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EFFECT OF ENZYME PREPARATIONS (PHYTASE, XYLANASE) ON THE DIGESTION OF PROTEIN SUBSTANCES IN THE DIET OF BROILER CHICKENS

Tulaganova Umida Tolibjon qizi
Master's Student at the Tashkent Branch of Samarkand State University of Veterinary Medicine, Livestock and Biotechnology

Khaitboev Ulugbek Norboy ugli
Master's Student at the Tashkent Branch of Samarkand State University of Veterinary Medicine, Livestock and Biotechnology

Yangiboev Abdimalik Eshmurodovich
Doctor of Agricultural Sciences (DSc) at the Tashkent Branch of Samarkand State University of Veterinary Medicine, Livestock and Biotechnology

Kholbutaev Ilyosjon Rustam ugli
Candidate of Agricultural Sciences (PhD) at the Tashkent Branch of Samarkand State University of Veterinary Medicine, Livestock and Biotechnology

Abstract:

This study investigates the impact of enzyme preparations—phytase and xylanase—on the digestion of protein substances in broiler chicken diets. Results indicate that enzyme supplementation enhances nutrient digestibility, growth performance, and feed efficiency. Phytase improves the hydrolysis of phytate phosphorus, while xylanase aids in the breakdown of non-starch polysaccharides, leading to better protein utilization and overall performance. Protein digestibility increased by 4–7%.

Keywords:

Broiler, enzyme preparations, phytase, xylanase, protein digestion, feed conversion, nutrient absorption.

Introduction

Improving feed efficiency and nutrient utilization is essential for sustainable poultry production. Incomplete digestion of phosphorus and complex carbohydrates limits the bioavailability of proteins and minerals. Phytase and xylanase are exogenous enzymes that complement the birds' endogenous enzyme system, improving the breakdown of complex feed components.

Materials and Methods

An experiment was conducted on Ross-308 broiler chickens divided into three groups (40 chicks per group): a control group with a basal diet, a group with phytase supplementation (500

FTU/kg), and a group with a combination of phytase (500 FTU/kg) and xylanase (1000 EXU/kg). The study lasted for 42 days, during which growth performance, feed intake, and protein digestibility were evaluated using nitrogen balance analysis.

Groups	Experimental Conditions	Feed Composition
Control	Basal diet without enzymes	Standard broiler feed
1st Experiment	Basal diet + Phytase (500 FTU/kg)	Phosphorus-digesting enzyme
2nd Experiment	Basal diet + Phytase (500 FTU/kg) + Xylanase (1000 EXU/kg)	Feed with a complex of enzymes

Results and Discussion

The experimental results clearly indicate that the inclusion of **phytase** and the combination of **phytase + xylanase** in broiler diets had a positive effect on growth performance, feed efficiency, and protein digestibility.

Average live weight

Broilers in the control group reached an average live weight of 2320 g at 42 days.

Supplementation with phytase increased the average live weight to 2455 g, representing an approximate **5.8% improvement** over the control.

The combination of phytase + xylanase further enhanced growth, achieving 2575 g, a **10.9% increase** compared to the control.

This suggests that the enzymatic supplementation promotes better nutrient utilization, particularly of phosphorus and carbohydrates, thereby enhancing growth rates.

Feed intake and feed conversion ratio (FCR)

Feed intake decreased slightly with enzyme supplementation (3.75 kg in control vs. 3.62 kg in phytase and 3.5 kg in phytase + xylanase), while growth performance improved.

Consequently, the feed conversion ratio improved significantly: 1.62 kg/kg in control, 1.48 kg/kg in phytase, and 1.36 kg/kg in phytase + xylanase.

This demonstrates that the birds utilized the feed more efficiently, likely due to enhanced digestibility of nutrients and reduced anti-nutritional effects of non-starch polysaccharides.

Protein digestibility

Protein digestibility increased from 78.2% in the control group to 82.5% in the phytase group and reached 85.1% in the phytase + xylanase group. This improvement indicates that the enzymatic treatments facilitated better breakdown and absorption of dietary proteins, likely by reducing the phytate-protein complex and improving intestinal nutrient availability.

Mortality rate

Mortality decreased from 3.0% in the control group to 2.0% with phytase supplementation, and further to 1.5% in the phytase + xylanase group. This suggests that enzyme supplementation may support overall gut health and resilience, potentially reducing stress-related losses.

1-table The following table summarizes the experimental results:

Indicators	Control	Phytase	Phytase + Xylanase
Average live weight, g (42 days)	2320.0	2455.0	2575.0
Feed intake, kg	3.75	3.62	3.5
Feed conversion ratio (kg/kg)	1.62	1.48	1.36
Protein digestibility, %	78.2	82.5	85.1
Mortality, %	3.0	2.0	1.5

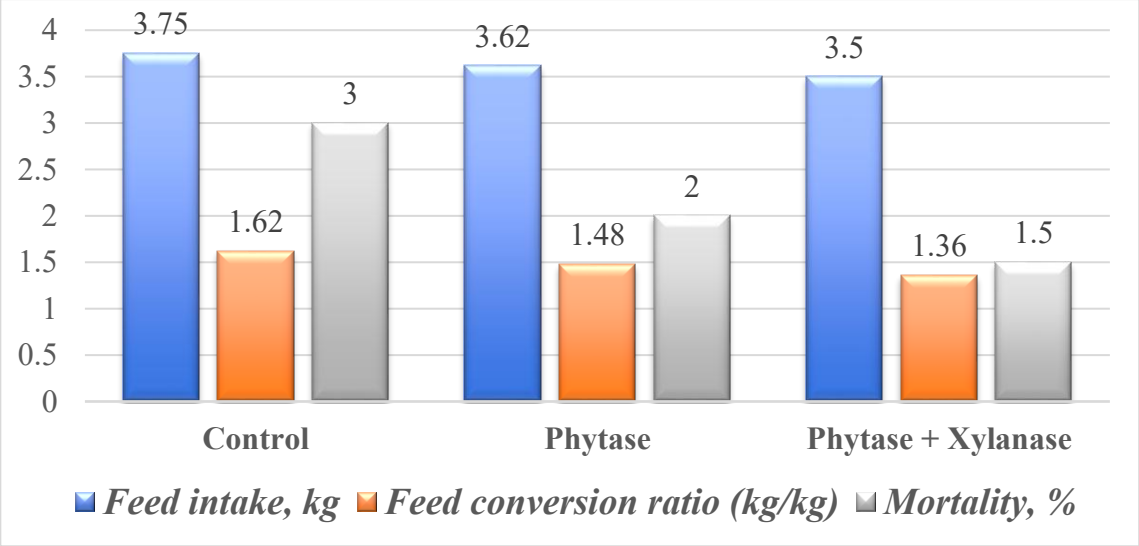

Figure 1. Effect of enzyme preparations on broiler performance indicators.

The results demonstrate a clear improvement in feed conversion and protein digestibility in enzyme-supplemented groups. Phytase hydrolyzes phytate, releasing bound phosphorus and amino acids, while xylanase breaks down arabinoxylans, enhancing intestinal nutrient absorption. The combined enzyme treatment produced the highest performance gains.

Conclusion

1. Enzyme supplementation (phytase and xylanase) significantly increased protein digestibility by 4–7%.
2. The combined enzyme treatment improved feed conversion efficiency and growth rate.
3. These findings highlight the importance of enzyme technology in optimizing broiler nutrition and sustainability.

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