the egg occupy a large area. A full-fledged egg is described by a spherical shape of the yolk, the boundaries of a thick layer of white are clearly marked, a dense layer of white repeats the shape of the egg, the contents of the egg occupy a small area. The conducted organoleptic study indicates the usefulness of eggs of chickens of experimental groups. The results of measuring large and small white diameters showed that

in the experimental group, the large diameter was smaller compared to the control group by 1.93%, and the small diameter – by 3.56%. The small yolk diameter was also smaller in the eggs of the experimental group, although this difference was insignificant and amounted to 0.75%. The height of the dense layer of white and yolk are indicators that allow objectively assessing the quality of eggs. Thus, the height of the dense layer of white and yolk was higher in the experimental group compared to the control group, which is positive, and indicates a higher quality of such eggs. This difference was 21.54% and 20.00%, respectively. There was a highly significant difference between the groups ($p<0.001$).

The ratio of white mass to yolk was 1.96:1 and 2.02:1, respectively, for the control and experimental groups.

According to the calculations, the caloric value of the eggs of the control group was 90.20±1.013 kcal, the experimental group was 90.66±1.261 kcal, i.e., the eggs of the experimental group have higher values, but the difference between the groups is not probable.

For the use of poultry in the conditions of industrial farms, it is important to evaluate the productivity of poultry according to the main characteristics – the level of laying, quality indicators of eggs, preservation of livestock, etc., as well as determining the level of realisation of the genetic potential of productivity. The main indicators of egg productivity of poultry, which primarily determine the effectiveness of using poultry in the farm, are egg production for the initial laying hen, egg weight, and livestock safety. In this study, a higher level of manifestation of signs was established in the birds of the research group, which indicates a positive effect of the introduction of a prebiotic drug into the compound feed on the level of egg productivity and preservation of birds.

A comparison with the normative values of the laying index per initial laying hen (according to the Hendrix Genetics BV company [20] – 213 eggs) shows that it is lower by 14.4 units, or 6.76%, and 16.8 units, or 7.89%, the level for the birds of the experimental and control groups, respectively, which is 93.24% and 92.11% of the standard level of laying per initial laying hen for the cross. The preservation of the birds of the experimental group was 0.2% higher than the level recommended by the company developing the cross – 97.3%; however, the control group had a lower (by 0.3%) indicator level. Comparison with the standard cross egg mass value, which is 63.1 g [20], indicates a higher level of this indicator for chickens of experimental groups – by 1.95 g, or 3.09%, for the control group and 3.04 g, or 4.82%, for the experimental group. The results obtained indicate a fairly high level of realisation of the genetic potential of poultry productivity in the farm.

The established egg mass level in poultry groups indirectly indicates an elevated level of herd uniformity in live weight based on the correlation between these traits [21].

The revealed greatest difference between the relative content of egg components in chickens of experimental groups – in terms of relative white content – confirms the existing biological pattern of changes in the mass of egg components with an increase in their mass [19].

Upon assessing the quality of food eggs, it is important to identify the energy value (caloric content) of this product. The total content of nutrients that a chicken egg contains is determined by the size and components of the egg, namely the mass of white and yolk. The caloric content of an egg has a direct relationship with the weight of the egg and the white:yolk ratio, which allows calculating the caloric content of the product by considering the energy coefficients of white, fat, and carbohydrates contained in the egg. It was found [19] that for eggs weighing 50-70 g, the ratio of white mass to yolk is 1.896-2.142:1, which was confirmed by the study (1.96-2.02:1).

Egg white contains 10-11% protein and a small amount of carbohydrates (0.8-0.9%), its caloric content is 16-17 kcal. Egg yolk is characterised by a high level of protein (up to 18%) and fat (31-33%), its caloric content is 16-17 kcal [19]. That is, the caloric content of egg yolk is 4 times higher than the caloric content of egg white. Such considerable differences in the caloric content of the main components of the egg determine the role of their ratio in calculating the energy value and are a prerequisite for calculating the caloric content of eggs of chickens of experimental groups and establishing higher values for chickens of the experimental group.

