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Research Article

Kinetics of Changes in Biochemical Parameters and Activity of the Blood Lipase Enzyme in Partridges (*Alectoris chukar*) with the Complex Use of Vitamins and an Anti-Stress Drug

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Abstract

The aim of this work was to study the activity of the lipase enzyme in the blood serum of partridges. In experiments, experimental groups of partridges were fed with a complex of vitamins (A-20000 IU, D3 - 1250 IU, E - 50 mg) and an anti-stress drug (succinic acid) at a dose of 0.01, 0.03, 0.05 g per 1 kg of body weight per day. Determination of the activity of the lipase enzyme in the blood serum of partridges was carried out on a Specol 1500 spectrophotometer (Analitik Jena) according to the method of R Rej., M Hoder, U.H Bergmeyer at a wavelength of 540 nm. At the same time, the activity of lipase in the blood of control partridges was within the normal range (11.2-26.2 U/l). There were no statistically significant differences between the groups ($P > 0.05$). As a result of experimental studies, the activity of the enzyme lipase in the blood serum of the experimental groups of partridges was revealed, which was 1.02, 1.56, 1.30, 1.29, 1.15, 1.13, 1.16, 1.24, 1.53, 1.29 times more, compared with the indicators of the enzymatic activity of the control groups of partridges. The level of lipase activity in partridges was experimentally revealed with the complex use of vitamins (A, D_3, E) and the anti-stress preparation succinic acid, which reached 11.5 ± 0.7 U/l in one-day-old partridges, and a maximum value of 33.8 ± 4.7 U/l in 30- daily. Thus, the results of experimental studies can be used for scientific purposes to study the influence of various factors on the biochemical parameters of bird blood.

Keywords: Enzyme Activity; Lipase; Blood; Partridges; Alectoris Chukar; Vitamins; Anti-Stress Drug

Introduction

Poultry farming is considered one of the actively developing branches of agriculture, the main condition for growth is the use of feed resources and the proper organization of full-fledged feeding of poultry. The most important is the provision of diets with protein and vitamin supplements, as well as enzymes, vitamins, amino acids, antibiotics and other biologically active substances that increase productivity and accelerate the growth of poultry.

Poultry farming provides the country's population with such highly nutritious and dietary products as eggs and meat, supplies light industry with down and feathers, and agriculture provides organic fertilizers. In this regard, agricultural birds deservedly enjoy increased attention from scientists of various specialties.

The literature available to us covers mainly the issues of cultivation technology, maintenance, frequency of feeding; composition and type of feed, egg productivity of the studied birds.

Also, to assess the effect on the metabolism of chickens, an experiment was conducted in which the features of the action of the feed additive Bacell were studied, depending on the dosage of

its introduction into the feed of broiler chickens of the "SK Rus-6" cross. For what formed four experimental groups of daily broilers with 56 heads each. Group 1 chickens that received no supplements served as controls.

The activities of pancreatic enzymes in pancreatic juice, blood serum, and pancreatic homogenate (in broilers) were determined using the kinetic methods. Activity of amylase in pancreatic juice and pancreatic homogenate was determined using Smith-Roy method modified by Ugolev [2] and expressed as mg of hydrolyzed starch per 1 ml of juice (or 1 g of homogenate) per min; activity of lipase on semi-automatic biochemical analyzer BS3000P (China) using reagent kit by DIAKON-VET Co. (Russia) and expressed as units per 1 ml of juice (or 1 g of homogenate). The activities of amylase and lipase in blood serum were determined also on automatic biochemical analyzer Chem Well 2900 (T) (USA) using reagent kits Liquicolor (Pancreas-Amylase and Lipase, Human, Germany) and filters 405 nm for amylase and 580 nm for lipase; the results were expressed as units per liter [3].

Activity of proteases in pancreatic juice and pancreatic homogenate was determined by casein degradation with colorimetric control [4] and expressed as mg of hydrolyzed casein per 1 ml of juice (or 1 g of homogenate) per min. The activity of trypsin in blood serum were determined on semi-automatic biochemical analyzer BS3000P (China) using BAPNA (N-α-Benzoyl-D, L-arginine 4-nitroanilide hydrochloride) as a substrate and expressed as units per liter.

