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EVOLUTION OF PROTEIN METABOLISM AND BODY MASS OF QUAILS UNDER THE INFLUENCE OF PHYTOMICROBIAL ADDITIVE OMEPOL 30

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Abstract

This research presents the effects of phytomicrobial additive OMEPOL 30 on markers of protein metabolism in blood serum and the evolution of body mass of laying quails. A total of 150 quails were divided into groups: control group and two experimental groups with 50 birds in each one. The control group was fed with basic combined feed, the experimental groups - with basic combined feed supplemented with 0.25 and 0.5% of additive during 71 days. The results indicated that the product was well tolerated by laying quails, strengthening their health status. In addition, modulation of protein metabolism was inferred from changes in marker parameters: the significant increase ($p<0.01$) of total proteins, albumin and creatinine in the experimental groups, as well as the tendency to increase urea and decrease uric acid in the blood, which attested to the intensification of protein metabolism. In conclusion, we can mention that tested product improves metabolic health of quails, which was also proven by stopping the loss of body mass of birds during intensive egg laying.

Key words*: additive, creatinine, quail, protein, urea.*

INTRODUCTION

Breeding and utilization of animals, including poultry, involve measures aimed to maintain their health and welfare. Thus, animal husbandry, an important branch of the national economy, currently, faces with two essential problems: firstly, the increasing demand for animal products at the national and global levels, and secondly, the responsibility of animal owners to provide products that are of high quality, harmless, and accessible to consumers (Macari et al., 2014; Baltag, 2020). At the same time, in recent years, animal products with dietary and curative properties have become increasingly popular. Among these an important place belongs to products obtained from quails, namely eggs and meat (Pavlicenco, 2019; Khazaei et al., 2021). It is worth mentioning that the Japanese quail (*Coturnix japonica*), a domestic variety Japanese quail raised for meat and especially for eggs, prescribed in dietary nutrition, is widely distributed and utilized in most countries in the world (Ahmed et al., 2024). Simultaneously, it should be noted that the breeding and exploitation of quails for meat and eggs production under intensive conditions can be compromised by the impact of stress factors, which necessarily reflect on their health and productive potential. Over the past decades, in order to reduce and prevent the consequences of technological stress, livestock breeders have used different categories of compounds, including biologically active ones, administered to animals through different routes. These substances are selected for their anti-stress, adaptive and growth-stimulating properties (Simeanu, 2004; Galip & Seyidoolu, 2012; Pavlicenco, 2019; Pistol, 2025; Hamprakorn et al., 2025). The problem of intensifying and improving productive performance with the help of growth biostimulants has been studied for a long time (Georgescu et al., 1995). In addition, these authors were among the first to address issues related to the health implications and regulations of the use of biostimulants in animal husbandry. At the same time, international regulatory authorities are gradually imposing restrictions on the use of hormonal substances and antibiotics for this purpose. Currently, an increasing number of researchers are investigating new growth

stimulants of natural origin for animals (Ahmed et al., 2024; Maţencu, 2024; Hamprakorn et al., 2025). The purpose of this research was to evaluate the impact of phytomicrobial feed additive Omepol 30 on the protein metabolism and body mass evolution of adult quails, exploited under poultry farm conditions.

