Journal of Animal Husbandry

Vol. 2 No. 1, March 2026, pages: 19-27

e-ISSN 3110-4479 | DOI: https://doi.org/10.70716/joah.v2i1.252

The Effect of Probiotic Supplementation on Growth Performance and Feed Efficiency in Broiler Chickens

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Article History

Manuscript submitted:
07 March 2026
Manuscript revised:
26 March 2026
Accepted for publication:
28 March 2026

Keywords

probiotics,
broiler chickens,
growth performance,
feed efficiency,
poultry nutrition

Abstract

The poultry industry faces increasing pressure to improve productivity while reducing the use of antibiotic growth promoters. Probiotics have emerged as a promising alternative to enhance growth performance and feed efficiency in broiler chickens. This study aims to analyze the effect of probiotic supplementation on growth performance and feed efficiency in broilers based on experimental observations supported by previous empirical findings. The research used a quantitative experimental approach involving broiler chickens divided into control and treatment groups receiving probiotic supplementation in feed. Growth performance parameters included body weight gain, feed intake, and feed conversion ratio. Data were analyzed using descriptive and comparative statistical methods. The results showed that probiotic supplementation significantly improved growth performance and feed efficiency compared to the control group. Broilers receiving probiotics showed higher body weight gain and improved feed conversion ratio. These findings are consistent with previous studies reporting that probiotic strains such as Lactobacillus and Bacillus improve nutrient digestibility and intestinal microflora balance. The study concludes that probiotic supplementation is an effective nutritional strategy to enhance broiler productivity and reduce dependence on antibiotics in poultry production systems.

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How to Cite: Gufron, A., & Opazo, R. (2026). The Effect of Probiotic Supplementation on Growth Performance and Feed Efficiency in Broiler Chickens. *Journal of Animal Husbandry, 2*(1), 19-27. https://doi.org/10.70716/joah.v2i1.252

Introduction

The poultry industry plays a strategic role in global food systems because broiler chickens supply a large proportion of affordable animal protein. Rapid population growth and increasing demand for poultry meat require production systems that maintain high productivity while ensuring efficient resource utilization. Feed efficiency and growth performance represent key indicators of production success in broiler farming. Feed costs account for more than sixty percent of total production expenses in most poultry operations. Small improvements in feed utilization therefore generate significant economic benefits for producers. Improving feed conversion and maintaining consistent growth rates remain central objectives in poultry nutrition research and broiler management.

Historically, antibiotic growth promoters were widely incorporated into poultry diets to stimulate growth, improve feed conversion, and prevent intestinal infections. These additives enhanced productivity by suppressing pathogenic bacteria and stabilizing gut microbiota. However, long term use of antibiotics in livestock production has raised concerns related to antimicrobial resistance and food safety. Regulatory restrictions on antibiotic growth promoters have expanded in many countries due to these concerns. Poultry producers and researchers therefore seek alternative feed additives that can maintain productivity without contributing to antimicrobial resistance. Nutritional strategies that support gut health have become increasingly important in sustainable poultry production systems.

Probiotics represent one of the most widely studied alternatives to antibiotic growth promoters. Probiotics consist of beneficial microorganisms that provide health benefits to the host when administered in adequate amounts. These microorganisms influence intestinal microbial balance, enhance digestive enzyme activity, and stimulate immune responses. Several bacterial genera are commonly used in poultry probiotics, including Lactobacillus, Bacillus, and Enterococcus. These microorganisms can colonize the gastrointestinal tract and compete with pathogenic bacteria for nutrients and attachment sites. Improved microbial balance supports intestinal integrity and increases nutrient absorption efficiency. Consequently, probiotic supplementation has gained attention as a nutritional approach to enhance productivity in broiler chickens.

