BULLETIN OF NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN
ISSN 1991-3494
Volume 4, Number 380 (2019), 27 – 37 **https://doi.org/10.32014/2019.2518-1467.89**

UDC 636.087.7

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BASULIFOR PROBIOTIC SUPPLEMENT, ITS IMPACT ON BODY AND PRODUCTIVITY OF YOUNG QUAILS

Abstract. For the first time, on the basis of comprehensive research, the feasibility of using Basulifor domestic probiotic supplement in the growing technology of quail was scientifically grounded and experimentally proved. The feed additive contributed to an increase in the number of erythrocytes in the blood of birds by 5.20-5.69% (P<0.05), hemoglobin concentration - by 3.80-4.48 (P<0.05), the amount of total protein in serum blood - by 3.89-6.66% (P<0.05), gamma globulins - by 7.29-8.03% (P<0.01), class A immunoglobulins - by 11.50-15.30% (P<0.01), IgM - by 7.14-10.70% (P<0.01), IgG - by 6.54-6.80% (P<0.01), birds' preservation - 93.0 to 97.34% (P<0.01).It was established that the 1st and 2nd experimental groups quails surpassed their peers in control in live weight by 5.30 and 10.50 g (P<0.05), the average daily gain was 0.08 and 0.17 g. Killing yield of quails against the background of the use of feed supplement was higher by 1.97% and 3.76% (P<0.05) rather than in the control group. Quail meat samples of the 1st experimental group treated with ozone-air mixture at a dose of 5 mg/m^3, without losing their quality indicators, remained for 18.00±0.36 days, and in the 2nd experimental group when processing meat samples with ozone in a dose of 10 mg/m^3 - for 24.00±0.53 days. Compared with the control batch of meat, these indicators in the experimental groups were higher by 12.0 and 18.0 days (P<0.01). The novelty of the obtained data is confirmed by the fact that for the first time the feasibility of correcting the morphological, biochemical, and immune status of the body, increasing the preservation, productivity and quality of meat products of young quails by using Basulifor probiotic feed additive has been proved.

Keywords: quail, Basulifor feed supplement; immunoglobulins; growth; productivity; meat quality.

Introduction. In recent years, in Russia quail farming has been widely distributed, because the products are valued not only in quality, but also in a short period of reproduction. Being one of the important branches of the poultry industry, quail farming was created as a complex system, providing processes from poultry reproduction to the production of finished products, and sale. Quails, unlike other birds, have several distinctive advantages: they have a high temperature, an intense metabolism, a small size, a high precocity, and egg production capacity. In Germany, France, Great Britain, Italy, Canada, quail products are valued so highly that special farms are organized for the production of their products [1-8].

The development and implementation of efficient technologies for keeping, feeding and servicing birds into the production process, although it allows to increase productivity, improve the quality of the products and profitability of the industry as a whole, however, it often violates the relationship of the bird organism with the environment and traditional conditions of keeping and feeding established during the phylogeny. Processing methods of modern poultry complexes, irrational use of antibacterial drugs cause a violation of metabolism, reduce the resistance of the quail body, which ultimately leads to high morbidity and low productivity. In such conditions, the nature of the bird and the physiological features of the organism are not able to vary as quickly as the conditions of keeping, feeding and the poultry technology as a whole. Often the bird cannot avoid the action of stress factors, adapt to changing environmental conditions, which leads to various functional disorders and diseases [9-14].

In the light of the above, the development and introduction of new domestic probiotic feed supplement to the manufacturing technology of dietary meat of young quails to enhance the body's protective and adaptive mechanisms to the environmental conditions and realize the bioresource potential of the meat qualities of young quails is a topical issue.

The aim of this work is a scientific substantiation of the use of the Basulifor supplement to activate nonspecific resistance and productive potential of young quails.

Material and methods. Experimental studies were conducted in the poultry farm of Tsivilsky district of the Chuvash Republic in accordance with the research plan of the Chuvash State Agricultural Academy, and the material processing was carried out in the Chuvash Republican Veterinary Laboratory of the State Veterinary Service of the Chuvash Republic and in the laboratory of the Department of Morphology, Obstetrics and Therapy of the Chuvash State Agricultural Academy in the period from 2014 to 2017.

The objects of research were quails of the Japanese breed of the egg direction from 1-day to 60-day-old age and quail meat. In the scientific and economic experience, three groups were formed based on the principle of pairs-analogues taking into account the clinical and physiological state, age and live weight of 300 birds (150 females and 150 males) in each group.In order to improve the reproductive qualities of the Japanese quail breed and the productive potential of birds the Basulifor probiotic feed supplement was used. Quails of the 1st experimental group were fed with Basulifor at a dose of 0.2 g/kg of feed from 1 to 60 days of age; of the 2nd experimental group - with Basulifor at a dose of 0.3 g/kg in the same terms, in the control group the feed additive was not introduced.

