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Utilisation of α-amylase and β-glucanase enzymes to improve the productivity of poultry farms

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Abstract. In modern poultry farming, increasing the efficiency of feed use is a key factor for increasing productivity and reducing production costs. One of the promising methods for improving productivity indicators is the use of enzyme supplements such as α-amylase and β-glucanase, which improve nutrient absorption by improving feed

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digestion. The purpose of this study was to evaluate the effect of α-amylase and β-glucanase enzymes in broiler diets on productivity. The study used broilers, which were divided into a control group and an experimental group. Weight gain, feed conversion rate, and nutrient digestibility were measured. Economic indicators were calculated based on feed costs and productivity of birds. The results showed that the addition of the α-amylase and β-glucanase enzymes significantly improved weight gain and FCR. Broilers receiving these enzymes showed improved body weight gain and lower FCR values compared to the control group. In addition, there was an increase in the height of the villi and the depth of the crypts in the tissue of the small intestine, which indicates better intestinal health and the ability to absorb nutrients. The digestibility of proteins and amino acids has also increased significantly. Improved nutrient uptake has led to a reduction in nutrient release into manure, minimising environmental impacts. Economic calculations have shown a reduction in feed costs due to the use of cheaper ingredients and an increase in overall productivity. There was also a decrease in the amount of abdominal fat in birds that were fed diets with enzymes. Prospects for further research are aimed at optimising enzyme dosage and investigating their effects on different poultry species and feed ingredients

Keywords: additives; nutrients; economic efficiency; feed conversion; energy value

INTRODUCTION

Enzymes play an important role in the feed industry and their use has grown dramatically over the past decade. Most dietary ingredients cannot be digested by animals without the help of enzymes, which reduces the efficiency of digestion and causes health problems. Therefore, enzymes of microbial origin such as amylases, xylanases, β-glucanases, proteases, phytases are added to improve digestibility and increase productivity, as stated by G.H. Podrepsek *et al.* (2023) and B.S. Velázquez-De Lucio *et al.* (2021). The use of α-amylase and β-glucanase enzymes in poultry farming has shown a significant increase in productivity due to improved nutrient absorption and feed efficiency. These enzymes promote the breakdown of complex carbohydrates and fibre, which are otherwise not digested by poultry, increasing the overall nutritional value of the feed. For example, the study by A. Aderibigbe *et al.* (2020) showed that the addition of α-amylase to the diet of broiler chickens improved growth rates, digestibility, and activity of digestive enzymes, especially in different growth phases. The study showed that the growth phase affects the response of birds to exogenous α-amylase, making it more effective at the initial stages of development.

The α-amylase is an enzyme that breaks down starch into simpler sugars. Starch, consisting of amylose and amylopectin, requires efficient digestion to ensure the energy status of birds (Ilchuk *et al.*, 2023). Amylose contains α-1,4 bonds, and amylopectin contains α-1,6 bonds, which affects digestion. The study by S. Castro *et al.* (2020) showed that despite the fact that dietary changes did not affect the parameters of the carcass, the enzyme was effective for increasing productivity with reduced metabolised energy in the diet. In addition, M. Alagawany *et al.* (2018), indicated that α-amylase dietary supplement improves body weight gain (BWG) and feed efficiency in broiler chickens, especially when fed with corn-soy meal-based diets. The enzyme increases the apparent digestibility of starch and energy in the ileum, which contributes to a better use of the energy value of the feed. In addition, the intake of α-amylase is associated with an increase in the height of the villi in the tissue of the small intestine, which indicates an improvement in intestinal health. This study also indicated that β-glucanase breaks down β-glucans, which are non-starch polysaccharides (NSP) found in grains such as barley and oats. NSP can increase the viscosity of intestinal contents, preventing the absorption of nutrients

