

The Effectiveness of the Fungal Autolysate Use in the Quails Breeding

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Abstract. The article presents the results of the application of a feed additive in the diet of Texas quails based on autolysate of biomass of the non-pathogenic soil fungus *Cephalophora tropica* D3, grown in the environment enriched with macro- and microelements ("Albit-BIO"). It has been established that the use of fungal autolysate in the diet of quails contributes to the improvement of the economic indicators of poultry, increases preservation, live weight, increases and reduces the cost of feed for weight gain. The use of a feed additive in the diet of Texas breed quails kept by the outdoor method is more promising, since a positive trend was observed in the dynamics of the studied economic indicators than at cage keeping. The use of "Albit-BIO" contributes to an increase in the slaughter yield, as well as the mass of the muscle part, which is especially pronounced in poultry of the second experimental group, where the additive was used for outdoor keeping of quails. It was revealed that the feed additive, regardless of the conditions of poultry keeping, has a positive effect on the formation of beneficial intestinal microflora while simultaneously suppressing representatives of opportunistic microorganisms. As a result, the process of digestibility and application of feed nutrients improves, which is especially pronounced in poultry in experimental groups that received a feed additive and were kept in the outdoor way. It is recommended to increase the economic indicators and efficiency of the quail industry to grow poultry in the outdoor way and additionally introduce Albit-BIO fungal autolysate into the diet at a dose of 0.13 ml per 1 liter of drinking water throughout the growing period.

1 Relevance

Currently, the effective development of industrial poultry farming is based on the use of feed additives that contribute to increasing the productivity and preservation of livestock, as well as obtaining biosafety products. The priorities of the intensification of the industry are justified by the Concept of state policy in the field of healthy nutrition of the population in the Russian Federation, which places high demands on the balance of compound feeds and diets that determine the quality and preservation of food products, and, consequently, the health of the nation [1, 2].

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The development of biotechnology has led to the appearance of feed products and biologically active additives with new functional properties [3]. The feed additive developed by "Albit" LLC on the basis of autolysate of biomass of fungal culture and saturated with trace elements is produced under the trade name "Albit-BIO". It is designed to balance the diets of essential trace elements, which contributes to a rapid increase and reliable maintenance of a high level of productivity of animals and poultry. The results of the application of the developed feed additive in the diet of farm animals, including poultry, have shown its high efficiency. However, there is no information on the scientific and patent search for the most effective schemes for the use of fungal autolysate "Albit-BIO" in quail farming, which confirms the relevance of scientific research.

The purpose of the work is to study the effectiveness of the feed additive "Albit-BIO" use based on fungal autolysate in the quails breeding.

2 Materials and methods

Experiments on quails were carried out in the research laboratories of the Department of Biotechnology, Biochemistry and Biophysics and the Scientific Testing Center of Toxicopharmacological Research and Development of Veterinary Medicines, feed additives and disinfectants (a structural division of the University).

The object of research is the feed additive "Albit-BIO", obtained from the autolysate of the biomass of the fungus *Cephalophora tropica*, saturated with macro- and microelements. It is designed to balance diets, effectively increase and reliably maintain the productivity of animals and poultry at a high level.

Experiments were carried out on quails of the meat direction – Texas (meat white quail).

Quails were raised in semi-industrial multi-storey metal cages and in specially equipped rooms for outdoor poultry keeping. Each tier of the five-story cage is divided into two sections, each containing 20 heads. Water supply was carried out automatically through nipple drinkers, feeding – through suspended feeders. When kept outdoor, the formed groups of quails were placed separately from each other, a mixture of rice and sunflower husks was used as bedding. Vacuum drinkers were used for drinking poultry, and bunker floor feeders were used for feeding. The feed additive was introduced into the poultry diet daily by drinking through a common system or vacuum drinkers with water. The technological modes of growing quails met the requirements of VNITIP [4, 5].

In the work, four groups of quails were formed by the method of analog groups:

- two control groups of poultry – received only standard balanced feed for quails, of which in the first control group the poultry were kept in cages, and in the second control group – in an outdoor way;
- two experimental groups of quails were fed with a standard balanced compound feed and the feed additive "Albit-BIO" at a dose of 0.13 ml per 1 liter of water additionally introduced into the drinking system: in the first experimental group, the birds were kept in cages and in the second experimental group - by outdoor methods.

In the studied groups of birds, their preservation was taken into account daily. Each week, the dynamics of the live weight of quails was studied by individual weighing. The difference in the initial and final weight was used to calculate the increase in the live weight of poultry. Daily accounting of feed consumption was carried out. Feed conversion was calculated as the ratio of the volume of feed consumed by quails to 1 kg of gain during the research period [6].

At the end of the studies their slaughter and anatomical cutting were carried out to study the parameters of meat productivity of quails.

A balance experiment was conducted a week before the completion of the research to study the digestibility of feed components and the coefficient of mineral use by poultry. The algorithm of chemical analysis of compound feed and manure included, according to regulatory documentation: sampling, determination of moisture, dry residue, crude protein, crude fat, crude ash and crude fiber.