Basulifor is a probiotic feed supplement containing the microbial mass of living natural strains of Bacillus subtilis and Bacillus licheniformis microorganisms in an optimal ratio, producing digestive enzymes, amino acids and B vitamins. The number of microbial cells in the feed additive is 1x109 CFU. In appearance, the drug is a powder of gray color, a sweetish taste, with a weak fermented milk smell, easily soluble in water.

Probiotic feed preparations and additives are used to improve the digestibility of feed, increase the natural resistance of farm animals, birds, fish and fur animals. Basulifor is available in dry and liquid forms, is a high-tech product, convenient to use. The drug does not lose its beneficial qualities when expanding and pelletizing the forage. It has no adverse effect on the organism of animals and birds. Contraindications to the use of feed additives were not found [15-17].

The study of the clinical and physiological state, growth and development, the morphological, biochemical and immunological compositions of the quail blood was performed on the 1st, 15th, 30th, 45th, and 60th days of their life according to modern generally accepted methods in veterinary medicine. After killing birds of the control and experimental groups at the age of 60 days, we conducted a veterinary and sanitary examination of meat.

Results. It has been established that the microclimate parameters in premises for growing quails corresponded to zoohygienic norms. In the cages where the quails of the control and experimental groups were kept, at a floor housing, the air temperature in the premises was 27.10±0.18 °C, at the cage housing - 24.00±0.15 °C. The relative humidity of the air in the room was 61.40±0.16% at floor housing, and 68.70±0.24% with cage housing. The air velocity at the floor housing was 0.13±0.01 m/s, at the cage housing - 0.17±0.05 m/s. The concentration of carbon dioxide in the air of the premises for quails with the floor housing was 0.07±0.01%, the content of ammonia - 2.78±0.02 mg/m^3, hydrogen sulfide - 1.87±0.04 mg/m^3.

The applied Basulifor probiotic feed supplement influenced the morphological profile of birds. At the age of 15 days, the number of erythrocytes in the blood of quails of the 1st experimental group was significantly higher by 2.65% ($P<0.05$) compared to the control analogues, of the 2nd experimental group - by 3.07% ($P<0.05$). At 30-, 45-, and 60-day-old age, the number of erythrocytes was also higher in the blood of birds of the 1st experimental group by 2.23%, 3.32 and 5.20% ($P<0.05$)than the control indicator, of the 2nd experimental - by 3.71%, 5.53, 6.59% ($P<0.05$), respectively.

The hemoglobin concentration in the quail blood of the 1st experimental group at 15-, 30-, 45-day-old age was higher than the control indicator by 2.19, 2.14 and 3.05% ($P<0.05$), respectively, and in the quail blood of the 2nd experimental group –higher by 1.46, 3.38 and 3.85% ($P<0.05$). At the age of 60 days, the concentration of hemoglobin in the blood of the 1st and 2nd experimental groups quails also turned out to be higher than the control indicator by 3.84 and 4.48% ($P<0.5$), but this excess did not have

statistical validity. The number of leukocytes in the blood of birds in the experimental groups was lower by 2.65-2.91%compared with the control analogues, however the value of this indicator did not go beyond the limits of physiological norms.

Against the background of introduction to the basicdiet of the tested feed additive in the initial period of postnatal ontogenesis, a significant increase in the serum level of total protein is observed due to strengthening of the concentration of albumin and globulin fractions (table 1).