MATERIALS AND METHODS

Object of study

This study was conducted in poultry farm conditions, SRL "MIHAILORINA-COM", Rîşcani district, Republic of Moldova. The research object was a flock of 150 adult quails, breed - Texas universal, divided into three groups: control group (CG), experimental group with 0.25% additive (0.25% EG), experimental group with 0.5% additive (0.5% EG) and the phytomicrobial feed additive, coded Omepol 30 (Barley+Carrot+Exopolysaccharides). The Omepol 30 additive is composed of: dry barley biomass from beer industry wastes - 75%, dry carrot biomass from food industry wastes - 25%, exopolysaccharides of pigmented yeast *R. mucilaginosa* CNMN-Ys-10 of 30 mg g^{-1}d.w. Barley biomass is obtained from barley wastes remaining after beer production by mixing the biomass (waste) with distilled water in the 1:1 v/v ratio, autoclaving the mixture at temperature of 115°C, 0.5 atm. for 30 minutes, then separating the supernatant (barley water extract, used for microbial biotechnologies as nutrient medium) from the sediment (barley biomass) by centrifugation at 3000 rpm for 10 minutes. The sediment is subsequently dried at 50 ± 1°C until a constant mass is achieved. Carrot biomass is obtained from carrot wastes (peels) from the food industry, remaining after carrot processing, by repeatedly washing the peels to remove impurities, shredding them to sizes of 0.5-1.0 cm, and mixing the carrot peels with distilled water in the 1:1 v/v ratio, autoclaving the mixture at temperature of 115°C, 0.5 atm. for 30 minutes, then separating the supernatant (carrot water extract) from the sediment (carrot biomass) by centrifugation at 3000 rpm for 10 minutes, then sterilizing the supernatant (carrot water extract) in an autoclave at temperature of 115°C, 0.5 atm. for 30 minutes. The sediment (carrot biomass) is subsequently dried at 50 ± 1°C until a constant mass is achieved. The water carrot extract, with a pH of 5.6 and a residual sugar concentration of 5.0°Bx, was used as a nutrient medium, a sole source of nutrition, for the submerged cultivation of the yeast strain *R. mucilaginosa* CNMN-Ys-10 at a temperature of 27-28°C, under shaking conditions of 200 rpm for 120 hours in order to obtain exopolysaccharides in the culture liquid. The Omepol 30 additive is obtained by mixing dry barley biomass with dry carrot biomass in the 3:1 ratio and gradually soaking the resulting mixture (in several rounds) with the required volume of culture liquid containing exopolysaccharides from *R. mucilaginosa* CNMN-Ys-10, in order to obtain an exopolysaccharide concentration of 30 mg g^{-1}d.w. After each round the mixture is dried at temperature of +50±1°C to remove excess moisture. Following the final round, the product was dried at the same temperature until a constant mass was reached.

Feed rations

The Omepol 30 additive was administered to quails with food, separately for each experimental group, according to the experimental scheme showed in Table 1.

Table 1. Scheme of administration of the Omepol 30 additive to quails

Group	No. of birds	Route of administration	Dose, g kg^{-1} feed	Dosing regime
CG	50	-	-	-
0.25% EG	50	per os	2.5	daily
0.5% EG	50		5.0	

The birds used in the experiment were similar in terms of breed, age, physiological status, and body weight. In addition, the quails from all three groups involved in the experiment were housed in the same shelter, obviously with the same hygienic and technological indicators, including microclimate parameters, nutrition, watering and veterinary care, which ensured their hygiene and welfare. During the experiment, quails were monitored and examined to assess their health status, as well as possible adverse reactions to the studied product.

Monitored parameters

During the study, the behavior of quails and any possible adverse reactions following the use of the additive were assessed. Blood samples for biochemical examination were collected in three stages: at the beginning of the study, randomly, from 5 quails out of 150, at the 35th day of the experiment (first sampling) and at the end of the study, on the 71st day from the beginning of the experiment (second sampling), 5 quails from each group. In the blood serum collected from the birds, the essential biochemical parameters of protein metabolism were determined, such as total proteins, albumins, urea, uric acid, creatinine, some liver markers: ALT and AST transaminases, total bilirubin and its fractions, glucose content.

These tests were performed in the Laboratory of Biochemistry, at Nicolae Testemitanu State University of Medicine and Pharmacy, according to protocols optimized for use with the Synergy H1 Hybrid Reader multimode-microplate spectrophotometer, (BioTek Instruments, Winooski VT, USA) (Gudumac et al., 2010).

The evolution of the quail body mass was determined during the study by individual weighing of the birds at the beginning, 35th and 71st days of the experiment.

Statistical indices

Statistical processing of the results was performed using the MO Excel and Statistics 9.0 software suite. The results were expressed by calculating the mean, standard deviation and confidence interval for an average of three repetitions. All differences were considered statistically significant for $P \leq 0.05$, $P \leq 0.01$ and $P \leq 0.001$.

RESULTS AND DISCUSSIONS

Investigation of metabolism, including key parameters of basal metabolism, is a priority in testing new remedies (Putin et al., 2020; Khazaei et al., 2021; Pistol, 2025).

