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Influence of probiotic additive “Evitalia” on growth and blood indices of quails

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The results of the studies on the determination of the optimal dose of the probiotic additive “Evitalia” (PAE) for the quails of the Texas breed have been presented in the article. The experiments were conducted on the quails aged 1–35 days. The object of the research was the probiotic additive “Evitalia” that consisted of eight components (the strains of lactic acidmicroorganisms, macro- and microelements). The subject of the investigation was the influence of PAE on the growth, preservation, the morphological composition and biochemical indices of blood. The studies were carried out in the following conditions of microclimate and sanitary regime: the air temperature in the pens-cages was 16–18 °C in the autumn and winter period that was 5–7 °C lower than it was provided by the standard; in spring the temperature was 23–15 °C that was lower than it was provided by the standard (29–35 °C). The concentration of carbon dioxide ranged within 0.20–0.25 % (2.0–2.5 l/m³), ammonia – 12–13.4 mg/m³, the general contamination of the air by microflora was 50–60 thousand KOE/m³. The experiments were conducted on the four groups of quails, 60 quails in each group. The quails of the control group were fed by water without PAE, the probiotic at the dose of 7 mg/500 ml of water was given to the quails of the experimental group 1 (E-1), 9 mg of probiotic/500 ml water received the birds of the experimental group 2 (E-2) and the quails of the experimental group 3 (E-3) were given the probiotic at the dose of 11 mg/500 ml water. The positive influence of the probiotic additive “Evitalia” on the growth and the body live weight gain of the quails was observed in the experimental groups as compared to the quails of the control group. The trustworthy increase in the growth and live weight gain of the quails was detected on the 7-, 14-, 21-, 35-day of their life ($P < 0.05$), especially in the quails that received PAE at the dose of 9 mg (E-2). The quails of the experimental group 2 exceeded the others by the average daily live weight gains. The growth intensity of the quails in the experimental group 2 was 6.43 % higher than that of the control one, higher by 3.47 % and 5.57 % than in the experimental groups 1 and 3, respectively. The preservation of the quails in the control group was lower by 4.8 – 5.1 % as compared to the quails in the experimental groups. By the data on the growth of the body live weight, the composition and biochemical indices of blood of the quails it can be concluded that the optimal dose of the probioticadditive “Evitalia” is 9 mg/500 ml water that activates hemapoiesis and stimulates the growth and development of quails.

Key words: probioticadditive “Evitalia”, quail, morphological indicators of blood, average daily live weight gain, preservation.

Introduction

The modern stage of the development of quail breeding has been predetermined by the strict conditions of the all year-round keeping of the quails in the closed space without any contact with the elements of the biosphere (air, soil, water), when the only connecting link between the organism and nature is fodder with which the quails

receive ray energy, mineral substances, vitamins, amino acids (Kochish et al., 2005; Zherebov, 2011). In such conditions of quail growing the use of immune stimulating drugs to increase the indicators of the productivity and body resistance is relevant and necessary (Ibrahim & Abu Salem, 2009; Paliy et al., 2018).

Quail farming is an important direction in the development of meat poultry farming in a number of countries.

The potential of this branch is early maturity, relatively low maintenance costs as well as the possibility to breed quails in the conditions of the commercial and subsidiary farms (Sahin et al., 2001).

One of the most important issues in modern poultry farming is the issue of the increase in the viability of quails at different stages of their development. The specificity of the bird ontogenesis is that the development of an embryo takes place outside the mother's body, it occurs in the environment that has an influence on the postnatal development of the bird by abiotic and biological factors (feeds, temperature fluctuations, light, noise, microflora and others) (Garmata, 2018). The influence of different factors causes the changes of homeostasis, the processes of metabolism (Ayasan et al., 2006; Hristov et al., 2017), the reduction of resistance and productivity (Groza, 2014; Munez et al., 2015).

Quails have a number of advantages over the other types of poultry: their growth rate is five times as high as that of the chickens, the egg production begins at the age of 5–6 weeks. Quail eggs contain more vitamins A, P, K, B₆, B₂, iron, lysozyme (Kochish et al., 2005). The weight of a laying quail is up to 140 g, the weight of the eggs laid by a laying quail for a year is 24 times as high as the weight of the body (Dener & Bidg, 1996).