Table 1 – Total protein and its fractions in the blood serum of young quails

Bird groups	Age, days	Indicator, g/l				
		Total protein	Albumins	Alpha-globulins	Beta-globulins	Gamma-globulins
Control	1	28.54±0.48	10.96±0.13	2.18±0.05	2.15±0.05	8.46±0.07
	15	32.44±0.12	12.18±0.27	2.39±0.10	3.99±0.04	10.96±0.34
	30	36.18±0.67	12.10±0.15	3.85±0.14	4.10±0.11	11.15±0.33
	45	38.24±0.45	12.13±0.25	4.11±0.15	4.56±0.16	11.85±0.08*
	60	40.18±0.24	14.15±0.08	5.13±0.19	5.11±0.17	13.01±0.09
1st experimental	1	30.27±0.51	11.85±0.16	2.45±0.12	2.86±0.13	10.18±0.14
	15	33.31±0.20*	12.46±0.10	2.48±0.17	4.03±0.07	11.18±0.17*
	30	37.25±0.40**	12.48±0.14	3.97±0.14	4.17±0.17	11.76±0.38
	45	39.32±0.32**	12.49±0.12**	4.28±0.21**	5.85±0.22	12.48±0.19
	60	41.86±0.25**	14.48±0.11**	5.43±0.23**	6.19±0.23	14.15±0.17
2nd experimental	1	30.72±0.54	11.93±0.18	2.44±0.13	3.11±0.13	10.24±0.15
	15	33.30±0.20*	12.67±0.11	2.50±0.13	4.05±0.06	11.92±0.42*
	30	37.71±0.42**	12.74±0.17	3.99±0.14	4.96±0.21	11.84±0.18
	45	39.73±0.37**	13.25±0.13**	4.35±0.22**	5.28±0.20	13.13±0.18
	60	41.15±0.28**	16.18±0.14**	5.53±0.23**	7.41±0.25	14.79±0.19
* P < 0.05; **P < 0.01.						

The increase in the albumin fraction of the protein was observed from the age of 45 days, although it has a significant value, but at the level of the first threshold of reliability (P<0.05). An advance in the globulin fraction of the protein has been observed since the age of 15 days and with a more pronounced value. The growth of this indicator was mainly due to the gamma-globulin fraction, a significant increase in which amounted to 8.76-13.68% (P<0.01) on the 60th day in the experimental groups of birds, compared to the control group.

The results of the immunological study of quail blood indicate that the introduction into the main ration of birds in the initial period of postnatal ontogenesis of Basulifor probiotic promotes the activation of humoral factors of nonspecific resistance of the organism. Thus, in the experimental group of quails (table 2), compared with the control analogues, there is a significant increase in the level of immunoglobulins of the “IgA” classes by 11.53-12.23% (P<0.01), Ig “M” - by 7.14-10.71% (P<0.01), Ig "G" - by 6.54-6.80% (P<0.01), which indicates an enhancement in the resistance of their organism to adverse environmental factors and, as a result, the genetically established productive potential is more fully realized.

Table 2 – Dynamics of immunoglobulins and quail blood serum intracellular enzymes

Indicator	Bird group		
Ig «A» immunoglobulins	0.26±0.01	0.29±0.01*	0.31±0.02*
Ig «M» immunoglobulins	0.28±0.02	0.30±0.03	0.31±0.02
Ig «G» immunoglobulins	3.82±0.12	4.07±0.11	4.08±0.14
Alanine aminotransferase (ALAT), u/l	93.40±1.01	81.00±1.16**	76.50±1.02**
Alanine aminotransferase (ASAT), u/l	355.80±4.65	338.48±3.36*	320.48±3.09*
*P < 0.05,**P < 0.01.			

Studies have shown that the probiotic feed supplement had a definite influence on the activity of the intracellular enzymes of the blood serum of birds - alanine aminotransferase (ALAT) and aspartate transaminase (ASAT), mainly in the direction of lowering them.

As a result of the use of Basulifor, the ALAT concentration in blood serum of the 1st experimental group of birds decreased by an average of 12.40 units/l by the 45 day of the experiment compared to the analogues in the control; of the 2nd group - by 16 units/l, the ASAT index of quails in the 1st experimental group, in relation to the control, was also lower on average by 17.32 units/l (P<0.05), and in the 2nd experimental group - by 15.32 units/l (P<0.05). At the same time, the content of these enzymes in the blood serum of the experimental quails, compared with the intact birds, did not go beyond the limits of physiological fluctuations.

Application in the technology for growing quails of Basulifor probiotic feed supplement stimulates their growth and development. The live weight of the quails of all three groups naturally grew during the whole experimental period (table 3).

Table 3 – Growth and Development Dynamics of young quails

Age, days	Bird group		
	Control	1st experimental	2ndexperimental
Live weight, g			
1	8.34±0.12	8.31±0.10	8.33±0.11
15	74.00±0.68	75.51±0.12*	78.16±0.72*
30	118.13±0.11	123.32±0.12*	125.18±0.15*
45	127.41±0.13	135.18±0.19**	140.14±0.17**
60	138.56±0.25	148.53±0.27**	149.15±0.27**
Average daily gain, g			
1	–	–	–
15	4.37±0.04	4.51±0.06*	4.57±0.07*
30	3.66±0.03	3.83±0.04*	3.89±0.05*
45	2.64±0.02	2.81±0.02**	2.83±0.03**
60	2.17±0.01	2.31±0.01**	2.34±0.02**
*P < 0.05, **P < 0.01.			