Conclusions

The introduction of the prebiotic preparation Actigen in the amount of 500 g/t in the compound feed for feeding laying hens for 6 weeks led to changes in the level of productivity:

– the highest level of egg production of chickens of the experimental group – 198.6 pcs against 196.2 pcs in the control group (the difference is 2.4 eggs, or 1.22%) at 52 weeks of life;

– in terms of the level of livestock safety, the indicators of poultry in the experimental group are higher by 0.50% (97.50% vs. 97.00% in the control group);

– the mass of eggs obtained from chickens of the experimental group was higher by 1.09 g (the difference is statistically significant at $p<0.05$). A lower level of variation (Cv) of the "egg mass" trait of the poultry of the experimental group (3.05%) than in the control group (3.51%) is positive, and indirectly indicates the level of uniformity of the herd in live weight;

– a higher level of egg white mass (by 1.04 g) and yolk (by 0.37 g) was found in the poultry of the experimental group;

– the height of the dense layer of white and yolk was higher in the experimental group compared to the control group (by 21.54% and 20.00%, respectively), which is positive, and indicates the highest quality of such eggs;

– the caloric content of eggs of chickens in the control group was 90.20 kcal, the experimental group – 90.66 kcal, i.e., the indicators of eggs of chickens in the experimental group are higher.

The results obtained indicate a positive effect of Actigen administration on the level of egg productivity of poultry and are of practical value for the work of poultry enterprises specialising in the production of food-grade chicken eggs. It is promising to continue conducting research on the impact of the prebiotic preparation Actigen on the quantitative and qualitative indicators of egg productivity of chickens, specifically to extend the productive use of poultry.

References

[1] *Sales of veterinary antimicrobial agents in 31 European countries in 2019 and 2020. Trends from 2010 to 2020. Eleventh ESVAC report*. (2021). Luxembourg: Publications Office of the European Union.

[2] Regulation (EC) No 1831/2003 of the European Parliament and of the Council of 22 September 2003 on additives for use in animal nutrition. (2003). *Official Journal of the European Union*, 46, 29-43.

[3] Kucheruk, M.D., Zasekin, D.A., Dymko, R.O., & Shcherbyna, O.A. (2017). Sanitary and hygienic conditions for good productivity of organic poultry. *Biological Resources and Nature Management*, 9(5-6), 116-124.

[4] Markowiak, P., & Slizewska, K. (2018). The role of probiotics, prebiotics and synbiotics in animal nutrition. *Gut Pathog*, 10(21). doi: 10.1186/s13099-018-0250-0.

[5] Alloui, M.N., Szczurek, W., & Świątkiewicz, S. (2013). The usefulness of prebiotics and probiotics in modern poultry nutrition: A review. *Annals of Animal Science*, 13(1), 17-32.

[6] Gibson G.R., & Roberfroid M.B. (1995). Dietary modulation of the human colonic microbiota: Introducing the concept of prebiotics. *The Journal of Nutrition*, 125(6), 1401-1412. doi: 10.1093/jn/125.6.1401.

[7] Roberfroid, M. (2007). Prebiotics: The concept revisited. *The Journal of Nutrition*, 137, 830-837.

[8] Teng, P.-Y., & Kim, W.K. (2018). Review: Roles of prebiotics in intestinal ecosystem of broilers. *Frontiers in Veterinary Science*, 5, 245. doi: 10.3389/fvets.2018.00245.

[9] Biswas, A., Mohan, N., Dev, K., Mir, N.A., & Tiwari, A.K. (2021). Effect of dietary mannan oligosaccharides and fructo-oligosaccharides on physico-chemical indices, antioxidant and oxidative stability of broiler chicken meat. *Scientific Reports*, 11, article number 20567. doi: 10.1038/s41598-021-99620-2.

[10] Tang, S.G.H., Sieo, C.C., Ramasamy, K., Saad, W.Z., Wong, H.K., & Ho, Y.W. (2017). Performance, biochemical and haematological responses, and relative organ weights of laying hens fed diets supplemented with prebiotic, probiotic and synbiotic. *BMC Veterinary Research*, 13, 248. doi: 10.1186/s12917-017-1160-y.

[11] Kapustian, A.I., Cherno, N.K., & Kolomiiets, I.A. (2018). Obtaining and characterization of muropeptils of cell walls of probiotic cultures. *Bioprocesses, Biotechnology of Food Products*, 12(1), 10-17.

[12] Ricke, S.C., Lee, S.I., Kim, S.A., Park, S.H., & Shi, Zh. (2020). Prebiotics and the poultry gastrointestinal tract microbiome. *Poultry Science*, 99(2), 670-677. doi: 10.1016/j.psj.2019.12.018.

[13] Orishchuk, S.O., & Tsap, S.V. (2020). Research and production justification of the use of probiotics to improve the quality of poultry products. *Theoretical and Applied Veterinary Medicine*, 8(4), 241-245.

