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EFFICIENCY INDICATORS OF BROILER CHICKEN RAISED WITH THE HELP OF ENZYMES

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Abstract:

In this scientific research, the effect of phytase and xylanase enzyme preparations on nutrient digestion, feed intake, feed conversion and growth performance in broiler chicks was studied. The experiment was conducted on broiler chicks aged 1–28 days. During the study, the chicks were divided into three groups: the control group was fed a standard diet, experimental group I was fed a diet supplemented with phytase (500 FTU/kg), and experimental group II was fed a diet supplemented with phytase (500 FTU/kg) and xylanase (200 mg/kg). According to the results of the study, live weight gain, nutrient digestion and feed efficiency improved in the groups that received enzyme preparations. In particular, when phytase and xylanase were used together, feed conversion decreased to 1.36 kg/kg, and feed efficiency increased significantly. In addition, protein and phosphorus digestibility indicators were also higher than in the control group. The results obtained showed that the use of enzyme preparations in broiler poultry farming is important for increasing economic efficiency and rational use of feed resources.

Keywords

Broiler chicks, phytase, xylanase, enzyme preparations, feed digestion, feed conversion, live weight, feed intake, protein digestion, phosphorus digestion, productivity.

Introduction

Digestion is an important factor in the optimal utilization of feed and healthy growth of broiler chickens. Phosphorus and non-starch polysaccharides (NSP) in the feed can limit the digestibility of poultry. Therefore, enzyme preparations, in particular phytase and xylanase, are widely used in agricultural practice.

Phytase is a phosphate-liberating enzyme that improves the digestion of phytate phosphate in feed. Xylanase breaks down NSP and increases the bioavailability of nutrients in the intestine. At the same time, their combination helps to improve the digestion process and increase growth performance.

In our region, in particular, in the broiler industry of Uzbekistan, Kazakhstan and Kyrgyzstan, low feed efficiency is observed. Due to the lack of widespread use of enzyme preparations, the digestibility of nutrients decreases by 10-15% (Uzbek. FAO National Reports, 2023). Therefore, there are urgent tasks at the regional level: Increasing feed efficiency, Increasing animal productivity, Protecting the environment.

The subjects of the study were broiler chickens aged 1-28 days and enzyme preparations (Phytase 500 FTU/kg and Xylanase 200 mg/kg) added to their standard diet.

Research subject

The subject of the study is to determine the effect of enzyme preparations on protein, phosphorus and energy digestibility, feed efficiency and growth performance in broiler chickens.

METHODS

Zootechnical, biological, laboratory and biometric-statistical methods were used in this research work. During the research, the effect of adding enzymes to the diet of broiler chickens on their growth, development and meat yield was studied based on production experiments.

Determination of live weight and growth rates of chicks was carried out in accordance with zootechnical research methods. Methods for determining live weight of poultry and calculating average daily growth rates were carried out on the basis of the methodology for conducting poultry experiments developed by AP Kalashnikov, VI Fisinin, IA Egorov. Live weight of chicks was regularly weighed and based on the results obtained, average live weight and growth dynamics were determined.

Feed intake and feed conversion of chicks were determined based on the methodology recommended by VI Fisinin, VV Lukashenko, and IA Egorov, and the amount of feed consumed in each group during the experiment was calculated. Feed conversion was estimated based on the ratio of feed consumed to live weight gain.

The survival rate and physiological development indicators of chicks were determined based on zootechnical observations, and in this regard, Bessarabov BF (2009) and Fisinin VI (2013) The poultry research methods recommended by were used. The obtained data

were analyzed using Microsoft Excel 2019 and SPSS 25. The difference between groups was determined using ANOVA (Analysis of Variance). Significant differences between groups were assessed using Student's t-test: $P < 0.95$ statistical confidence level. Coefficient of variation (Cv%) – was used to assess the dispersion of the experimental results.

RESULTS

Assessment of feed intake and feed conversion

Nutrient digestibility and feed conversion are important biological and economic indicators in intensive broiler farming. The effective absorption of nutrients in feed by the body directly affects the growth, development, live weight gain and productivity of poultry. In particular, the use of enzyme preparations accelerates the breakdown of complex compounds in feed, improves nutrient digestibility and increases the efficiency of feed use. In this study, the effect of phytase and xylanase enzyme preparations on feed digestion and feed conversion in broiler chickens was studied. During the experiment, the chickens were divided into three groups: the control group was fed a standard diet, experimental group I was fed a diet supplemented with Phytase 500 FTU/kg, and experimental group II was fed a diet supplemented with Phytase 500 FTU/kg and Xylanase 200 mg/kg.

The phytase enzyme breaks down phytin-phosphorus compounds in the feed and increases the bioavailability of phosphorus. As a result, mineral metabolism improves and nutrient digestion is activated. The xylanase enzyme breaks down non-starch polysaccharides (NSP) found in grain feeds, reduces intestinal viscosity and improves nutrient absorption. The combined effect of these enzymes leads to increased protein, energy and mineral digestion in the broiler body.

According to the results of the experiment , the digestibility of nutrients in the groups that used enzyme preparations was higher than in the control group. In particular, in the II experimental group, a significant increase in the digestibility of protein and phosphorus was observed. This is explained by the fact that enzymes enhance the breakdown of complex substances in the food.