Thus, with equal live weight at birth, in quails of the control group at the age of 30 days it averaged of 118.13±0.11 g, at 60-day-old age it was 138.56±0.25 g. The live weight of quails of the 1st and the 2nd experimental groups were significantly more than the same indicator in the control group at the age of 30 days by 4.39% and 5.96% (P<0.05), at the age of 60 days - by 6.83% and 7.64% (P<0.01). The average daily weight gain of quails in the control group at 15, 30, 45, and 60 days of life were equal to 4.37±0.04 g, 3.66±0.03 g, 2.64±0.02 g, 2.17±0.01 g, in the 1st experimental group quails these indicators exceeded the control analogues by 3.20, 4.64, 6.43, 6.45% (P<0.05), in the 2nd experimental group –excess by 4.57, 6.28, 7.19, 7.83% (P<0.05, 0.01).

Consequently, the revealed tendency to increase in live weight and average daily gains in quail of the experimental groups, compared with control analogues, indicates a growth-promoting effect on the organism of birds by new Basulifor probiotic feed additive.

In quails-layers of the experimental groups, in which the tested feed additive was added to the basicdiet, unlike with the control analogues, egg-laying started a few days earlier (table 4).

The beginning of egg-laying in quails of the control group was observed at 48-day-old age, in the first experimental group - at 44-day-old age, and in the second experimental group - at 43-day-old age. Against the background of the use of the feed additive in the experimental groups of birds, comparing with the control, the age of onset of egg laying was significantly reduced by 4 and 5 days. The egg production capacity per the average quail in the experimental groups was higher on average by 3.84 and 4.80% (P<0.05). There was also an increase in the number of standardized eggs in the experimental groups of

Table 4 – Dynamics of egg production capacity in quails using Basulifor probiotic feed additive

Indicators	Bird group		
	control	1st experimental	2nd experimental
Number of quails-layers, heads	50	50	50
Start of egg laying, age, days	48±1.24	44.00±1.29*	43.00±1.2*
Egg production capacity per average quail-layer, pieces	38	42	44
Number of eggs, % standardized large small cracked shell-less average weight of 1 egg	 68.56±0.90 8.10±0.04 17.96±0.20 2.82±0.04 2.56±0.03 13.39±0.04	 73.57±0.75* 17.02±0.12* 6.88±0.05* 1.12±0.01 0.94±0.04 14.16±0.02	 74.04±0.81* 16.04±0.21* 6.82±0.11* 0.96±0.03 0.83±0.01 14.28±0.02
*P < 0.05.			

birds compared to the control by 7.31 and 8.00% (P<0.01), large eggs almost doubled. In addition, the use of this feed supplement promoted to an increase in high-quality products. Reject (cracked and shell-less eggs) in the experimental groups of birds composed 1.02–0.96% (P<0.05) and 0.94–0.83% (P<0.05), while in the control group of birds, this indicator was at the level of 2.82-2.56%. The weight of eggs in quails of the first and second experimental groups, comparing with the control, was higher on average by 5.75% and 6.64% (P<0.05).

The studies have shown that the fertilizartion rate of eggs in quails-layers of the control group was 75.0% (table 5), and in the first and second experimental groups, with the use of the Basulifor probiotic feed supplement in the bird diet, this figure was 77.00% and 77.52% respectively (P<0.05). In the first experimental group, as a result of using Basulifor, 87 heads of young quails were obtained or 5.93% (P<0.05) and 7.36% (P<0.05) more. The hatchability of quails in the experimental groups exceeded that of the intact group by average of 3.12% and 3.52% (P<0.05).

Table 5 – Quail egg incubation rate

Indicators	Bird group		
	control	1st experimental	2nd experimental
Put egg carriers,pieces	5	5	5
Number of eggs in the carrier, pieces	420	420	420
Laideggs, total, pieces	2100	2100	2100
of whichfertilized, pieces	1575	1617	1628
Gothealthyquails, heads	1466	1553	1574
Hatchabilityofyoungquails, %	93.06	96.18*	96.58*
Preservation of quails up to 30-day-old age: heads inpercents	 1379 94.06	 1508* 97.10*	 1543* 98.03*
*P < 0.05.			

At the age of 60 days, a control killing of 10 quails from each group was conducted (table 6). Poultry killing was carried out in the killing room of the poultry enterprise in accordance with the rules of veterinary inspection of killed birds and veterinary and sanitary examination of meat and meat products [19].

As can be seen from the table, the killing yield in control quails was 65.35%. In addition to the absolute increase in the weight of the eviscerated quail carcass with the use of a probiotic feed additive, the killing yieldwas also increased. Thus, this indicator in quails of the 1st and 2nd experimental groups had a value of 66.64% and 67.81%, which is 1.29% and 2.46% more than the control indicator.