[14] Bentea, M.-J., Marti, R., Sara, A., Toader, I., Gabor, E.-F. (2016). The effects of some prebiotic products (Actigen, Biotronic Top3) on the production and consumption indices in broiler chickens. *Bulletin UASVM Animal Science and Biotechnologies*, 73(2), 197-201.

[15] Waqas, M., Mehmood, S., Mahmud, A., Saima, J., Hussain, S., Ahmad, M.T.K., Rehman A., Zia, M.W., & Shaheen, M.S. (2019). Effect of yeast based mannan oligosaccharide (Actigen™) supplementation on growth, carcass characteristics and physiological response in broiler chickens. *Indian Journal of Animal Research*, 53, 1475-1479.

[16] Chernikova, G.Yu., & Prokopenko, N.P. (2019). Productivity and microbiological parameters of the intestines of broiler chickens using a prebiotic preparation. *Taurida Scientific Herald*, 110(2), 106-110.

[17] Kasianenko, O.I., Nahorna, L.V., & Kasianenko, S.M. (2018). Effectiveness of Actigen use in duck rearing. Retrieved from http://repo.snau.edu.ua/bitstream/123456789/6576/1/7.pdf.

[18] Commercial management guide. Cage housing. (2020). Retrieved from https://layinghens.hendrix-genetics.com/documents/980/Management_guide_commercial_cage_English_vs_L0260-6_.pdf.

[19] Shtele, A.L., & Filatov, A.I. (2012). Mathematical modeling of the energy value of food eggs. *Poultry and Poultry Products*, 3, 58-61.

[20] Dekalb white. Product guide. Cage housing. Retrieved from https://www.dekalb-poultry.com/documents/583/Dekalb_White_CS_product_guide_cage_EN_L1211-1.pdf.

[21] Lacin, E., Yildiz, A., Esenbuga, N., & Macit, M. (2008). Effects of differences in the initial body weight of groups on laying performance and egg quality parameters of Lohmann laying hens. *Czech Journal of Animal Science*, 53(11), 466-471.

Продуктивність яєчних курей за використання пребіотичного препарату

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Анотація. Актуальність дослідження зумовлена активним впровадженням у практику годівлі сільськогосподарської птиці пребіотичних препаратів і необхідністю визначення впливу їх використання на кількісні і якісні показники продуктивності. У зв'язку з цим, робота спрямована на визначення впливу введення пребіотичного препарату Актиген до раціону курей-несучок на їх рівень продуктивності та морфологічні показники яєць. За використання комплексного підходу досліджено рівень яєчної продуктивності курей за введення препарату до складу комбікорму у кількості 500 г/т впродовж 6 тижнів. Оцінювання птиці за 52 тижні життя свідчить про дещо вищий рівень несучості курей дослідної групи – 198,6 шт. проти 196,2 шт. у контрольній групі (різниця становить 1,22 %) та збереженості поголів'я – 97,50 % проти 97,00 % у контрольній групі. Встановлено, що маса яєць, отриманих від курей дослідної групи, була вищою на 1,09 г ($p<0,05$). Менший рівень варіації (Cv) ознаки «маса яєць» птиці дослідної групи (3,05 %), ніж в контрольній (3,51 %), є позитивним, а також опосередковано свідчить й про рівень однорідності стада за живою масою. Встановлено, що маса білка та жовтка яєць курей дослідної групи була на 1,04 г та 0,37 г відповідно вищою, ніж у контрольній групі. Різниця між групами не є вірогідною, але показує напрям їх змін. У яєць птиці дослідної групи великий діаметр білка був меншим порівняно з контрольною групою на 1,93 %, а малий діаметр – на 3,56 %. Висота щільного шару білка і жовтка, які є об'єктивними показниками якості яєць, були більшими у дослідній групі ($p<0,001$) порівняно з контрольною групою, що є позитивним, ця різниця становила відповідно 21,54 % і 20,00 %. За показниками енергетичної цінності яєць суттєвих відмінностей між піддослідними групами не встановлено. Отримані дані (підвищення рівня несучості птиці, збереженості поголів'я, маси яєць, покращення показників якості яєць курей дослідної групи) свідчать про позитивний вплив введення пребіотичого препарату Актиген на рівень яєчної продуктивності птиці. Матеріали статті становлять практичну цінність для роботи птахівничих підприємств, спеціалізацією яких є виробництво харчових курячих яєць

Ключові слова: пребіотик, несучість, кури-несучки, Актиген, маса яєць, білок, жовток