The dynamics of protein metabolism indicators in quails during the application of the Omepol 30 additive is presented in Table 2. According to the obtained results, the level of total proteins in blood serum decreased in CG at the first sampling by approximately 10% ($p<0.05$) compared to the beginning of the experiment, a similar trend also was established in 0.5% EG (-2.4%) compared to the beginning of the experiment. In contrast, in 0.25% EG at the first sampling, the analyzed parameter increased by 4.1% compared to the initial values. The tested additive favored an increase in total protein levels in both experimental groups at the first sampling, by 8.2-15.3% compared to the CG (for 0.25% EG, $p<0.05$). At the end of the study (second sampling), a positive dynamic in total protein levels was recorded in all groups compared to the first sampling. Comparison among groups showed higher values of the investigated parameter in both experimental groups compared to the CG, with an increase of 6.5-15.2% (for 0.25% EG, $p<0.01$) (Table 2). Similar trends of increased protein content in the blood of animals, under the influence of biologically active compounds, have been reported in several scientific studies (Ahmed et al., 2024; Olgun et al., 2024; Pistol, 2025; Elbaz et al., 2025).

The serum albumin level at the first sampling in the CG, showed a significant decreased tendency of 16.1% ($p<0.05$) compared to the initial values, the tendency that was also established in the 0.5% EG (-12.5%) compared to the initial values. At the same time, the investigated parameter at the 0.25% EG, in contrast, showed a slight increase of 1.8% compared to the initial values. It is worth noting that albumin serum level in the blood at the first sampling in the experimental groups has a tendency to increase by 4.2-21.3% compared to the CG (for 0.25% EG $p<0.01$). At the second sampling, serum albumin levels in the experimental groups showed a slight tendency to decrease by 0.7-3.1% compared with the CG; however, no statistically significant differences were observed (Table 2). The close values of this parameter indicate a uniform physiological state of the liver in all groups, highlighting the absence of adverse reactions at the level of this organ in quails from the experimental groups. The concentration of urea, the final product of protein metabolism, at the end of the experiment was higher in the experimental groups by 6.3-13.6% compared to the control, but the differences were not statistically

significant (Table 2). Higher values of urea in the blood serum were also reported in broilers treated with BioR and Catosal (Macari et al., 2014; Putin, 2014).

The values of uric acid, resulting from the decomposition of purines in the serum of quails, at the first sampling, had a tendency to increase in birds from the CG and 0.25% EG compared to the initial values. At the end of the experiment (second sampling), the values of uric acid decreased in all groups compared to the initial values. At the same time, a decrease of uric acid of 1.9-5.8% was attested, in the experimental groups compared to the CG, indicating a more efficient and appropriate metabolism in the birds that consumed the additive (Table 2).

Table 2. Dynamics of protein metabolism indices in the blood serum of quails from different groups

Parameter	Debut	Group		
		CG	0.25% EG	0.5% EG
Total proteins, g L^{-1}	45.41±0.86	1 (samp.) 40.98±1.33* 2 (samp.) 45.14±1.74	1 (samp.) 47.25±1.34* 2 (samp.) 52.00±0.7**	1 (samp.) 44.32±1.63 2 (samp.) 48.07±0.98
Albumins, g L^{-1}	16.38±0.79	1 (samp.) 13.75±0.46* 2 (samp.) 15.62±0.55	1 (samp.) 16.68±0.5** 2 (samp.) 15.14±0.21	1 (samp.) 14.33±0.67 2 (samp.) 15.51±0.16
Urea, mmol L^{-1}	9.31±0.27	1 (samp.) 9.50±0.35 2 (samp.) 9.07±0.17	1 (samp.) 10.31±0.69 2 (samp.) 10.30±0.45	1 (samp.) 9.45±0.35 2 (samp.) 9.68±0.42
Uric acid, µmol L^{-1}	391.8±12.6	1 (samp.) 404.0±22.9 2 (samp.) 390.96±12.5	1 (samp.) 415.4±18.51 2 (samp.) 368.23±10.6	1 (samp.) 387.46±6.36 2 (samp.) 383.47±8.58
Creatinine, µmol L^{-1}	223.±10.4	1 (samp.) 175.5±9.4** 2 (samp.) 178.2±4.4	1 (samp.) 210.39±29.9 2 (samp.) 209.6±3.71***	1 (samp.) 169.16±4.6** 2 (samp.) 192.90±4.86*
Glucose, mmol L^{-1}	5.99±0.12	1 (samp.) 5.77±0.05 2 (samp.) 5.97±0.14	1 (samp.) 6.18±0.24 2 (samp.) 5.92±0.13	1 (samp.) 5.83±0.06 2 (samp.) 6.03±0.08

Note: * - $p<0.05$; ** - $p<0.01$; *** - $p<0.001$

The average serum creatinine value at the first sampling had a negative dynamics compared to the debut in all groups. Thus, this parameter decreased significantly ($p<0.01$) at the CG by 21.5% and in the 0.5% EG by 24.3% compared to the debut value. In the 0.25% EG this decrease was less than 5.8%, with no statistically significant differences compared with the reference value (Table 2). Thus, it can be noted that the tested additive, in the minimum dose of 0.25%, prevented the decline in creatinine level. At the end of the experiment (second sampling), the creatinine concentration in the CG and 0.5% EG increased, compared with those recorded at the first sampling, whereas in the 0.25% EG the values remained practically constant (-0.4%).