The activities of enzymes in pancreatic juice and blood serum can be influenced by different factors. Ingestion of feed and its movement down the gastro-intestinal tract is a powerful stimulator of exocrine pancreatic secretion; during the first minutes after the feeding amounts of juice and enzymes within the juice rise substantially compared to the corresponding pre-prandial levels (in starved birds) due to the complex-reflex phase of regulation [5].

Animal fats and vegetable oils are being used in broiler diets to increase energy density and improve growth performance [7,8]. However, fat addition negatively affects fat digestibility [9,10] especially during early broiler age [11]. Immature physiological function of the pancreas in broilers results in less production of bile acids and pancreatic lipase during early ages [12], which may lead to poor fat digestibility.

Supplementation of bile acids in broiler diet significantly improve the digestibility of fat [13]. Similarly, other studies [14-16] reported that the supplementation of bile acids improve daily weight gain, feed conversion ratio (FCR) and carcass yield in broilers. Like bile acids, exogenous lipase also improves physiological limitation of poultry digestive system [17]. On the other hand, Hu., *et al*. [18] reported that providing reduced energy diet had decreased ($p < 0.05$) body weight (BW) gain compared to basal energy diet during a period of 14 days, however, it was compensated with the supplementation of 0.015% and 0.03% lipase. According to Wang., *et al*. [19], the supplementation of lipase in broiler diets improved FCR, growth performance and fat digestibility. On the contrary, other researchers reported that lipase supplementation had no effect on nutrient utilization and bird's performance in broiler fed wheat-based diets [20].

The literature data obtained make it possible to objectively assess the relationship of metabolic processes in the organism of the studied birds and their influence on the level of activity of blood enzymes. However, the given data of scientific sources do not give a complete picture and many aspects need a deeper study. Based on the foregoing, the aim of this work was to study the activity of the lipase enzyme in the blood of partridges.

Material and Research Methods

Experimental studies on the activity of the lipase enzyme in the blood serum of partridges were carried out on 35 birds, which were divided into control and experimental groups of 5 birds for 120 days. The control group of partridges were kept under standard conditions without the addition of vitamins and an anti-stress drug to their diet. During feeding, experimental groups of partridges were fed with a complex of vitamins (A-20000 IU, D3 - 1250 IU, E - 50 mg) and an anti-stress drug (succinic acid) at a dose of 0.01, 0.03, 0.05 g per 1 kg of body weight per day.

Determination of the activity of the lipase enzyme in the blood of partridges was carried out on a Specol 1500 spectrophotometer (Analitik Jena) according to the method of R Rej., M Hoder, U.H Bergmeyer at a wavelength of 540 nm [21]. At the same time, the activity of lipase in the blood of control partridges was within the normal range (11.2-26.2 U/l). There were no statistically significant differences between the groups ($P > 0.05$).

The experimental groups of partridges were divided into three groups: the 1st experimental group was given a vitamin complex, the 2nd experimental group was given an anti-stress drug, the 3rd experimental group was added a complex of vitamins and an anti-stress drug. To determine the activity of the lipase enzyme in the blood serum of partridges, blood was obtained from the axillary vein before feeding and one hour after feeding. A heparin solution was added to the tubes, the blood was centrifuged at 5000 rpm for 5 min, followed by determination of the enzyme activity. Blood serum was examined for lipase activity. Statistical processing of the research results was performed using the Excel computer program, determining the mean value (M) and standard errors of the mean (m). Significance of differences was assessed by Student's t-test. Differences were considered statistically significant at $p < 0.05$.

Research Results

As a result of our experimental studies, it was found that the activity of lipase in the blood serum of both control and experimental groups of partridges was undulating with a maximum in the control group by the age of 5,10,18 days and a minimum at the age of 1, 30 days, and in experimental groups of partridges with a maximum of 3, 10, 30, and with a minimum activity of 1, 5, 15 days of age, which, in all likelihood, is associated with a change in diet. The enzymatic activity of lipase in the blood of experimental groups of partridges, which simultaneously included in the diet both a complex of vitamins and an anti-stress drug, was more overestimated than the experimental groups, in which only vitamins or only an anti-stress drug were separately included in the diet, reaching a maximum value by 30 days (Figure 1).