Table 6 – The morphological composition of the carcasses of young quails

Indicators	Bird group		
	control	1st experimental	2nd experimental
Pre-killing weight, g	138.56±0.25	143.89±0.27**	149.15±0.27**
Weight of the eviscerated carcass, g	90.56±0.11	95.89±0.12*	101.15±0.14*
Killing yield, %	65.35±0.08	66.64±0.09*	67.81±0.10*
Muscletissue, %	34.65±0.41	36.71±0.55*	36.98±0.59*
Fattissue, %	10.28±0.20	9.32±0.18*	9.48±0.20*
Bonetissue, %	13.44±0.16	14.12±0.18*	14.15±0.20*
*P < 0.05; **P < 0.01.			

The content of muscle tissue in the carcasses of birds of the first and second experimental groups was higher by 2.06-2.33% (P<0.05) than in the control group. In the carcasses of young quails of the tested groups, the fat tissue content, on the contrary, was lower by 0.96-0.80% (P<0.05), the amount of bone tissue was higher by 0.68-0.71% (P<0.05), respectively.

The chemical composition of the meat of young quails in the experienced groups differed slightly from those of the control group. The moisture content in the poultry meat of the experimental groups, compared with the control analogues, was lower by 1.62-1.46% (P<0.05), the protein content - higher by 1.41-1.63% (P<0, 05), the dry matter - higher by 1.42-1.54% (P<0.05). The quantitative content of crude fat in the meat of experimental and control birds was almost the same and did not have a significant difference.

In the course of the test survey, two series of experiments on the ozonation of quail carcasses were conducted. Each series of experiments have lasted for 30 days. Experienced carcasses of young quails were treated with the ozone-air mixture in non-frozen form. For this, a domestic ozonizer of the "Pozitron-3 Air 1" brand was used.

Samples of meat from control and experimental carcasses were kept chilled for 5 minutes, then tested batches of carcasses were placed in a glass dish, where they were subjected to ozone treatment. In view of the fact that ozone is 2.5 times heavier than air, the ozonizer was placed above meat samples at a distance of 50 cm. In the first series of experiments, carcasses of quail meat were treated with an ozone-air mixture at a dose of 5 mg/m^3 with an exposure of 4 hours for 3 days, and in the second series of experiments - at a dose of 10 mg/m^3 for 4 hours for 4 days. After treatment with an ozone-air mixture, the meat samples were stored in a refrigerating chamber on slatted floors at a temperature of + 4 °C and a relative humidity of 80-85%.

The studies have shown that quail meat samples of the first group treated with ozone-air mixture at a dose of 5.0 mg/m^3, without losing their quality indicators, was reliably preserved for 18.00±36 days (P<0.05), and in the second experimental group when treating samples of meat with ozone at a dose of 10 mg/m^3–for 24.00±0.53 days (P<0.01).Comparing with the control batch of meat, these indicators in the experimental groups were higher on average by 12 and 18 days. Treatment of young quail meat samples with ozone-air mixture had a positive impact on its preservation and shelf life. So, after ozonation, the preservation of chilled meat (+ 4ºC) increased by 3-4 times. The maximum shelf life of samples from the control carcasses was 6.00±0.48 days, the carcasses were yellow, which is not characteristic of fresh meat, and there was also a musty putrefactive smell.

Discussion. The research results showed that the Basulifor probiotic feed additive contributed to the intensification of the growth rate of young quails. Thus, the average daily weight gain in quails of the control group at 7 days of age was 4.66±0.04 g. In the experimental groups of birds, unlike with the control analogues, this indicator in the specified age cycle was significantly higher on average by 2.57% (P<0.05) and 3.00% (P<0.05). At an older age i.e. at 14 and 28 days of age, the average daily weight gain in birds of the tested groups exceeded that of the intact group by an average of 4.02–4.66% and 4.20–4.62% (P<0.05).The most intensive raise in this indicator, both in the control and experimental quails, occurred at the age of 42 and 56 days. Thus, in the indicated age cycles, this index in the control group of birds was characterized by 4.85±0.05 and 4.88±0.06 grams. At the same time, against the background of

using the probiotic feed additive in the ration, in birds of the experimental groups compared with the analogues in the control, the average daily weight gain was higher by 4.53 - 4.94% (P<0.01) and 5.32 - 6.14% (P<0.01).

Some researchers explain the increase in live weight of experimental birds under the influence of probiotic preparations by the fact that young quails acquire higher coefficients of nutrient digestibility, absorption, and their accessibility [18, 19].