One of the actual directions to realize the genetic potential of quails is the use of the immunostimulating drugs of natural origin that condition the preservation and activation of the defense reactions of the body (Karput & Babina, 1996).

The probiotic additive “Evitalia” was used in our experiments as an alternative to synthetic drugs. The additive is freeze-dried special strains of lactic and other microorganisms (acidophilic bacillus, lactococci, bacteriocins) and a number of the components: vitamins: B₁, B₂, B₆, B₁₂, A, E, C; macro- and microelements (Ca, Fe, Mg). High association of live microorganisms (more than 2 ppm) in one bottle 1,5 – 2 × 10⁹ KOE that contributed the acidification of the intestinal contents, suppressed the growth of putrefaction and conditionally pathogenic microorganisms, reduced the formation of enterotoxins, had a positive influence on the protective functions of the body (Kurdeko & Sandul, 2010; Davlova, 2015).

Material and methods

The research was conducted on the basis of “Feldman Eco-Park” (Kharkiv). For the experiment four groups of

the quails of Texas breed were formed by the principle of analogues: three experimental groups and a control one. During the studies the quails of the experimental groups were fed the probiotic “Evitalia” with water: E-1 – 7 mg/500 ml water, E-2 – 9 mg/500 ml, E-3 – 11 mg/500 ml.

The quails were kept in the cages in a separate pen for 16 sections in three tiers, where there were 40–60 heads. Trixie 50w IR lamps and 60w LED lamps were installed for heating. The technological parameters (temperature and light regime, stocking density, access to feeds and water) were provided in accordance with the Department Standards for Technological Design (DSTD) of poultry enterprises. During the experiment the temperature and relative humidity of the air were monitored with Assmanpsychrometer, the speed of air velocity – by an electroanemometer, the lighting – with a U-16 light meter, the content of ammonia in the air was determined by the express method according to V.D. Prokhorov. The growth of the quails was monitored on an electronic scale of the VLKT-500 type with the calculation of the average daily weight gain (ADG), the clinical and physiological indices (body temperature) were monitored with an electrothermometer, pulse and respiration – with a phonendoscope.

There are only a few reports about the possibility of using the probiotic “Evitalia” in animal husbandry (Nalyvayska, 2010; Cherny & Kulak, 2016). No research was carried out in quail farming that conditioned the necessity to study the above probiotic in this industry.

Results and discussion

The genetic program of poultry productivity can be achieved if the production technology, comfortable conditions of microclimate and sanitary conditions are observed (Golubev et al., 2016).

The live weight of the body is an objective indicator of the growth of the organism as a whole, the exterior measurements reflect the growth of separate parts of the body and its skeleton (Medvedskiy, 2015). In the biological sense the above indicators are characterized by an alteration of their increase and decrease that is determined by the change of the live weight of the body with age (Mudji & Mubarah, 2015; Skvortsova, 2020).

The live weight is one of the most important indices of the quail health (Table 1).

Table 1
Dynamics of live weight of the quails, g (M ± m, n = 40)

Group	Age, days			
	7	14	21	35
Control	28.3 ± 0.09	80.3 ± 0.74	136.11 ± 8.2	223.4 ± 1.36
E – 1	28.01 ± 0.07	82.1 ± 0.49	138.4 ± 3.34	227.3 ± 1.74
E – 2	28.17 ± 0.07	83.2 ± 0.20	140.4 ± 2.53	231.8 ± 1.56
E – 3	28.11 ± 0.08	83.11 ± 0.32	138.5 ± 3.14	227.4 ± 2.03
% to control:				
E – 1	102.60	102.84	101.68	101.74
E – 2	103.18	103.61	103.15	103.76
E – 3	102.96	103.39	102.76	101.83

The live weight of one day-old quail was 8.4–8.7 g. The young quails at the age of 7 days exceeded the quails of the control group in terms of the live weight: E-1 by 2.6 %, E-2 – by 3.18 %, E-3 – by 2.96 %; At the age of 14 days the quails from the E-1, E-2 и E-3 exceeded the analogues from the control group by 2.84, 3.61 and 3.39 %, respectively ($P < 0.05$). At the age of 21 days the difference in the live weight in the quails of the experimental groups was 1.76 % (E-1), 3 % (E-2) and 2.35 % (E-3). The quails of the experimental group 2 that was

given 9 mg of the probiotic “Evitalia” a day grew more intensively. At the age of 35 days they exceeded the quails of the control group 1.29 %, E-2, E-1 – by 2,86 %, E-3 – by 2.46 %.