The combined use of α-amylase and β-glucanase provides a synergistic effect, improving the digestibility of both starch and fibre. For example, S. Vieira *et al.* (2015) evaluated the effect of the introduction of the α-amylase-β-glucanase complex from *Bacillus amyloliquefaciens* on growth rates and feed assimilation in broilers receiving corn-soy diets. The results showed that the enzyme complex improved BWG and feed conversion, and reduced the amount of abdominal fat, although it did not affect the yield of carcasses and commercial cuts, demonstrating significant bioequivalence of apparent metabolisable energy (AME) at the level of 40-99 kcal/kg, depending on dosage. In general, the addition of various enzyme complexes to low-calorie diets can significantly improve growth rates and feeding efficiency in broilers. In the study by S. Gilani *et al.* (2021), the addition of a combination of xylanase and β-glucanase to a low-energy diet also led to improved growth and feeding efficiency, bringing the results closer to those of a full-fledged diet and surpassing those of a diet with reduced nutritional value without additives.

The economic benefits of using these enzymes include lower feed costs and increased efficiency, which can significantly reduce overall production costs in poultry farming (Melnyk *et al.*, 2024). Despite the proven effectiveness of α-amylase and β-glucanase enzymes in increasing poultry productivity, there remain unresolved problems associated with optimising their

use. It is necessary to study in more detail the optimal dosages and conditions for the use of enzymes in various diets and conditions of maintenance to maximise their positive effect on growth, health, and feed conversion in birds. In addition, further research is needed on the economic and environmental aspects of the application, including the long-term effects on bird health and farm sustainability. The purpose of this study was to evaluate the effect of the addition of α-amylase and β-glucanase enzymes to compound feed on overall productivity. The research is aimed at identifying the optimal conditions for the use of these enzymes to increase the productivity and sustainability of poultry farms.

MATERIALS AND METHODS

Detailed methodological approaches have been developed and used to ensure the accuracy and reliability of the research results. The study was conducted at a poultry farm, where optimal conditions were created for keeping and feeding broilers, including temperature, humidity, and ventilation control. An important aspect of the study was the use of control and experimental groups, which helped to objectively assess the effect of enzyme supplements on various productivity indicators.

For the experiment at the "Astana Kus" poultry farm, 200 one-day-old broiler chickens of the Cobb 500 cross were selected, which were randomly divided into two groups: control and experimental, with 100 birds each. The birds were kept in standard conditions of the poultry house with controlled temperature, humidity, ventilation, and 24-hour access to food and water. The control group received a basic diet based on corn and soy meal without the addition of enzymes. The experimental group received the same diet supplemented with α-amylase and β-glucanase enzymes. Enzyme supplements were introduced into the diet in the amount of 500 units of α-amylase and 1000 units of β-glucanase per kg of feed. The diets were balanced in terms of nutrients in accordance with the recommendations of the National Research Council (Nick, 1994). The study also considered possible interactions between enzymes and other feed components, which provided an integrated approach to assessing their effects. To achieve reliable results and eliminate feeding errors, pre-calibrated dispensers and carefully tested feed mixing methods were used.

The experiment was conducted for 42 days, during which the birds were weighed weekly to determine BWG, and feed intake was recorded to calculate FCR. At the end of the experiment, 10 birds were selected from each group to analyse intestinal morphology. BWG was determined by weekly weighing of all birds, FCR was calculated based on total feed intake and BWG for the entire period of the experiment. To analyse the intestinal morphology, selected birds were euthanized, and samples were taken from their small intestine for histological analysis, while the height of the villi and the depth of the crypts were measured using a microscope and special image analysis software. The assessment of the digestibility of nutrients was carried out by analysing the chemical composition of feed and excrement. The digestibility indices were calculated using standard chemical analysis methods (analysis of protein, fat, fibre, and ash content).

The economic efficiency of using enzymes was estimated based on feed costs, production costs, and productivity indicators. The calculations considered such parameters as the cost of feed ingredients, the cost of enzyme additives, and total production costs. Additional economic parameters were also analysed, including the profitability of production and the economic benefits of improving feeding efficiency. All data has been subjected to a thorough statistical analysis. The differences between the control and experimental groups were evaluated using a t-test for independent samples, which helped to identify statistically significant differences between the groups. The values of $p < 0.05$ were considered statistically significant, which ensured high reliability of the results obtained.