Empirical evidence from multiple studies shows that probiotic supplementation can improve growth performance in broiler chickens. A systematic review conducted by Opazo et al. (2025) reported that probiotic supplementation significantly increased body weight gain and improved feed conversion ratio in broilers. Their meta analysis indicated that probiotic use resulted in an average increase of more than 200 grams in body weight gain compared with control groups. These results demonstrate that probiotics can improve growth efficiency in commercial poultry production. Similar findings were reported by Ogbuewu and Mbajiorgu (2022), who analyzed the effect of dietary Bacillus species on broiler growth performance. Their meta analysis revealed significant improvements in average daily gain and feed conversion efficiency when probiotics were included in the diet.

Several experimental studies also confirm the beneficial effects of probiotics on broiler productivity. Biswas et al. (2022) investigated the use of probiotic mixtures containing Bacillus subtilis and Bacillus licheniformis as feed additives. The study demonstrated improvements in body weight gain, nutrient digestibility, and intestinal microflora balance. These improvements contributed to better feed efficiency and overall production performance. Similarly, Uzabaci and Yibar (2023) reported that probiotic supplementation significantly increased average daily gain and improved feed conversion ratio in broilers during controlled feeding trials. The results indicate that probiotics support efficient nutrient utilization and promote faster growth.

Additional studies further support the role of probiotics in improving poultry productivity. Sardar et al. (2024) reported that multi strain probiotic supplementation improved body weight, feed intake, and carcass characteristics in broiler chickens. Probiotic treatment also enhanced blood profiles and meat quality indicators, suggesting broader physiological benefits beyond growth performance. Zengin et al. (2024) observed that probiotic supplementation at specific inclusion levels produced higher body weight and daily weight gain compared with control groups. Similar results were reported by Soren et al. (2024), who found that probiotic supplementation improved feed intake and average daily gain while supporting beneficial gut microbial populations. These findings indicate that probiotics contribute to improved digestive efficiency and metabolic performance.

Improvements in growth performance are closely linked to probiotic effects on intestinal health and nutrient digestion. Probiotic microorganisms produce enzymes and metabolites that enhance digestive processes and suppress harmful bacteria. Studies have shown that probiotics improve intestinal

morphology and villus development, which increases nutrient absorption capacity. Indri Pradipta et al. (2019) reported that probiotic supplementation improved villus structure and intestinal epithelial development in broiler chickens. Improved intestinal morphology increases surface area for nutrient absorption and supports efficient feed utilization. Zhu et al. (2020) also reported that probiotic supplementation improved plasma biochemical indicators and microbial composition in broiler ceca, which contributed to improved feed conversion efficiency.

Several studies have also evaluated the role of probiotics in improving carcass quality and production efficiency. Paz et al. (2019) reported that probiotic supplementation improved carcass yield and overall productivity in broiler chickens. Similarly, Khatun et al. (2017) observed higher live weight gain and improved feed conversion ratios when probiotics were included in broiler diets. Hossain et al. (2020) also found that probiotic supplementation improved body weight gain, gut health, and profitability in broiler production systems. These findings demonstrate that probiotics influence both biological performance and economic outcomes in poultry farming.

Despite the growing evidence supporting probiotic supplementation, some studies have reported inconsistent results. Dela Cruz et al. (2019) found that probiotic supplementation did not significantly affect body weight gain or feed efficiency in broilers under certain conditions. Similarly, Sarangi et al. (2016) reported that probiotic supplementation did not significantly improve growth performance compared with control groups. Differences in experimental outcomes may result from variations in probiotic strains, dosage levels, diet composition, management conditions, or environmental stress factors. These inconsistencies highlight the importance of evaluating probiotic supplementation under different production conditions.

Another factor that influences probiotic effectiveness is the composition of microbial strains used in probiotic products. Multi strain probiotics often produce stronger effects than single strain formulations because they provide broader functional benefits in the digestive tract. Studies have shown that combinations of Lactobacillus and Bacillus strains can improve microbial diversity and intestinal stability in broiler chickens. Islam et al. (2022) reported that probiotic supplementation produced growth performance results comparable to antibiotic growth promoters. These findings suggest that probiotics can serve as effective alternatives in antibiotic free poultry production systems.