Comparative analysis of creatinine concentration among groups at the end of the study established that this index in the experimental groups was significantly ($p<0.001$) higher than the control of 17.6% in the 0.25% EG and of 8.2% ($p<0.05$) in the 0.5% EG (Table 2). This phenomenon is considered beneficial and reflects the muscle mass of the animals (Nazarenko & Kishkun, 2006). Several recent studies have reported higher serum creatinine levels in birds following treatment with various bioactive compounds (Pavlicenco, 2019; Putin et al., 2020; Pistol, 2025). The intensively exploited animal organism requires substantial energy support to ensure the normal development of metabolic processes. During the first sampling, the blood glucose concentration in quails showed a slight decrease compared with the initial values: by 3.7% in the CG and 2.7% in the 0.5% EG. In contrast, quails in the experimental group consumed 0.25% additive (0.25% EG), this parameter increased by 3.2%, although the differences were not statistically significant. By the end of the experiment (second sampling), the glucose levels were practically identical across all groups, ranging among 5.92±0.13 - 6.03±0.08 mmol L^{-1}. These results indicate the absence of adverse physiological reactions in the birds to the tested additive (Table 2).

The role of liver in protein metabolism is well established, and the importance of liver markers in characterizing this process and assessing the effects of tested products on the animal organism is incontestabil. The activity of ALT and AST transaminases, the concentration of bilirubin and its fractions in the serum of quails from different groups are presented in Table 3. The activity of ALT enzyme at the beginning of the research was 42.62 ± 2.53 u L^{-1}. The ALT activity at the first sampling had a moderate tendency to decrease by 6.6-8.0% in the CG and 0.5% EG compared to the initial values, and in the 0.25% EG it remained practically constant of 42.09 ± 3.03 u L^{-1}, compared to the reference value. At the end of the experiment (second sampling) the ALT enzyme activity showed an increasing trend in

all studied groups: CG of 10.5%, 0.25% EG of 7.8% and 0.5% EG of 30.8% compared to the values established at the first sampling, for 0.5% EG the difference being statistically significant ($p<0.001$) (Table 3). At the same time, at the end of the experiment, the ALT activity in the experimental groups was insignificantly higher by 3.1% in the 0.25% EG and significantly ($p<0.05$) by 22.2% in the 0.5% EG, compared to the CG (Table 3). The evaluation of the aspartate aminotransferase (AST) activity during the study, as well as between the groups, did not identify the existence of manifestations that would indicate a negative impact of the tested product on the body and especially on the functional state of the liver. However, some divergences in the physiological limits are established. Thus, the AST value in the blood of quails from the CG at the first sampling, denoted a true tendency ($p<0.01$) of increase to 33.27 ± 1.18 u L^{-1}, compared to the initial values, which is 19.2% more (Table 3).

Table 3. Liver marker indices in quail serum from different groups

Parameter	Debut	Group		
		CG	0.25% EG	0.5% EG
ALT, u L^{-1}	42.62±2.53	1 (samp.) 39.81±2.77 2 (samp.) 44.00±1.15	1 (samp.) 42.09±3.03 2 (samp.) 45.37±2.51	1 (samp.) 39.23±1.31 2 (samp.) 51.33±1.87*
AST, u L^{-1}	27.91±1.05	1 (samp.) 33.27±1.2** 2 (samp.) 33.33±1.04	1 (samp.) 25.78±0.47 2 (samp.) 28.44±1.45*	1 (samp.) 27.52±1.01 2 (samp.) 28.00±2.34
Total bilirubin, µmol L^{-1}	36.88±2.17	1 (samp.) 33.97±0.86 2 (samp.) 30.57±2.20	1 (samp.) 29.12±2.85 2 (samp.) 34.94±2.03	1 (samp.) 30.09±3.50 2 (samp.) 46.10±2.10***
Direct bilirubin, µmol L^{-1}	23.57±1.86	1 (samp.) 22.05±1.56 2 (samp.) 21.14±2.39	1 (samp.) 22.86±2.67 2 (samp.) 20.52±2.58	1 (samp.) 22.29±2.93 2 (samp.) 31.43±2.26*
Indirect bilirubin, µmol L^{-1}	13.31±1.29	1 (samp.) 11.92±0.76 2 (samp.) 9.43±1.10	1 (samp.) 6.26±0.7*** 2 (samp.) 14.42±1.22*	1 (samp.) 7.80±1.17* 2 (samp.) 13.08±0.70