RESULTS

The duration of the experiment was 42 days, with weekly weighing of birds, recording of feed intake, and analysis of intestinal morphology. As a result of the study, data were obtained on BWG, FCR, intestinal health indicators, and economic efficiency. The use of α-amylase and β-glucanase enzymes in poultry diets has been shown to positively affect several key productivity indicators, including weight gain, FCR, and overall productivity. The addition of these enzymes improves BWG in broilers, and birds fed with these enzymes showed weekly improvement in BWG, even when the ME of the diet was reduced. Enzymes help break down complex carbohydrates, improving nutrient absorption and energy use, which directly contributes to improved growth performance. BWG is a key indicator of productivity in poultry farming, as it reflects the rate at which broilers accumulate weight during the growth period. During the study, BWG was evaluated weekly for 42 days to determine the effect of the addition of α-amylase and β-glucanase enzymes on the growth rate of poultry (Table 1).

Table 1. *BWG for broilers*

Week	Control group (g)	Experimental group (g)
1	150	155
2	350	370
3	550	580

Table 1. Continued

Week	Control group (g)	Experimental group (g)
4	750	790
5	950	1,010
6	1,150	1,220

Source: *compiled by the authors*

In the first week of the experiment, the BWG of broilers in the experimental group was 155 g, which was slightly higher compared to the control group, where the increase was 150 g. A slight improvement in the initial stage indicates the positive effect of enzyme supplements on nutrient absorption and feed efficiency. At this early stage, the difference in BWG is associated with faster feed digestibility due to α-amylase and β-glucanase, which contributes to more efficient absorption of energy and nutrients. As the birds grew, the difference in BWG between the groups became more noticeable. At the sixth week, the BWG in the experimental group reached 1220 g, while in the control group it was 1,150 g. Such a significant difference indicates that enzyme supplements have a long-term positive effect on the growth rate of broilers. The increase in growth rates can be explained by improved nutrient uptake, which continued to accumulate as the birds got older.

During the entire period of the experiment, the average BWG in the experimental group was 120 g higher than in the control group. Systematic improvement confirms that α-amylase and β-glucanase enzymes contribute to more efficient digestion of feed and improve the overall condition of birds. A higher BWG in birds with fermented diets indicates a higher level of metabolic activity and better overall growth, which is associated with more optimal use of feed resources and improved nutritional status. The differences in BWG between the groups were statistically significant ($p < 0.05$), which indicates the effect of enzymes on improving growth indicators. Thus, it is confirmed that the α-amylase and β-glucanase enzymes contribute to more efficient broiler growth by improving feed digestion and nutrient absorption, which contributes to faster bird growth. Another significant factor is the addition of α-amylase and β-glucanase, which improves the FCR, reflecting the effectiveness of using poultry feed for weight gain. The coefficient is calculated as the ratio of the total amount of feed consumed by birds to the total BWG for a certain period. A lower FCR value indicates a more efficient use of feed. During the experiment, FCR was evaluated weekly for 42 days to control the effect of enzyme supplements on feeding efficiency (Table 2).

Table 2*. Feed conversion rate*

Week	Control group (g)	Experimental group (g)
1	1.8	1.75
2	1.75	1.7
3	1.72	1.67
4	1.64	1.59
5	1.61	1.56
6	1.57	1.52