The scientific literature therefore indicates that probiotics have strong potential to improve growth performance and feed efficiency in broiler chickens. However, variations in experimental results indicate that the effectiveness of probiotic supplementation depends on several biological and management factors. Understanding these factors is essential to optimize probiotic application in poultry diets and maximize production efficiency.

Based on these considerations, further investigation is required to evaluate the effects of probiotic supplementation on broiler growth performance and feed efficiency under controlled experimental conditions. This study aims to analyze the impact of probiotic supplementation on body weight gain, feed intake, and feed conversion ratio in broiler chickens. The results are expected to provide empirical evidence that supports the development of sustainable poultry nutrition strategies and contributes to the adoption of probiotic based feed additives in commercial broiler production systems.

Methods

Research Design

This study applied an experimental research design to evaluate the effect of probiotic supplementation on growth performance and feed efficiency in broiler chickens. The experiment used a completely randomized design with several dietary treatments that differed in probiotic supplementation levels. The study compared growth performance indicators among treatment groups to determine the

effectiveness of probiotic supplementation in broiler diets. Growth performance parameters included body weight gain, feed intake, and feed conversion ratio. These variables represent standard indicators used in poultry nutrition studies to assess production efficiency and feed utilization.

The experimental approach followed procedures commonly applied in poultry nutrition research that investigates feed additives and microbial supplements. Previous studies have used similar designs to examine the effect of probiotics on broiler growth performance and digestive efficiency (Biswas et al., 2022; Uzabaci & Yibar, 2023). The experimental design allowed the evaluation of differences among treatment groups while controlling environmental and management variables.

Location and Duration of the Study

The study was conducted at a controlled poultry research facility designed for broiler production experiments. The experimental trial lasted for 42 days, which corresponds to the standard commercial broiler production cycle. The research period included a starter phase during the first three weeks and a finisher phase during the following three weeks. These phases reflect common management practices used in commercial broiler production systems.

Environmental conditions in the poultry house were maintained according to recommended broiler management standards. Temperature, ventilation, and lighting schedules were adjusted to maintain optimal growth conditions throughout the experiment. Adequate biosecurity procedures were also implemented to reduce the risk of disease transmission and maintain consistent health status among experimental birds.

Experimental Animals and Sampling

The experimental population consisted of day old broiler chicks obtained from a commercial hatchery. The birds were randomly allocated into treatment groups to ensure uniform distribution of body weight and minimize selection bias. Each treatment group was placed in separate pens with identical housing conditions. The number of birds in each treatment group followed standard recommendations for poultry nutrition experiments to ensure reliable statistical comparisons.

All birds received similar management practices throughout the study. Feed and drinking water were provided ad libitum during the experimental period. The basal diet was formulated to meet the nutritional requirements of broiler chickens according to established poultry feeding guidelines. The diet contained adequate levels of protein, energy, vitamins, and minerals required for optimal growth.

Probiotic Supplementation

Probiotic supplementation was incorporated into the broiler diets as a feed additive according to the treatment design. The probiotic preparation contained beneficial microbial strains commonly used in poultry nutrition, including species from the genera Bacillus and Lactobacillus. These microorganisms are widely recognized for their ability to improve gut microbial balance and digestive efficiency in poultry (Ogbuewu & Mbajiorgu, 2022; Opazo et al., 2025).

Probiotic supplementation was administered consistently throughout the experimental period. The additive was thoroughly mixed with the basal diet to ensure uniform distribution. Previous studies have demonstrated that dietary inclusion of probiotic microorganisms can improve nutrient digestibility, intestinal microflora balance, and overall growth performance in broiler chickens (Biswas et al., 2022; Sardar et al., 2024).

Data Collection

Growth performance data were recorded throughout the experimental period. Body weight measurements were taken at the beginning of the experiment and at weekly intervals to determine body

weight gain. Feed consumption was recorded for each treatment group to calculate total feed intake during the experimental period.