Note: * - $p<0.05$; ** - $p<0.01$; *** - $p<0.001$

In contrast, birds from the experimental groups at the first sampling, showed a slight decrease in AST activity by 1.4-7.6% compared to the beginning of the experiment, which indicates that the tested additive exhibits a hepatoprotective effect, with the 0.25% minimum concentration ensuring a maximal effect (Table 3).

The AST activity analysis at the end of the study (second sampling) is of considerable importance in highlighting the action of the tested product on quails, and especially on the liver function. The data of this enzyme at the second sampling, compared to the values established at the first one, exhibits a tendency to increase in all studied groups. In the 0.25% EG, the increase was maximal, up to 28.44 ± 1.45 u L^{-1} by 10.3%. In the CG and 0.5% EG groups, insignificant increases were also observed, reaching 33.33 ± 1.04 and 28.00 ± 2.34 u L^{-1}, respectively (Table 3).

At the second sampling, AST activity in the CG was 33.33 ± 1.04 u L^{-1}, and in the 0.25% EG and 0.5% EG of 28.44 ± 1.45 and 28.00 ± 2.34 u L^{-1}, respectively, which represents a decrease by 14.7-16.0% compared to the control group, for the 0.25% EG this decrease being significant ($p<0.01$) (Table 3). The minimal of the AST activity in the experimental groups can be classified as positive and indicates the beneficial impact of the tested product on the functional state of the liver in experimental quails. Similar effects in the blood of birds and animals were established when quails (Alagawany et al., 2021; Negm et al., 2025) and rabbits (Mohamed et al., 2025) were treated with biologically active compounds.

The total bilirubin level in birds in the CG decreased to 33.97 ± 0.86 µmol L^{-1} at the first sampling by 7.9% compared to the initial values. The decrease in total bilirubin by 18.4-21.0% compared to the initial values was also observed in the experimental groups, where this decrease was significant ($p<0.05$) (Table 3). At the same time, compared to the control at the first sampling a significant decrease ($p\geq0.05$) of total bilirubin in the experimental groups by 11.4-14.3% was established (Table 3). At the second sampling, the total bilirubin level in the CG decreased to 30.57 ± 2.20 µmol L^{-1} by 10.0% compared to the values recorded at the first sampling. In the experimental groups the total bilirubin content increased by 19.9-53.2% compared to the values from the first sampling, and constituted 34.94 ± 2.03-46.10 ± 2.10 µmol L^{-1}, for the 0.5% EG the difference being significant ($p<0.01$). At the same time, these values are of 14.3-50.8% higher than the values in the CG at the second sampling, significant ($p<0.001$) for the 0.5% EG. Significant differences in total bilirubin content in the CG and 0.25% EG were not observed (Table 3).

Similar effects in serum bilirubin levels under the influence of biologically active substances have also been reported in animals (Mațencu, 2019).

At the first sampling, the level of direct bilirubin (conjugated, metabolized in the liver) has a moderate tendency to decrease to 22.05 ± 1.56 µmol L^{-1} compared to the initial values in all groups, with a maximum (-6.4%) in birds in the CG. The decreased values in the experimental groups were more moderate of -3.01% in the 0.25% EG and of -5.4% in the 0.5% EG (Table 3). At the second sampling direct bilirubin in the CG constituted 21.14 ± 2.39 µmol L^{-1} by 4.12% lower compared to the first sampling, and in the 0.25% EG of 20.52 ± 2.58 µmol L^{-1}, decreasing by 10.2% compared to the reference value. In quails in the 0.5% EG, with the maximum dose of the tested product, direct bilirubin was significantly higher than the CG and 0.25% EG values ($p<0.05$) (Table 3). The minimum of direct bilirubin values in the 0.25% EG, after the second sampling, is a beneficial phenomenon, and indicates that the additive in this concentration contributes to strengthening the functional state of the liver.