An important indicator that characterizes the poultry productivity is the growth rate for a particular period and the higher it is, the less time it takes to grow the poultry (Tuchemskiy, 1999; Razanova & Golubenko, 2017). Giving the probiotic additive “Evitalia” with water had a positive influence on the growth rate of the quails (Table 2).

Table 2

Changes of the average daily live weight gains of the quails in the experimental groups ($M \pm m$, $n = 5$)

Age, days	Group			
	Control	E-1	E-2	E-3
1 – 7	2.33 ± 0.02	2.41 ± 0.04	$2.48 \pm 0.03^*$	$2.46 \pm 0.02^*$
% to control	100.0	103.43	106.43**	105.57*
1 – 14	7.18 ± 0.03	7.68 ± 0.05	7.84 ± 0.06	7.70 ± 0.03
% to control	100.0	106.96	109.19**	107.24*
1 – 28	7.5 ± 0.06	7.8 ± 0.05	8.33 ± 0.05	7.32 ± 0.03
% to control	100.0	103.90	110.9**	105.45
1 – 35	6.38 ± 0.05	6.47 ± 0.03	$6.87 \pm 0.04^*$	$6.59 \pm 0.02^*$
% to control	100.0	104.41	107.68	103.29

* $P < 0.05$; ** $P < 0.001$

The analysis of the data given in the table 2 has shown that the growth of the quails was uneven. The quails that received the probiotic “Evitalia” grew more intensively in the first, second and third week of their life. The average daily live weight gains at the age of 1–7 days were higher in E-1 by 3.43 %, E-2 – by 6,43%, E-3 – by 5.57 % than in the control. By the age of 35 days the intensity of the

growth decreased, however the quails of the experimental groups exceeded the quails of the control group by 3.29 and 7.68 % ($P < 0.05$).

One of the most important functions in the poultry body is performed by the morphological indices of blood that objectively reflect the intensity of redox processes (Table 3).

Table 3

Morphological parameters of blood of the quails in the experimental groups ($M \pm m$, $n = 5$)

Age, days	Group			
	Control	E-1	E-2	E-3
hemoglobin, g/l				
7	108.43 ± 46	112.40 ± 7.51	120.30^{**}	116.50 ± 5.39
% to control	100.0	103.66	109.47*	105.44
14	109.87 ± 7.11	112.31 ± 9.03	119.8 ± 53	117.40 ± 5.72
% to control	100.0	102.22	109.03**	106.85**
21	110.25 ± 5.60	114.40 ± 7.10	$122.4 \pm 11.30^*$	115.20 ± 7.43
% to control	100.0	103.76	111.02**	104.48
35	107.45	114.52^*	125.73^{**}	114.85 ± 8.12
% to control	100.0	106.57	117.01	106.88
erythrocytes, T/l				
7	3.01 ± 0.11	3.17 ± 0.02	3.28 ± 0.19	3.20 ± 0.17
% to control	100.0	105.31	108.97	106.31
14	2.86 ± 0.14	2.97 ± 0.23	$3.30 \pm 0.25^{**}$	2.93 ± 0.18
% to control	100.0	103.84	115.38**	110.83
21	2.51	2.63 ± 0.15	2.84 ± 0.11	2.62 ± 0.20
% to control	100.0	104.78	113.14	104.38
35	2.54	2.58 ± 0.19	2.93 ± 0.17	2.60 ± 0.11
% to control	200.0	102.78	115.35	103.58
leucocytes, g/l				
7	20.13 ± 1.80	20.76 ± 2.40	20.76 ± 2.40	22.09 ± 2.75
% to control	100.0	105.96	103.12	109.79
14	22.10 ± 2.38	21.19 ± 3.71	23.07 ± 3.11	22.87 ± 3.06
% to control	100.0	100.42	104.34	103.48
21	23.10 ± 2.41	23.13 ± 2.52	$24.10 \pm 3.14^*$	23.16 ± 2.48
% to control	100.0	100.08	104.32	100.25
35	23.44 ± 2.38	23.51 ± 2.40	$24.81 \pm 3.52^*$	23.80 ± 2.31
% to control	100.0	100.29	105.84*	100.68