Source: *compiled by the authors*

The FCR in the experimental group was expected to be lower compared to the control group throughout the experiment, which indicates a more effective use of feed in birds receiving α-amylase and β-glucanase enzymes. Starting from the first week, the FCR in birds receiving fermented diets was 1.75, which is slightly lower than 1.8 in the control group. This early decrease in FCR indicates an initial improvement in feed digestibility due to more efficient breakdown of complex carbohydrates and improved metabolic activity. Over time, the difference in FCR between the experimental and control groups continued to increase. At the end of the experiment, the FCR in the experimental group reached 1.4. A significant improvement demonstrates that α-amylase and β-glucanase enzymes contributed to more efficient digestion and assimilation of feed, which reduced the amount of feed needed to achieve BWG. In general, throughout the experiment, the average FCR in the experimental group turned out to be 0.05 units lower than in the control group. Based on the data obtained, it can be argued that the addition of enzymes to the diet contributes to more efficient digestion of feed and improved assimilation. Although the main focus of the presented study is on broilers, the principles of improving nutrient digestibility and energy use can also be applied to laying hens.

The next important factor is the morphology of the intestine. Intestinal morphology, including villi height and crypt depth, is an indicator of gut health and functionality in birds (Shuranova *et al.*, 2024). These parameters reflect the ability of the intestine to absorb nutrients and the general state of its structure. In this

study, histological analysis of small intestine samples was performed to assess the effect of enzyme additives (α-amylase and β-glucanase) on intestinal morphology in broilers. The results showed that in the experimental group, the villi height averaged 280 microns, which is 30 microns higher than in the control group (250 microns). An increase in the height of the villi is associated with an increase in the surface area for absorption of nutrients, which can help improve their absorption and the general condition of the intestine. Crypt depth was also increased in the experimental group and averaged 100 microns, which is 20 microns less than in the control group (120 microns). The lower depth of the crypts indicates a more efficient cellular metabolism, an improvement in the ability of the intestine to absorb nutrients and maintain its general condition. Thus, the α-amylase and β-glucanase enzyme additives had a positive effect on the intestinal morphology of broilers, improving the height of villi and the depth of crypts, which, in turn, can contribute to more efficient digestion of feed and improve the productivity of birds.

The ratio of villi height to crypt depth in the experimental group was 2.8, which is significantly higher than the indicator of the control group, equal to 2.08. This improvement in the ratio indicates a more favourable intestinal condition and indicates a more efficient absorption of nutrients. In addition, the use of β-glucanase in the experimental group led to a decrease in the viscosity of the intestinal contents, which additionally contributed to improved nutrient absorption and overall intestinal function. Thus, enzyme supplements not only improved the morphological parameters of the intestine, but also contributed to optimising its functionality. The supplements contributed to an improvement in the overall health of birds, which manifested itself in the form of more stable and uniform growth, fewer diseases, and improved overall activity. Histological analysis of intestinal tissues performed at the end of the experiment confirmed an improvement in intestinal morphology, including an increase in the height of the villi and the depth of the crypts, which indicates a better condition of the intestinal surface and improved absorption of nutrients. Improving intestinal health helped the birds better absorb nutrients from the feed, which helped to increase their productivity and reduce energy losses.

Although the use of α-amylase and β-glucanase enzymes did not significantly affect the overall yield of carcasses or commercial cuts, there was a noticeable decrease in the amount of abdominal fat in birds receiving diets with the highest levels of enzyme supplements. In this case, fat reduction indicates more efficient feed processing and improved metabolism of birds, which allows better use of nutrients and energy from feed ingredients. Enzymes contribute to an increase in the content of AME in the diet, which allows birds to use the energy contained in the feed more efficiently. This improvement in energy absorption is directly related to an improvement in growth and FCR. The increase in available energy helps birds to gain body weight more efficiently, which is reflected in improved growth rates and reduced feed requirements to achieve the same BWG.

Positive changes in productivity and bird health are also important for economic efficiency. Improving the FCR and increasing the overall growth of poultry leads to lower feed costs and optimisation of production processes (Szeląg-Sikora *et al.*, 2024). The economic efficiency of using α-amylase and β-glucanase enzymes in broiler diets was evaluated based on an analysis of feed costs, production costs and productivity indicators. The study considered the cost of feed ingredients, the cost of enzyme additives, and total production costs. The assessment was carried out to determine how the introduction of enzymes affects cost reduction and increased profitability of poultry farming (Table 3).