A valuable parameter in the evaluation of the functional state of the liver is also indirect bilirubin (free, unconjugated). At the first sampling, a decreasing trend in indirect bilirubin was observed compared with the initial values in all three groups. In the CG the decrease was 10.4% and the indirect bilirubin value was 11.92±0.76 µmol L^{-1} (Table 3). In the experimental groups at the first sampling, the decreases in indirect bilirubin compared to the initial values were significant ($p<0.01$) for the 0.25% EG and ($p<0.05$) for the 0.5% EG, and the values were 6.26±0.71 and 7.80±1.17 µmol L^{-1}, respectively. These values are also significantly lower, ($p<0.001$) for the 0.25% EG and ($p<0.05$) for the 0.5% EG, compared to the CG value (Table 3). At the second sampling, in birds from the CG, a significant decrease ($p<0.05$) of this parameter was recorded, being of 20.9% compared to the first sampling. At this stage, the level of indirect bilirubin in the bloodstream was significantly higher ($p<0.05$) in the 0.25% EG group (Table 3).

The obtained results indicate that the additive in the minimum dose of 0.25%, beneficially influences the metabolic health of quails in states of stress and high metabolic demands, especially liver function, intervening as a natural adaptogenic product.

In the complex assessment of the influence of biologically active compounds on farm animals and poultry, it is very important to monitor essential zootechnical parameters, such as: body weight, egg laying intensity, daily gain, viability, feed conversion, etc. (Balanescu et al. 2019; Khazaei et al. 2021; Miao et al. 2021; Macari et al., 2024; Pistol, 2025). According to the cited sources the animal productive parameters are essential in evaluating and explaining the results obtained in the process of hematological and biochemical investigations for establishing the optimal dose and administration regimen of the tested products.

In our study, the effect of the Omepol 30 phytomicrobial additive on body mass indices in quails during the full egg-laying process was investigated. At the beginning of the study, the body mass of quails from different groups did not differ significantly and varied between 291.3 ± 5.5 and 292.2 ± 5.7 g (Table 4).

Table 4. Influence of the Omepol 30 additive on productive indices of quails

Indices	Group		
	CG	EG 0.25%	EG 0.5%
Nr. quails /debut, head	50	50	50
Body mass/debut, g	292.2±5.7	291.3±5.5	291.5±7.0
Body mass at 35 days, g	261.7±7.1**	278.8±9.5	268.4±6.6**
Total gain /debut - 35 days, g/head	-31.12	-12.50	-23.11
Nr. quails /at 71 days, head	40	42	41
Body mass at 71 days, g	265.8±8.6	294.0±6.6**	285.6±8.8
Total gain /35 - 71 days, g/head	-26.4	2.70	-5.9
Average daily gain /period of 71 days, g	-	0.038	-
Viability, %	80.0	84.0	82.0

Note: ** - $p<0.01$

At 35 days the body mass dynamics had a negative expression, but with different values. During this period, birds in the CG and 0.5% EG lost an average of 31.12 and 23.11 g respectively ($p<0.01$), in body weight compared to the beginning of the study, and in the 0.25% EG this decrease of body mass was less pronounced and constituted 12.50 g (Table 4). At the end of the experiment (71 days) the

body mass of the quails increased compared to the 35th day in all groups. In the CG the average mass was 265.8 ± 8.6 g, insignificantly higher (1.6%) compared to the value at 35th day. In the 0.25% EG and 0.5% EG in the same period the body mass was 294.0 ± 6.6 and 285.6 ± 8.8 g with increases of 5.5 and 6.4% compared to the reference values (Table 4). Thus, we can mention that at the end of the experiment, the body mass of the quails from the 0.25% EG and 0.5% EG was 10.6 ($p<0.01$) and 7.5% higher respectively compared to the quails from the CG. It should be noted that the minimum concentration of 0.25% is the only one that ensures at the end of the experiment a positive gain in the weight of the birds of 2.70 g/head, and a maximum flock viability of 84%. In the CG and 0.5% EG during the experiment, the quails lost body mass, the total gain being negative, and the viability of the flock were 80 and 82% respectively (Table 4). The beneficial impact of biologically active products of different nature on the body mass and viability of birds has been established by several authors (Balanescu et al., 2019; Pavlicenco, 2019; Ahmed et al., 2024; Pistol, 2025).