The moisture content was studied according to GOST 9793-74; fat – GOST 23042-2015 and protein - GOST 25011-81 to analyze the chemical composition of the muscle tissue of birds. The dietary property of poultry meat was determined by the meat quality index (the ratio of the amount of fat to protein). The essential amino acids of the birds' muscles were studied on the device "Drops-105 M".

After the slaughter of quails, intestinal resection was performed to study the microbial background [7].

The digital values of the research results were processed using mathematical statistics using Microsoft Office Excel 2019. The reliability criterion was determined by the Student's table. The results were considered reliable at the probability level $P \leq 0.05$.

3 Results of research

3.1 Characteristics of the feed additive "Albit-BIO"

The feed additive "Albit-BIO" is intended for enriching and balancing the diets of farm animals and poultry by trace elements. Autolysate of biomass of the non-pathogenic soil fungus *Cephaliophora tropica* D3, grown in an environment enriched with macro- and microelements, in appearance is a thick suspension of brown color with a greenish tinge, with a pleasant coniferous smell, well soluble in water. The shelf life of Albit-BIO is 12 months from the date of manufacture.

The biological effect of the additive is due to the presence in it of biologically available elements (selenium, iodine, magnesium, calcium) necessary for active metabolism, effective functioning of the immune system, improving the safety and productivity of livestock of farm animals and poultry. Selenium, iodine and other elements in the feed additive are in biologically active form as part of the biomass of the fungus *Cephaliophora tropica* D3 and are effectively absorbed in the animal body compared to inorganic compounds. This makes it possible to enhance the physiological effect of selenium and iodine in metabolic processes.

Livestock and poultry products for the production of which a feed additive was used are characterized by unlimited food purposes.

3.2 The effect of the feed additive "Albit-BIO" on economic parameters in the quails breeding

Economic indicators for the cultivation of Texas breed quails in conditions of cage and outdoor maintenance by groups are presented in Table 1.

Table 1. Economic indicators in the cultivation of Texas breed quails ($n = 50$)

Parameter	Conditions of keeping			
	cage		outdoor	
	Group			
	1 st control	1 st experimental	2 nd control	2 nd experimental
Preservation, %	86,0	94,0	88,0	96,0
<i>Live weight gain</i>				
One head, g	333,81	377,41	348,63	394,53
<i>Feed costs</i>				
On one head, g	1074,46	1112,48	1093,46	1121,76
On 1 kg of gain, kg	3,22	2,95	3,13	2,84

The results of the experiments confirm that the viability of quails of the first and second experimental groups was maximum and amounted to 94.0 and 96.0 %, respectively. At the end of the 56th day of the study, it was revealed that the mass of quails of the first and second experimental groups was significantly higher than the control ones of the same name by 12.6 and 12.9 % ($P \leq 0.05$). The difference between the experimental groups was 4.4 % in favor of the second group.

When analyzing the conversion of compound feed, it was found that in the first experimental group this indicator was lower than in the first control group by 8.4 %, and in the second experimental group it was lower than in the second control group by 9.3 %. Between the experimental groups, the conversion rate of compound feed was lower in the second experimental group and was 3.7 %.

3.3 The effect of the feed additive "Albit-BIO" on digestion when growing quails

The results of the study of the digestibility and use of nutrients of mixed feed by quails of the Texas breed are presented in Table 2.

Table 2. Coefficients of digestibility and use of nutrients of mixed feed by quails, %

Parameter	Conditions of keeping			
	cage		outdoor	
	Group			
	1 st control	1 st experimental	2 nd control	2 nd experimental
<i>Coefficient of digestibility of nutrients</i>				
Organic substance	54,94 ± 1,50	60,30 ± 1,28	57,37 ± 1,48	62,78 ± 1,18
Crude protein	54,07 ± 1,33	57,88 ± 1,49	55,11 ± 1,06	59,07 ± 1,44
Crude fat	74,59 ± 1,97	79,05 ± 2,07	76,87 ± 2,04	81,66 ± 2,10
Crude fiber	32,45 ± 0,75	35,01 ± 0,88	32,05 ± 1,01	36,33 ± 0,96
BEV	39,86 ± 0,93	43,82 ± 0,85	41,28 ± 1,33	45,80 ± 1,41
<i>Coefficient of mineral substances use</i>				
Calcium	33,69 ± 0,27	39,42 ± 0,35*	36,78 ± 0,38	41,79 ± 0,39**
Phosphorus	30,55 ± 0,30	34,33 ± 0,32*	31,43 ± 0,28	36,92 ± 0,30**
* Difference with the 1st control group is reliable ($P \leq 0.05$).				
** Difference with the 2nd control group is reliable ($P \leq 0.05$).				