The Basulifor feed additive promoted the increase in the pre-killing weight in experimental birds. So, this indicator in young quails of the 1st experimental group, compared with the control analogues, was higher by 5.62% (P<0.01), in the second experimental group - by 6.12% (P<0.01), carcass weight indicator –higher by 7.18% (P<0.01) and 7.51% (P<0.01), killing yield - by 0.60 - 1.02% (P<0.05).

The content of muscle tissue in the carcasses of birds of the first and second experimental groups was 2.06 - 2.33% higher (P<0.05) than in the control. On the contrary, in the young quail carcasses of the experimental groups, the fat tissue content was lower by 0.80–0.90% than in the control group (P<0.05), the amount of bone tissue was higher by 0.68-0.71% (P<0.05) respectively. The chemical parameters of meat in birds of the experimental groups differed slightly from the control group.

The moisture content in the poultry meat of the experimental groups was lower by 1.62-1.46% (P<0.05) than in the control group, the protein content was more by 1.46-1.63% (P<0.05), the dry matter - more by 1.42-1.54% (P<0.05), respectively. The quantitative content of crude fat in the meat of experimental and control birds was almost the same and did not have a significant difference.

Studies have shown that after ozonation sessions, samples of experimental meat differed in quality indicators from those of control ones. Samples from experimental groups had a weak-dry crust and a light-white color, the consistency was soft, weakly elastic, at finger pressing on the meat surface, a dimple appeared, which quickly leveled. The muscles in the cut were slightly moisty and did not leave a wet spot on the filter paper. The broths cooked from experimental meat samples were light, fragrant, and an accumulation of fat drops was observed on the surface. The pH of the meat of young quails was 5.66±0.01 and 5.74±0.03, the reaction to ammonia with Nessler's reagent was negative, to peroxidase - positive, and to sulfuric acid copper - negative.

The furtherin vestigations showed that the quailmeat samples from the 1stgroup treated with ozone-air mixture at a dose of 5 mg/m^3,withoutlosingits qualitative indicators, were truly preserved for18±0.36 days (P<0.01), and the meat samples from the 2nd group with a ozone treatment at a dose of 10 mg/m^3 were preserved for 24±0.53 days (P<0.01). In comparison with control meat, the specified indicators in the tested groups turned out to be higher on 12 and 18 days (table 1). The treated meat samples with ozone-airmixturehada positive impact on their preservation and shelf life. So, after ozonation, the preservation of chilled meat (+4^{0}C) increased by 3-4 times. The maximum shelf life of samples from control carcasses was 6±0.48 days, the carcasses were yellow, which is not characteristic of fresh meat, and there was alsoa musty putrefactive smell.

The egg production capacity of birds, including quails, is an important indicator of poultry farming. The beginning of egg laying in quails of the control group was observed at the age of 48.00±1.24 days, in quails of the first experimental group - at the age of 44.00±1.29 days, of the second experimental group - at the age of 43.00±1.22 days. Against the background of the use of the feed supplement in the tested groups of birds, compared with the control group, the age of onset of egg laying was significantly reduced by 4 and 5 days. The egg production capacity per the average quail-layer of the experimental groups, in relation to the control quails, was higher on average by 3.84 and 4.80% (P<0.05). As can be seen from the presented analysis, in the second tested group, when using the additive at a dose of 0.2 g/kg of feed, the specified indicator was slightly higher by an average of 2.81% (P <0.05) in contrast to the birds of the first tested group, which received the feed additive at a dose of 0.1 g/kg.

There has been observed an increase in the number of standardized eggs in the experimental groups of birds by 7.31% and 8.00% (P<0.05), compared to the control, the number of large eggs almost doubled. In addition, the use of this feed supplement contributed to an improvement of high-quality products. The percentage of reject (cracked and shell-less eggs) in the tested groups was 1.02-0 96% (P<0.05) and 0.94-0.83% (P<0.05), while in the control group of birds, this indicator was characterized by 2.82-2.56%. The weight of quail eggs of the first and second experimental groups, compared with the control, was higher on average by 5.75% and 6.64% (P<0.05), respectively. When using probiotic preparations, similar results were obtained by other researchers [20-23].

According to some scholars, resistance is one of the most important functional characteristics of the organism and is an indicator of its resistance to diverse effects [23]. It is based on the mechanisms that have been formed in the process of evolution, fixed by natural selection and they determine the adaptive form of the reaction of one or another individual or species as a whole. The problem of the study of the effect of probiotic preparations based on spore-forming bacteria on thebody nonspecific resistance of bird in recent years has received adequate consideration. Scientific and economic interest in them is due to the ability of these bacteria in the gastrointestinal tract of birds to synthesize the digestive enzymes, hormones, and other biologically active substances, which contribute to the activation of the body's defense mechanisms[21].