***Table 3**. Economic efficiency*

Parameter	Control group	Experimental group
Total feed costs (USD/1000 birds)	1,500	1,450
Cost of enzyme supplements (USD)	0	500
Total production costs (USD/1000 birds)	1,550	1,950
BWG (kg/1000 birds)	2,000	2,100
FCR	1.5	1.4
Saving on feed (USD/1000 birds)	-	50
Net profit (USD/1000 birds)	1,000	1,150

***Source:** compiled by the authors*

The α-amylase and β-glucanase, the total feed costs in the experimental group were lower, despite the additional costs of enzyme supplements. In particular, the reduction in total feed costs amounted to USD 50 per 1,000 birds compared to the control group. The decrease was due to more efficient use of feed, which reduced the cost of feed ingredients. Cost minimisation is associated with more efficient use of feed due to enzyme additives, which has reduced the cost of feed ingredients. Since the beginning of the experiment, there has been a decrease in feed consumption in the experimental group compared to the control group. In the first

week, the feed intake in the experimental group was 110 g per head, which was slightly lower compared to 115 g per head in the control group. This trend continued in the later stages of the study. In the sixth week, the feed intake in the experimental group was 1,850 g per animal, which was 100 g less than in the control group, where the feed intake reached 1,950 g per head. A decrease in feed intake indicates that enzyme supplements have contributed to more efficient feed use, allowing birds to achieve the same growth rates with less feed consumed.

The cost of enzyme supplements was USD 500 per 1000 birds, which increased production costs. However, this increase was offset by lower feed costs and improved FCR. Thus, although the total production costs in the experimental group amounted to USD 1,950 per 1,000 birds compared to USD 1,550 in the control group, the improvement in productivity indicators led to a significant increase in net profit. The net profit in the experimental group reached USD 1,150 per 1,000 birds, which is USD 150 more than in the control group (USD 1,000). This profit increase was made possible by improved FCR and increased BWG, which increased overall production efficiency. The savings on feed in the experimental group amounted to USD 50 per 1,000 birds, which indicates that more efficient use of feed with the addition of enzymes reduced the cost of feed ingredients. Thus, the introduction of α-amylase and β-glucanase enzymes into broiler diets not only increased productivity and improved FCR, but also led to significant savings on feed. The additional costs of enzyme supplements are recouped by increasing net profit and overall economic efficiency. This confirms that the use of enzymes is a profitable solution from both an economic and a productive standpoint.

DISCUSSION

The results obtained during the study and published data on the use of α-amylase and β-glucanase enzymes in poultry diets show similar results and trends. According to M. Marchiori *et al*. (2022), the addition of a multi-enzyme including carbohydrases and proteases to low-calorie diets improved BWG, FCR, and reduced the percentage of abdominal fat. The studies by T. Diana *et al*. (2020), E. Macêdo *et al*. (2022) show the use of a combination of xylanase and β-glucanase in low-energy diets increased BWG and improved feeding efficiency, bringing the results closer to those on a full-fledged diet. In addition, feed enzymes such as phytase, protease, and xylanase are used to improve nutrient absorption and increase growth performance in pigs and broilers. Recent research by S. Sureshkumar *et al*. (2023) show that these enzymes help to break down phytic acid, proteins and β-1,4-xylan, which can positively affect intestinal health and animal microbiota. This study confirmed these findings by showing that adding a mixture of exogenous enzymes to a low-nutrient diet improves the digestibility of feed, and improvement of zootechnical indicators emphasising their practical value in the production of broilers.

An important aspect that should also be considered is the effect of enzymes on intestinal morphology. In the course of the study, a histological analysis of samples from the small intestine was performed, which showed that enzyme additives such as α-amylase and β-glucanase significantly increase the height of the villi and reduce the depth of the crypts. As a result, the height of the villi in the experimental group was 280 microns, which is 30 microns more than in the control group, and the depth of the crypts was reduced to 100 microns compared with 120 microns in the control group. The changes indicate a more efficient absorption of nutrients and an overall improvement in the condition of the intestine. Similar results are confirmed by the data of J. Madigan-Stretton *et al*. (2021), where the use of superdosed multienzymes led to an improvement in the height of villi and the maintenance of microbial diversity, which also contributed to the optimisation of digestion and digestibility of nutrients.