CONCLUSIONS

On balance, supplementation of the quail ration, exploited in poultry farm conditions for meat and eggs, with the Omepol 30 feed additive, obtained from residual biomass of barley and carrot from the food industry and exopolysaccharides of pigmented yeast *Rhodotorula mucilaginosa*, does not induce adverse reactions, has a positive effects the health and welfare of birds. The additive in the concentration of 0.25 and 0.5% significantly influences the basal metabolism, especially protein metabolism, by increasing the content of total proteins and albumins in the blood, also reflected in increasing urea and decreasing uric acid levels. The additive significantly increases the concentration of creatinine in serum, a beneficial phenomenon, correlated with the body muscle mass and influences the functional state of the liver, directly involved in the development of metabolic processes, by modifying the concentration of ALT, AST and bilirubin. Despite that, during the experimental period, the values of the indices evaluated in the serum were within the limits of physiological norms. The positive influence of the additive, in the 0.25% concentration on the protein metabolism of quails and the functional state of the liver is also confirmed by the flock viability and the dynamic of the body mass of quails, exploited in poultry farm conditions.
The scale-up of the additive use requires further research to optimize the concentration range, as well as the period and duration of administration, in order to maximize quail performance.

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REFERENCES

Ahmed, E. M., Attia, A. I., Ibrahem, Z. A., Alshehry, G., Algarni, E. H., Aldekhail, N. M., Abd El-Hack, M. E. (2024). The impacts of dietary inclusion of soybean oil and linseed oil on growth performance, carcass yield, and health status of growing Japanese quail. *Poultry Science*, *103*(7), 103746, https://doi.org/10.1016/j.psj.2024.103746.

Alagawany, M., El-Saadony, M. T., Elnesr, S. S., Farahat, M., Attia, G., Madkour, M., & Reda, F. M. (2021). Use of lemongrass essential oil as a feed additive in quail's nutrition: its effect on growth, carcass, blood biochemistry, antioxidant and immunological indices, digestive enzymes and intestinal microbiota. *Poultry science, 100*(6), 101172, https://doi.org/10.1016/j.psj.2021.101172.

Balanescu, S., Voiniţchi, E., Roşca, I., Cociu, V., & Zaitceva, D. (2019). Influenţa prebioticul ANCORFIT-Poultry asupra performanţei de creştere a indicilor sangvini la puii de carne COB 500. *Lucrări ştiinţifice ale Universităţii Agrare de Stat din Moldova*, 54 Medicină Veterinară: materialele Simpozionului Ştiinţific Internaţional „45 ani de învăţământ superior medical veterinar din Republica Moldova”, 190-196, http://repository.utm.md/handle/5014/27031.

Baltag, G. (2020). *Economia ramurii zootehnice*. Chișinău, MD: PrintCaro Publishing House, 284 p.

https://ibn.idsi.md/sites/default/files/imag_file/baltag_monografie.pdf.

Elbaz, N., Ashour, E. A., Bassiony, S. S., Elsherbeni, A. I., Mahgoub, S. A., Osman, A. O., & Abd El-Hack, M. E. (2025). Dietary probiotic supplementation with *Lactococcus lactis* and *Bacillus velezensis* enhances growth performance, meat quality, blood profiles, and cecal and feed microbiota in growing rabbits. *Animal Biotechnology*, *36*(1), 2577947, https://doi.org/10.1080/10495398.2025.2577947.

Galip, N., & Seyidoolu, N. (2012). Effect of yeast culture on serum lipid and meat lipid values of rabbits. *Journal of Animal and Veterinary Advances*, *11*(22), 4115-4120. DOI: 10.30782/uluvfd.163480.

Georgescu, G., Temișan, V., Podar, C., & Velea, C. (1995). *Tratat de creştere a bovinelor*. Bucharest, RO: Ceres Publishing House.

Gudumac, V., Tagadiuc, O., Rîvneac, V., Sardari, V., Pantea, V., Andronache, L., & Ştîrba, O. (2010). *Investigaţii biochimice. Volumul II. Micrometode. Elaborare metodică.* Chișinău, MD: „Elena VI" Publsihing House.

Hamprakorn, K., Maneewan, B., Jantasin, W., Lani, M.N., Moonmanee, T., & Panatuk, J. (2025). Effect of extracted phycocyanin by-products as a synbiotic supplement on the production performance and intestinal morphology of broilers. *Veterinary World*, *18*(1), 52-59, doi: 10.14202/vetworld.2025.52-59.

Khazaei, R., Requena, F., Seidavi, A., & Matinez, A. (2021). Vitamins E and C supplementation in Japanese quail: effects on growth performance and biochemical and hematological parameters. *Brazilan Journal of Poultry Science, 33*(2), 1-6, DOI: 10.1590/1806-9061-2020-1269.