Feed conversion rate is the efficiency of converting feed consumed by the poultry body into product. This indicator is determined based on the amount of feed consumed per 1 kg of live weight gain. The lower the feed conversion rate, the higher the efficiency of feed use.

The results of the study showed that the feed conversion in the control group was 1.62 kg/kg, while in experimental group I this figure was 1.48 kg/kg, and in experimental group II it was 1.36 kg/kg. This indicates that enzyme preparations increased the efficiency of feed utilization. In particular, the combined use of phytase and xylanase reduced feed consumption and accelerated live weight gain.

treated with enzyme preparations, along with a decrease in feed consumption, protein and phosphorus digestibility also increased. Protein digestibility in the control group was 78.2%, while in experimental group I it reached 82.5%, and in experimental group II it

reached 85.1%. Phosphorus digestibility was 48.5%, 57.2%, and 61.8%, respectively. These results confirm that enzyme preparations improved nutrient absorption.

The experimental results were analyzed biometrically using Microsoft Excel 2019 and SPSS 25. Differences between groups were determined using ANOVA analysis of variance, and statistical reliability was assessed using Student's t-test. Results with P<0.95 were considered statistically reliable. The stability and dispersion of the experimental results were assessed using the coefficient of variation (Cv%).

Table 1. Assessment of feed intake and feed conversion

Indicator	Control X±Sx	Cv,%	Experiment I (Phytase 500 FTU/kg) X±Sx	Cv,%	Experiment II (Phytase + xylanase 200 mg/kg) X±Sx	Cv,%
Initial weight, g	46.2 ± 0.3	1.42	46.1 ± 0.4	1.67	46.3 ± 0.3	1.38
Final weight (day 28), g	2320 ± 18.5	2.11	2455 ± 19.2*	2.03	2575 ± 18.7**	1.91
Total feed intake (0–28 days), kg	3.75 ± 0.04	2.38	3.62 ± 0.03*	2.01	3.50 ± 0.03**	1.94
Average daily feed intake, g/day	133.9 ± 1.4	2.34	129.3 ± 1.1*	2.01	125.0 ± 1.1**	1.96
Total weight gain (0–28 days), kg	2.274 ± 0.018	2.17	2.409 ± 0.019*	2.05	2.529 ± 0.018**	1.88
Average daily weight gain, g/day	81.2 ± 0.6	2.45	86.0 ± 0.7*	2.16	90.3 ± 0.6**	1.98
Feed conversion ratio (FCR), kg/kg	1.62 ± 0.02	5.20	1.48 ± 0.01*	3.80	1.36 ± 0.01**	2.90

*P<0.95; **P<0.99

Note: * - Significant difference compared to the control group (P < 0.95)

** - Highly significant difference compared to the control group (P < 0.99)

Table 1 shows the changes in feed intake and feed conversion ratios in broiler chicks when phytase and phytase + xylanase enzyme preparations were used. The experiment was conducted for 28 days, and the initial weight between the groups was almost the same (46.1-46.3 g), which indicates that biological equivalence was ensured at the beginning of the experiment and allows for reliable comparison of the results.

Significant positive changes were observed in the final weight indicators in the groups where the enzyme was used. While the control group had 2320 g , it reached 2455 g in the experimental group I (phytase), and 2575 g in the experimental group II (phytase + xylanase). This result indicates that enzymes, especially their complex use, increased the growth intensity of broilers. Statistically, these differences were significant (P<0.95 and P<0.99), confirming a significant advantage over the control group.

There was also a downward trend in total feed intake. While the control group consumed 3.75 kg of feed, the phytase group consumed 3.62 kg, and the enzyme combination group consumed 3.50 kg. This indicates that the efficient use of feed increased as a result of the enzymes improving the digestion of nutrients. The average daily feed intake also decreased

accordingly (133.9 g → 129.3 g → 125.0 g), which indicates a high level of nutrient absorption in the body.

On the contrary, a positive increase was recorded in the overall weight gain indicators. The weight gain from 2.274 kg in the control group increased to 2.409 kg in the phytase group, and to 2.529 kg in the experimental group II. The average daily weight gain also increased accordingly (81.2 g → 86.0 g → 90.3 g). These results clearly indicate that the enzymes increased the growth efficiency.

A significant improvement was also observed in one of the most important indicators, feed conversion ratio (FCR). FCR in the control group, which was 1.62 kg/kg, decreased to 1.48 kg/kg when phytase was used, and to 1.36 kg/kg when phytase and xylanase were used together. This means that less feed was consumed to gain 1 kg of live weight and feed efficiency increased. Statistically, these differences are highly significant ($P<0.99$).

The coefficient of variation (Cv%) values also decreased in the enzyme-treated groups. This indicates that the stability of the experimental results increased and individual differences within the group decreased. In particular, the lowest Cv values in experimental group II indicate that the enzymes not only increased productivity, but also stabilized the results.

In conclusion, the results obtained confirm that phytase and xylanase enzymes have important biological and economic value in optimizing feed intake, improving feed conversion and increasing growth performance in broiler chickens. In particular, their complex application provided the highest efficiency.

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