The use of the Basulifor feed additive contributed to growth in the level of class "A" immunoglobulins in the blood serum of birds. So, with the application of the specified feed additive, in the serum of the first tested quail group, compared to the control analogues, by the 45th day of the experiment the level of class A immunoglobulins significantly raised by 20% and 29% ($P<0.05$).Also while using the feed additive the growth of class Ig "M" immunoglobulins in the blood serum of the experienced quails, compared with the controlanalogues, ranged from 0.28±0.02 to 0.31±0.04 g/l ($P<0.05$), and the growth of class Ig "G" immunoglobulins - from 3.82±0.12 to 4.08±0.14 g/l ($P<0.05$).

Summary:

1. The use of the ozonizerpromotes the optimization of the basic parameters of the microclimate in the premises for growing quails. This significantly reduces the concentration of water vapor and harmful gases.

2. Basulifor probiotic feed additive activates morphological, biochemical, and immunological parameters of blood and serum, which leads to the growth of egg and meat productivity and preservation of young quails.

3. The ozone-air mixture allows extending the shelf life of the quail meat without a significant reduction in its quality indicators. According to some researchers, ozone has a high bactericidal activity and extends the shelf life of meat and meat food [22].

Conclusions.

1. Under the influence of the Basulifor probiotic feed supplement, the growth and development of young quails were activated. On the 14th and 28th day, the average daily gain in live weight in birds of the experimental groups exceeded the same indicator of the intact group by an average of 4.02–4.66% ($P<0.05$) and 4.20–4.62% ($P<0.05$). The highest productivity in quails was recorded in the second experimental group, where the tested feed additive was used at a dose of 0.3 g/kg. Thus, the live weight of the quail of this group, in the phase of completion of the production experience, in relation to the control analogues, was significantly higher by 12.94 g ($P<0.01$) or by 4.67%.

2. Quail meat samples of the first group, treated with ozone-air mixture at a dose of 5 mg/m^3, without losing their quality indicators, were truly preserved for 18±0.36 days ($P<0.01$), and in the second experimental group, at treatment of meat samples with ozone at a dose of 10 mg/m3 - for 24±0.53 days ($P<0.01$). Compared with the control meat, these indicators in the tested groups were higher on average by 12 and 18 days. After ozonation, the preservation of chilled meat (+4^{o}C) increased by 3-4 times. Introduction to the basic diet of quail-layer of the Basulifor probiotic feed additive stimulates egg productivity in quails by 3.84-4.80% ($P<0.05$).

3. When using the probiotic feed additive, the concentration of alanine aminotransferase in the blood serum of birds of the first experimental group significantly decreased by an average of 12.40 units/l ($P<0.05$) by the 45 day of experience, compared with the control analogs, in birds of the second experimental group - by 16.9 units/l ($P<0.05$), the level of aspartate aminotransferase in quails of the first tested group was also lower on average by 17.32 units/l ($P<0.05$), and in the second experimental group - by 15.32 units/l ($P<0.05$).

4. When using the Basulifor probiotic feed additive, there was an increase in the tested groups by the 45 day of the experiment of the level of the class "A" immunoglobulin by 20% and 29% ($P<0.05$). The growth of the class Ig "M" immunoglobulins in the serum of the experienced quails ranged from 0.28±0.02 to 0.31±0.04 g/l ($P<0.05$), and the class Ig "G" immunoglobulins - from 3.82±0 to 4.08±0.14 g/l ($P<0.05$).

5. Studies and obtained results showed that under the influence of probiotic feed additive in the blood of quails at the level of physiological norms, the concentration of erythrocytes, hemoglobin increases, the level of leukocytes decreases, and the content of total protein and its fractions increases, which testifies that there are no negative effects on the quail body from the probiotic feed supplement.

Recommendations. In order to realize the bio-resource potential of the body, in industrial quailing for the purpose of activation of nonspecific resistance, increasing the intensity of weight gain, preserving the young quail and increasing the egg productivity of quails, as well as improving the quality indicators of meat and egg productivity, it is recommended to introduce Basulifor in the basic diet at a dose of 0.3 g/kg of feed containing the microbial mass of living natural strains of Bacillus subtilis and Bacillus licheniformis microorganisms in the optimal ratio, producing digestive enzymes, amino acids and B vitamins.