Thus, (table 1), hemoglobin as a respiratory pigment of an erythrocyte, when splitting off the oxygen, turns into the oxidized or reduced hemoglobin (Georgievskiy, 1990). In our studies the concentration of hemoglobin in the quails of the experimental group 2 was higher by 9.47–25.3 % as compared to the control one ($P < 0.05$), in our opinion that was connected with age and the intensity of the oxidative processes in the body.

The difference in the number of erythrocytes was revealed between the quails of the experimental groups as compared to the control. Thus, the content of erythrocytes in the quails of the experimental group 1 at the age of 14 days was higher by 5.31 %, in E-3 – by 6.31 % ($P > 0.5$), in E-2 – by 8.97 % ($P < 0.05$). At the age of 35 days the number of erythrocytes in the quails of the experimental group 2 was higher by 15.35 – 15.38 % as compared to the control group. No significant difference was found for the above parameter in the blood of the quails in the experimental groups 3 and 1, the difference was 10.62 and 112.92 % ($P > 0.5$). The content of leucocytes that perform the function of phagocytes, bacteria and foreign bodies, blood coagulation and metabolism was practically constant and did not go beyond the confidence limits. The differences in the number of leucocytes between the experimental groups were in the range of 3.12 – 4.34 % ($P > 0.5$) and the differences were significant as compared to the control group ($P < 0.05$).

Blood corpuscles are the clearest criteria to assess the effect of PAE on the quails. They include lymphocytes that produce gamma-globulins having phagocytic activity. In our research their level fluctuated within 65.73 – 66.54 %, that was higher by 13.4–15.1 % ($P < 0.001$) than in the quails of the control group at the age of 14-, 21-, 35- days. In our opinion, it was conditioned by the effect of PAE and better adaptation of the quails to the microclimatic factors. The greatest number of eosinophils that have phagocytic and motor activity was detected in the quails of the experimental group 2 (0.33–0.34 %). As for the monocytes performing bactericidal and phagocytic activity, their number was kept within 1.0 – 1.18 %, that was higher than in the control: in E-1 – by 1.76 %, E-2 – 1.88 % ($P < 0.05$), E-3 – by 1.74 % ($P > 0.5$).

Feeding PAE with water to the quails of the experimental groups had a positive influence on the retention of vitamins in their liver (after the decapitation at the age of 35 days). The content of vitamin A was higher in the quails of the experimental group 1 by 1.01 %, E-2 – by 1.29 %, E-3 – by 0.97 %; the content of vitamin C was higher by 5.2, 8.7 and 7.2 %, respectively, as compared to the control. At the same time, a positive correlation between their content and the dose of the probiotic supplement “Evitalia” has not been established.

The level of calcium in the blood serum of the quails of the experimental groups was on average higher by 3.2 – 3.8 % than the same indicator in the quails of the control group ($P < 0.01$) that is in accordance with the reports (Caren et al., 1989; Lisunova, 2009).

Conclusions

As a result of the use of the probiotic additive “Evitalia” in the conditions of non-standard microclimate and sanitary and hygienic regime it has been revealed that the additive “Evitalia” promoted the stimulation of the live weight growth by 3.15 % and the average daily weight gains of the quails by 6.57 % ($P < 0.05$), the increase in the preservation of the young quails by 4.8–5.1 %, the decrease in the limb morbidity by 18.3 %, the activation of hematopoiesis: concentration of hemoglobin by 6.57 and 17.1 %, erythrocytes – by 10.62–15.35 % ($P < 0.05$). The optimal is the giving of the probiotic additive “Evitalia” in the dose of 9 mg/500 ml of drinking water that allows to improve the blood leucogram, to reduce the culling of quails because of limb diseases to 0.62 %.

Prospects for further research. Further research will be aimed at the studying of protein composition of blood serum, the level of cellular and humoral nonspecific protection of the quails of different breeds under the influence of abiotic factors.

Conflict of interest

The authors declare that there is no conflict of interest.

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