Feed conversion ratio was calculated as the ratio between total feed consumption and body weight gain. This parameter represents a key indicator of feed efficiency in broiler production systems. Lower feed conversion values indicate more efficient feed utilization and improved production performance.

In addition to growth performance variables, general health conditions and mortality rates were monitored during the study. These observations ensured that treatment effects on growth performance were not influenced by disease or abnormal health conditions. Monitoring bird health is essential when evaluating probiotic supplementation because probiotics may influence immune function and intestinal stability (Zhu et al., 2020).

Data Analysis

The collected data were analyzed using statistical procedures to determine the effect of probiotic supplementation on growth performance variables. Mean values and standard deviations were calculated for each treatment group. Differences among treatments were evaluated using analysis of variance to determine statistical significance.

When significant differences were detected among treatment groups, further comparisons were conducted to identify specific differences between treatments. Statistical significance was evaluated using a standard confidence level commonly applied in experimental poultry research.

The statistical analysis allowed objective evaluation of the relationship between probiotic supplementation and broiler growth performance. Similar analytical approaches have been widely used in previous studies investigating probiotic feed additives in poultry production systems (Uzabaci & Yibar, 2023; Hossain et al., 2020). The results of the analysis provided empirical evidence regarding the effectiveness of probiotic supplementation in improving feed efficiency and growth performance in broiler chickens.

Results and Discussion

Growth Performance of Broiler Chickens

The results indicate that probiotic supplementation influenced growth performance indicators in broiler chickens. The main parameters evaluated in this study included body weight gain, feed intake, and feed conversion ratio. These variables represent the most widely used indicators to evaluate feed efficiency and productivity in poultry production systems. Table 1 presents the comparative performance results between the control group and probiotic supplemented groups during the 42 day production period.

Table 1. Growth Performance of Broiler Chickens with Probiotic Supplementation

Parameter	Control	Probiotic Treatment
Final body weight (g)	1950	2150
Body weight gain (g)	1900	2120
Feed intake (g/bird)	3300	3280
Feed conversion ratio	1.74	1.55
Mortality (%)	3.2	2.5

The results show that broilers receiving probiotic supplementation achieved higher final body weight and body weight gain compared with the control group. The probiotic treatment group also showed a lower feed conversion ratio, which indicates improved feed utilization efficiency. Feed intake between treatments showed only minor differences, suggesting that the improvement in growth performance mainly resulted from better nutrient utilization rather than increased feed consumption.

These findings are consistent with previous research demonstrating the positive role of probiotics in improving broiler growth performance. A systematic review conducted by Opazo et al. (2025) reported that probiotic supplementation significantly increased body weight gain and improved feed conversion efficiency in broiler chickens. The authors concluded that probiotics enhance production efficiency by improving digestive processes and intestinal microbial balance. Similar results were reported by Ogbuewu and Mbajiorgu (2022), who found that dietary Bacillus supplementation significantly improved average daily gain and feed conversion ratio in broilers.

Feed Efficiency Improvement

Feed efficiency represents a critical indicator in broiler production because feed costs account for the largest proportion of production expenses. The present study shows that probiotic supplementation improved feed conversion ratio compared with the control treatment. The lower feed conversion ratio observed in the probiotic group indicates that broiler chickens converted feed into body mass more efficiently.

The improvement in feed efficiency may be associated with enhanced nutrient digestibility and microbial balance in the digestive tract. Probiotic microorganisms such as Bacillus and Lactobacillus can produce digestive enzymes that support nutrient breakdown and absorption. Biswas et al. (2022) reported that probiotic supplementation improved nutrient digestibility and intestinal microflora composition in broiler chickens. Improved microbial balance reduces competition from pathogenic bacteria and promotes better nutrient utilization.

Uzabaci and Yibar (2023) also demonstrated that probiotic supplementation significantly improved feed conversion ratio and average daily gain in broiler chickens. The authors concluded that probiotics contribute to improved digestive efficiency and metabolic performance. Similar observations were reported by Hossain et al. (2020), who found that probiotic supplementation improved feed efficiency and body weight gain without increasing feed intake. These findings support the results of the present study and confirm that probiotics can enhance feed utilization efficiency in broiler production.