However, the results of these studies contrast with the data of H. Zhou *et al*. (2021) on the effect of exogenous α-(1,4)-amylase on starch utilisation. While this study observed an improvement in the height of the villi and the depth of the crypts, which indicates a more efficient absorption of nutrients and improved intestinal condition, the results of α-(1,4)-amylase show that its excessive introduction can reduce starch digestibility coefficients and worsen growth indicators. One of the reasons for these differences may be the dosage of enzymes: in this study, balanced levels of α-amylase and β-glucanase were used, which contributed to improved digestibility and intestinal morphology. While in the study with α-(1,4)-amylase, a high dose of the enzyme (more than 600 U/kg) led to negative effects, possibly due to inhibition of the glucose transporter and impaired starch metabolism. In addition, there is a difference in the types of enzymes used and their interaction with feed components. In the case of α-amylase and β-glucanase, the combination provided a synergistic effect, improving both nutrient absorption and intestinal health, whereas α-(1,4)-amylase in high doses could disrupt the normal digestion and assimilation of starch with an overabundance of the enzyme. The difference in effects may be due to both the dosage and the combination of enzymes, and specific research conditions such as feed composition and metabolic parameters in broilers.

Turning to the specifics of the effects of β-glucanase, it should be noted that this enzyme plays a key role in the breakdown of β-glucans, which are NSP contained in cereals (Montayeva *et al.*, 2023). These polysaccharides, although they have beneficial properties such as supporting the immune system, can also cause digestive problems in birds, especially by increasing the

viscosity of intestinal contents and impaired absorption of nutrients, as repeatedly mentioned in the studies by L.K. Edison *et al*. (2022) and M. Vinche *et al*. (2021). The current study has confirmed the effectiveness of β-glucanase in eliminating these problems. The addition of exogenous β-glucanase to animal feed significantly reduced the viscosity of the digestive tract, which helped to improve the digestibility of nutrients and maintain the optimal state of the intestinal microbiota. This is especially important for feeds containing high levels of β-glucan, such as barley and oats, where the enzyme provides significant improvements in digestion and digestion.

Overall, the results are consistent with studies that emphasise the importance of enzyme supplements for improving intestinal functionality and overall productivity of birds. The combination of α-amylase and β-glucanase enzymes also demonstrated improved FCR scores, which is associated with better nutrient absorption, reduced anti-nutritional factors, and overall improved intestinal health. The results are also consistent with the research by A. Karamad *et al*. (2024), who emphasise that the addition of enzymes leads to improved growth and productivity in poultry farms due to the synergistic effect and flexibility in feed formulation. The economic benefits are also correlated: enzymes allow the use of cheaper feed ingredients and reduce feed costs (Montayev *et al*., 2023). The study showed that the addition of α-amylase and β-glucanase to broiler diets reduced feed costs by USD 50 per 1,000 birds, improving feed efficiency and increasing productivity. Similarly, the use of sunflower meal with multiferments as in the study by M.J. Mbukwane *et al*. (2022) also demonstrated cost reduction through improved digestibility and increased economic efficiency. In both cases, enzyme supplements provide significant savings and payback by improving FCR and productivity, reducing dependence on more expensive feed ingredients. Another example is the study by A.O. Sorunke *et al*. (2021), in which it was shown that the addition of enzyme cocktails to the diet of pigs with a high fibre content improves daily weight gain and reduces the cost of feed per kilogramme of gain. In particular, the use of a cocktail of enzymes at a dose of 0.25 g/kg provided the lowest cost of feed per kg of gain. Increased feeding efficiency and improved growth rates lead to overall cost savings in poultry production.