Figure 1: Diagram of the effect of vitamins and an anti-stress drug on the activity of pheasant blood serum lipase.

The activity of the lipase enzyme in the blood serum of the experimental groups of partridges, when a complex of vitamins and an anti-stress drug was included in the diet, increased by 1,3,5,7,10,15,18,20,25 30 days at 1.02, 1.56, 1.30, 1.29, 1.15, 1.13, 1.16, 1.24, 1.53, 1.29 times compared to lipase activity in partridge control groups (Table 1).

Age in days	Control	1 experienced	2 experienced	3 experienced
1	11.2 ± 0.2	11.4 ± 0.3	11.3 ± 0.9	11.5 ± 0.7
3	12.6 ± 2.1	19.5 ± 0.9	18.3 ± 1.6	19.7 ± 0.3
5	16.1 ± 1.3	20.6 ± 1.2	19.5 ± 0.8	20.9 ± 0.2
7	14.3 ± 1.1	18.1 ± 2.1	17.5 ± 1.7	18.4 ± 1.7
10	20.0 ± 0.9	22.8 ± 0.9	21.3 ± 1.6	23.0 ± 2.8
15	18.1 ± 1.6	19.2 ± 1.3	18.7 ± 2.8	20.5 ± 3.1
18	24.5 ± 3.1	27.1 ± 4.1	24.7 ± 3.1	28.2 ± 3.5
20	21.3 ± 2.6	25.1 ± 3.4	23.6 ± 3.1	26.4 ± 4.0
25	16.5 ± 2.1	24.3 ± 5.1	23.1 ± 3.4	25.3 ± 5.1
30	26.2 ± 0.7	32.1 ± 4.7	30.5 ± 5.8	33.8 ± 4.7

Table 1: Influence of vitamins and anti-stress drug on the activity of partridge blood serum lipase (U/l).

(n =5, M ± m).

During the period from 1 to 30 days of partridge, which were fed with a complex of vitamins (A-20000 IU, D3 - 1250 IU, E - 50 mg) and an anti-stress drug (succinic acid) at a dose of 0.01, 0.03, 0.05 g per 1 kg of body weight per day had a higher enzymatic

activity compared to the control groups of birds. Partridges of the experimental groups, in which only vitamins or only an anti-stress drug were added to the diet, differed in lower indicators of lipase activity than the experimental groups of birds, in which a complex of vitamins and an anti-stress drug were included in the diet. At the same time, lipase activity was higher ($p < 0.05$) than with separate addition of a vitamin complex or an anti-stress drug to the diet.

By the activity of lipase, we can judge the state of the pancreas. As can be seen from the data in the table, the lipase activity of the blood serum of control partridges was within the normal range (11.2-26.2 U/l). There were no statistically significant differences between the groups ($P > 0.05$).

Thus, the experimental data obtained by us are of a fundamental nature and can be used for scientific purposes to study the influence of various factors (physical, chemical, biological) on the activity of enzymes.

It should be noted that a properly composed diet for birds is no less important than their genetic origin. Therefore, it is necessary to take into account not only the nutritional value of the feed ration, but also the presence of biologically active substances in them.

With the rational and purposeful use of biologically active additives in the diets of birds, it has a positive effect not only on metabolic processes in the body, but also with the positive effect of the drugs used, productivity increases and the profitability of poultry products increases.

Conclusions

- The activity of the enzyme lipase in the blood serum of the experimental groups of partridges was established, which was 1.02, 1.56, 1.30, 1.29, 1.15, 1.13, 1.16, 1.24, 1.53, 1.29 times higher, compared with the indicators of the enzymatic activity of the control groups of partridges.
- Installed The level the activity of lipase in the blood of control partridges was within the range 11.2-26.2 U/l. There were no statistically significant differences between the groups ($P > 0.05$).
- The level of lipase activity in partridges was revealed with the complex use of vitamins (A, D3, E) and the anti-stress preparation succinic acid, which reached a value of 11.5 ± 0.7 U/l in partridges, and a maximum value of 33.8 ± 4.7 U/l in 30 -day.

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