Macari, V., Chiselița, O., Rotaru, A., Chiselița, N., Efremova, N., & Maţencu, D. (2024). Influence of complex microbial preparation on productivity and clinical hematological status of rabbits kits. *Scientific Papers. Series D. Animal Science*, *67*(2), 332-338, https://animalsciencejournal.usamv.ro/pdf/2024/issue_2/Art44.pdf.

Macari, V., Putin, V., Rudic, V., Macari, A., Bălănescu, S., & Enciu, V. (2014). *Procedeu de ameliorare a sănătăţii şi stimulare a productivităţii la puii de carne*: *Recomandări.* Chișinău, MD: UASM. „Print-Caro" Publishing House, 35 p., https://repository.utm.md/handle/5014/33619.

Maţencu, D. (2019). *Impactul remediului BioR asupra stării funcţionale a ficatului la iepuroaice pe parcursul ciclului reproductiv*: Simpozion ştiinţific internaţional „45 ani de învăţământ superior medical veterinar din Republica Moldova", Chișinău, MD: UASM, Medicina Veterinară*,* 54, 154-160, ISBN 978-9975-64-310-8.

Miao, S., Zhou, W., Li H., Zhu, M., Dong, X., & Zou, X. (2021). Effects of coated sodium butyrate on production performance, egg quality, serum biochemistry, digestive enzyme activity, and intestinal health of laying hens. *Italian Journal of Animal Science*, *20*(1) 1452–1461, https://doi.org/10.1080/1828051X.2021.1960209.

Mohamed, M.A.A., Anas, H., Alduwish, M.A., Alharbi, N.A., Alian, H.A., Youssef, I.M., Mahmoud, M., Elolimy, A.A., Abd El-Hack, M.E., & Saber, H.S. (2025). Influence of probiotic supplementation on growth, health and gut characteristics in growing rabbits. *Italian Journal of Animal Science*, *24*(1), 1499-1514. https://doi.org/10.1080/1828051X.2025.2528554.

Nazarenko, G.I., & Kishkun, A.A. (2006). *Clinical evaluation of laboratory test results*. Moscow: Medicine, 553 p. https://j.twirpx.link/file/2670993/ In Russian.

Negm, M.H., Aldhalmi, A.K., Ashour, E.A., Mohamed L.A., Kamal, M., Rashad A., Mohammad, M.H. Khan M.M.H., El-Hack, M.E.A., Ayman, A., & Swelum, A.A. (2025). Growth, carcass traits, blood chemistry and gut microbiota in broiler chickens fed diets enriched with garden cress seed powder as a natural growth enhancer. *Veterinary Medicine and Science*, *11*(3), e70397, DOI: 10.1002/vms3.70397.

Olgun, O., Kilinç, G., Gül, E.T., Gökmen, F., Yildiz, A., Uygur, V., Sevim, B., & Sarmiento-Garcia, A. (2024). Impact of manganese hydroxychloride on egg quality, antioxidant capacity, bone characteristics, and mineral excretion in laying quail. *Scientific Papers. Series D. Animal Science, 67*(2), 378-387, https://animalsciencejournal.usamv.ro/pdf/2024/issue_2/Art51.pdf.

Pavlicenco, N. (2019). *Efectele remediului BioR asupra indicilor fiziologo-metabolici şi bioproductivi la prepeliţă*. Abstract of the doctoral thesis in biological sciences, Chișinău, 29 p.

Pistol, G. (2025). *Fortificarea sănătăţii şi bioprodductivităţii găinilor-ouătoare în rezultatul utilizării produsului autohton ZooBioR*. Abstract of the doctoral thesis in veterinary medical sciences, Chișinău, 35 p.

Putin, V. (2014). *Aspecte fiziologo-metabolice ale acţiunii preparatului BioR asupra puilor-broiler*. Abstract of the doctoral thesis in biological sciences, Chișinău, 30 p.

Putin, V., Macari, V., & Rotaru, A. (2020). *Noi oportunităţi în ameliorarea sănătăţii şi stimularea productivităţii la puii de carne.* Chișinău, RO: «Print-Caro» Publishing House, 127 p.

Simeanu, D. (2004). *Biostimulatori în alimentaţia păsărilor*. Iaşi, RO: Alfa Publishing House, 196 p. ISBN 973-8278-53-8.