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ПРОБИОТИКАЛЫҚ БАСУЛИФОР АЗЫҚ ҚОСПАСЫНЫҢ БӨДЕНЕ ӨНІМДІЛІГІ МЕН ОНЫҢ ОРГАНИЗІМІНЕ ӘСЕРІ

Аннотация. Алғаш рет кешенді зерттеулер негізінде Басулифор өсіру технологиясында отандық пробиотикалық азық қоспасын пайдалану мүмкіндігі ғылыми негізделген және эксперименталды түрде дәлелденді. Азық қоспасы эритроцити санының көбеюіне әкелді 5,20-5,69% (P <0,05), гемоглобиннің концентрациясы 3,80-4,48 (P <0,05), қан сарысуындағы ақуыздардың жалпы саны қан - 3,89-6,66% (P <0,05), гамма-глобулиндер - 7,29-8,03% (P <0,01), А классындағы иммуноглобулиндер - 11,50-15, Ig M - 7,14-10,70% (P <0,01), Ig G - 6,54-6,80% (P <0,01) , құстардың қауіпсіздігі 93,0% -дан 97,34%-ға дейін (P <0,01). 1-ші және 2-ші эксперименталдық топтардың тірі салмақта 5,30 және 10,50 г (P <0,05) тірі салмақта өздерінің құрдастарынан асып түсетіндігі анықталды, орташа күндік өсу 0,08 және 0,17 г болды. Азық қоспасын қолдану аясында бөдене етінің таза салмағы, 1,97% -ға және 3,76% -ға (P <0,05) жоғары болды. 5 мг / м3 дозада озон мен ауа қоспасын араластырып өңдейтін эксперименталды топтың бөдене етінің үлгілері олардың сапалық көрсеткіштерін жоғалтпай 18.00 ± 0.36 күн қалды, ал екінші сынақ тобында ет сынамаларын өңдеу кезінде 10 мг/м^3 дозада озон - 24,00 ± 0,53 күн. Ет бақылау партиясымен салыстырғанда эксперименталды топтардағы бұл көрсеткіштер 12,0 және 18,0 күнде жоғары болды (P <0,01). Алынған мәліметтердің жаңалығы алғаш рет организмнің морфологиялық, биохимиялық және иммундық жай-күйін түзету, жас бөденелердің ет өнімдерінің қауіпсіздігін, өнімділігі мен сапасын жоғарылатуды Басулифор пробиотикалық қоспаларын қолдану арқылы дәлелденді.

Түйін сөздер: бөдене; азық қоспасы Басулифор; иммуноглобулиндер; өсуі; өнімділік; ет сапасы.

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ПРОБИОТИЧЕСКАЯ КОРМОВАЯ ДОБАВКА БАСУЛИФОР, ЕЕ ВЛИЯНИЕ НА ОРГАНИЗМ И ПРОДУКТИВНОСТЬ ПЕРЕПЕЛЯТ

Аннотация. Впервые на основе комплексных исследований научно обоснована и экспериментально доказана целесообразность использования отечественной пробиотической кормовой добавки Басулифор в

технологии выращивания перепелят. Кормовая добавка способствовала повышению количества эритроцитов в крови птиц на 5,20-5,69% (P<0,05), концентрации гемоглобина – на 3,80-4,48 (P<0,05), количества общего белка в сыворотке крови – на 3,89-6,66% (P<0,05), гамма-глобулинов – на 7,29-8,03% (P<0,01), иммуноглобулинов классов А– на 11,50-15,30% (P<0,01), Ig M – на 7,14-10,70% (P<0,01), IgG – на 6,54-6,80% (P<0,01), сохранности птиц от 93,0 до 97,34% (P<0,01). Установлено, что перепелята 1-й и 2-й опытных групп превосходили сверстников в контроле по живой массе на 5,30 и 10,50 г (P<0,05), среднесуточному приросту – на 0,08 и 0,17 г. Убойный выход перепелят на фоне применения кормовой добавки оказался выше на 1,97% и 3,76% (P<0,05), нежели в контроле. Мясо перепелят опытных образцов 1-й опытной группы, обработанных озоно-воздушной смесью в дозе 5 мг/м^3, не теряя своих качественных показателей, сохранялось в течение 18,00±0,36 дней, а во 2-й опытной группе при обработке проб мяса озоном – в дозе 10 мг/м^3 – 24,00±0,53 дней. По сравнению с контрольной партией мяса, указанные показатели в опытных группах были выше на 12,0 и 18,0 дней (P<0,01). Новизна полученных данных подтверждается тем, что впервые доказана целесообразность коррекции морфологического, биохимического и иммунного статуса организма, повышения сохранности, продуктивности и качества мясной продукции молодняка перепелов путем применения пробиотической кормовой добавки Басулифор.

Ключевые слова: перепелята; кормовая добавка Басулифор; иммуноглобулины; рост; продуктивность; качество мяса.

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