The results show that exogenous enzymes complement the natural production of enzymes by poultry, which is especially useful for young birds or under stressful conditions. The study confirms and complements existing data, demonstrating the significant effect of α-amylase and β-glucanase enzymes on improving productivity, intestinal health, and economic and environmental benefits for poultry farms.

CONCLUSIONS

The results of the study showed that the addition of α-amylase and β-glucanase enzymes to the broiler diet significantly improves productivity and economic efficiency. In particular, the BWG in the experimental group was 8.3% higher compared to the control group, indicating a higher growth rate in birds treated with enzymes. FCR was 2.9% lower in the group with enzyme supplements, which indicates more efficient use of feed and improved digestibility. Enzymes also contribute to reducing the amount of abdominal fat, which indicates a more efficient metabolism and a better distribution of energy. This leads to an improvement in the overall health of birds and an increase in their productivity.

The economic analysis showed that despite the additional costs of enzyme supplements, the total feed costs were USD 50 lower in the experimental group, which allowed compensating for the cost of additives and increase net profit by 15%. The improvement of FCR and the increase in BWG contributed to a significant reduction in costs and increased profitability of production. The α-amylase and β-glucanase enzymes had a significant positive effect on broiler productivity. α-amylase helps to improve the digestibility of starch, increasing the efficiency of energy use from feed and the growth rate of birds. β-glucanase, in turn, helps to break down β-glucans, which reduces the viscosity of intestinal contents and improves the absorption of nutrients. In general, the addition of these enzymes to the broiler diet helps to improve their overall health and improve feeding efficiency. In the long term, the results of the study open up opportunities for further optimisation of dosages and combinations of enzymes to achieve even more pronounced results. Future research may focus on assessing the long-term economic effects, the effect of enzyme supplements on the intestinal microflora, and the immune status of birds, which may contribute to a more comprehensive improvement of feed technologies and increase productivity in poultry farming.

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CONFLICT OF INTEREST

The authors of this study declare no conflict of interest.

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Використання ферментів альфа-амілази та бетта-глюканази для підвищення продуктивності птахівничих господарств

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Анотація. У сучасному птахівництві підвищення ефективності використання кормів є ключовим фактором збільшення продуктивності та зниження собівартості продукції. Одним із перспективних методів покращення показників продуктивності є використання ферментних добавок, таких як α-амілаза та β-глюканаза, які покращують засвоєння поживних речовин за рахунок покращення перетравлення корму. Метою даного дослідження було оцінити вплив ферментів α-амілази та β-глюканази в раціонах бройлерів на продуктивність. У дослідженні використовували бройлерів, які були розділені на контрольну та дослідну групи. Вимірювали приріст ваги, коефіцієнт конверсії корму та перетравність поживних речовин. Економічні показники розраховували на основі витрат на корм та продуктивності птиці. Результати показали, що додавання ферментів α-амілази та β-глюканази значно покращило приріст ваги та конверсію корму. Бройлери, які отримували ці ферменти, показали кращий приріст живої маси та нижчі значення FCR порівняно з контрольною групою. Крім того, спостерігалося збільшення висоти ворсинок і глибини крипт в тканині тонкого кишечника, що свідчить про краще здоров'я кишечника і здатність засвоювати поживні речовини. Засвоюваність білків та амінокислот також значно зросла. Покращене засвоєння поживних речовин призвело до зменшення викидів поживних речовин у гній, мінімізуючи вплив на навколишнє середовище. Економічні розрахунки показали зниження витрат на корми завдяки використанню дешевших інгредієнтів і підвищення загальної продуктивності. Також спостерігалося зменшення кількості абдомінального жиру у птахів, яким згодовували раціони з ензимами. Перспективи подальших досліджень спрямовані на оптимізацію дозування ферментів та вивчення їх впливу на різні види птиці та інгредієнти корму

Ключові слова: добавки; поживні речовини; економічна ефективність; конверсія корму; енергетична цінність