It was found that, regardless of the method of keeping quails, the use of the feed additive "Albit-BIO" contributed to increasing the digestibility of feed nutrients and obtaining a reliable utilization rate of calcium and phosphorus. During the analysis of the difference between the first and second experimental groups on the digestibility of organic matter,

protein, fat, fiber and BEV, it was revealed that positive dynamics was observed in the second experimental group, in which the analyzed indicators were higher by 2.5; 1.2; 2.6; 1.3 and 2.0 %, and the proportion of calcium and phosphorus used is higher by 2.4 and 2.6 %, respectively.

When analyzing the microbiocenosis of the blind processes of the quail intestine, it was revealed that statistically significant changes in the microbial background were influenced by the use of fungal autolysate. Thus, the number of bacteria of the genus *Lactobacillus* in the intestines of quails of the first experimental group was 2.5 times higher than in the first control group, and in the second experimental group in relation to the second control group by 3.0 times (at $P \leq 0.05$). The amount of *Bifidobacterium* in the first and second experimental groups was significantly higher than similar indicators of the control groups by 2.4 and 3.1 times ($P \leq 0.05$). The content of bacteria of the genera *Escherichia*, *Staphylococcus* and *Streptococcus* of the first and second experimental groups was significantly reduced compared to the control groups.

3.4 The effect of the feed additive "Albit-BIO" on the meat productivity of quails

The data on the slaughter yield of quail carcasses are presented in Table 3.

Table 3. Slaughter index of quails ($n = 15$)

Parameter	Conditions of keeping			
	cage		outdoor	
	Group			
	1 st control	1 st experimental	2 nd control	2 nd experimental
Pre-slaughter mass of quails, g	343,67±3,34	387,52±3,11*	360,26±2,98	397,78±3,05**
Mass of gutted quail carcass, g	249,16±2,18	285,60±1,96*	264,07±2,26	300,72±2,43**
* Difference with the 1st control group is reliable ($P \leq 0.05$).				
**Difference with the 2nd control group is reliable($P \leq 0.05$).				

We found that the highest rates of slaughter yield of quail carcasses were detected in the second experimental group – 75.6 %, then in the first experimental group – 73.7 %. The difference between the parameters in the experimental groups was 1.9 % in favor of the second.

In assessing the mass of the chest, thigh and lower leg muscles, as well as other muscles, a positive effect of the use of the supplement on the analyzed indexes was revealed. The mass of all quail muscles in the study groups was 160.60 g (the first control group), 174.73 g (the first experimental group), 168.34 g (the second control group), 186.11 g (the second experimental group). The difference between the 1st and 2nd experimental groups was 11.38 g (or 6.5%), in favor of the latter.

3.5 Assessment of the quality of quail meat after the application of the feed additive "Albit-BIO"

It was found that the protein level in the meat of quails of the first experimental group was 22.23 %, and in the first control group – 21.54 %, the difference was 0.69 % in favor of the experimental group. In the second experimental group, the studied parameter was 1.27 % higher than in the second control group. The difference between the experimental groups was 1.08 % in favor of the second group. The fat content in the poultry meat of the experimental

groups was lower than in similar control groups by 0.14 and 0.35 %. The difference between the first and second experimental groups was 0.30 % in favor of the latter. The highest index of quail meat quality was found in the second experimental group, which was 0.17 units, then in the first experimental group – 0.19 units, in the second control group – 0.20 and in the first control group – 0.21 units.

In the first and second experimental groups of quails, the value of the analyzed amino acids in the muscles was higher than in the first and second control groups by 4.5 and 5.9 % for lysine; 6.8 and 5.7 % for tryptophan; 5.1 and 5.8 % for phenylalanine, 1.8 and 4.6 % for leucine and methionine by 6.4 and 3.8 %. The difference between the parameters of essential amino acids in the muscles of quails of the experimental groups was 6.2; 2.1; 2.9; 5.2 and 1.1 % in favor of the second group.

The veterinary and sanitary assessment showed that the quail meat was fresh, obtained from a healthy bird. Therefore, it can be eaten regardless of the use of feed additives and poultry conditions.

4 Conclusion

Performed scientific and laboratory researches to study the effect of the method of keeping and feeding quails on the example of the Texas breed using Albit-BIO fungal autolysate in their diet have demonstrated that, regardless of the method of keeping poultry, the most effective results are obtained in experimental groups where a feed additive was used. In quails of these groups, preservation parameters increased by 8.0 %, live weight and growth during the growing period by 12.6 and 12.9 %, the cost of compound feeds per unit of production decreased by 8.4 and 9.3 %, the chemical parameters of poultry meat improved as well as the taste properties of quail products.

Thus, to increase productivity, preserve the live weight of quails, obtain high-quality and safe poultry meat products, reduce feed consumption by 1 kg of gain, it is recommended to use Albit-BIO fungal autolysate in the diet of quails daily at a dose of 0.13 ml per 1 liter of drinking water during the growing period. However, the maximum economic effect can be achieved when keeping quails in the outdoor way.

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