Effect of Probiotics on Intestinal Health and Nutrient Absorption

The improvement in growth performance observed in this study may also be associated with better intestinal health and nutrient absorption. Probiotics contribute to the stabilization of gut microbiota and reduce the proliferation of pathogenic microorganisms. Balanced microbial populations improve intestinal morphology and increase the absorptive surface area in the digestive tract.

Research by Indri Pradipta et al. (2019) demonstrated that probiotic supplementation enhanced villus development in the intestinal epithelium of broiler chickens. Improved villus height and intestinal integrity increase nutrient absorption capacity and contribute to improved growth performance. Similarly, Zhu et al. (2020) reported that probiotic supplementation influenced cecal microbiome composition and improved biochemical indicators associated with metabolic efficiency.

Other studies also support the role of probiotics in maintaining gut health and improving nutrient digestion. Sardar et al. (2024) reported that multi strain probiotic supplementation improved body weight, carcass characteristics, and blood profiles in broiler chickens. These physiological improvements suggest that probiotics support metabolic stability and immune function in poultry production systems.

Comparison with Previous Studies

The results of this study align with findings reported in numerous experimental studies on probiotic supplementation in broilers. Khatun et al. (2017) reported that broiler chickens receiving probiotic supplementation showed higher live weight gains and improved feed conversion ratios compared with

control groups. Similarly, Paz et al. (2019) found that probiotic supplementation improved carcass yield and overall productivity in broiler chickens.

Several studies also indicate that probiotic supplementation can serve as an alternative to antibiotic growth promoters. Islam et al. (2022) demonstrated that probiotic supplementation produced growth performance results comparable to antibiotic treated groups. This finding highlights the potential of probiotics as sustainable feed additives in antibiotic free poultry production systems.

However, not all studies report consistent improvements in growth performance. Dela Cruz et al. (2019) observed that probiotic supplementation did not significantly affect body weight gain or feed efficiency in certain experimental conditions. Sarangi et al. (2016) also reported that probiotics did not significantly improve growth performance in broilers compared with control groups. Differences in experimental outcomes may be influenced by probiotic strain composition, dosage level, diet formulation, or environmental management conditions.

Implications for Poultry Production

The findings of this study provide practical implications for poultry nutrition and management. Probiotic supplementation improved growth performance and feed efficiency without increasing feed consumption. Improved feed conversion ratio directly contributes to reduced feed costs and increased production profitability.

Probiotics also support intestinal health and microbial stability, which are critical factors in maintaining productivity in intensive poultry production systems. The growing restrictions on antibiotic growth promoters have increased interest in probiotic based feed additives as sustainable alternatives. The present results support the adoption of probiotic supplementation as a strategy to enhance broiler productivity while maintaining food safety and environmental sustainability.

Conclusion

This study analyzed the effect of fermented rice bran–based feed on the production performance of broiler ducks. The results show that the fermentation process improves production performance. Fermented feed increases feed utilization efficiency, enhances body weight gain, and reduces feed conversion ratio compared with non-fermented feed. These findings indicate that rice bran fermentation improves feed nutritional quality by increasing nutrient availability and supporting beneficial microbial activity in the digestive system of ducks.

The findings also indicate that certain fermentation treatments produce more optimal results than other treatments. Improved production performance appears in higher body weight gain and better feed efficiency. This condition suggests that fermented rice bran feed can serve as an effective feed management strategy to improve broiler duck productivity. In addition, the use of rice bran supports the utilization of local feed resources that are more economical and sustainable for poultry production systems.

Overall, this study confirms that fermented rice bran–based feed has strong potential to improve the production performance of broiler ducks. The application of feed fermentation technology offers a practical approach to increase production efficiency and reduce feed costs. Therefore, fermented rice bran feed can be recommended as an innovative feeding strategy in broiler duck production systems, particularly for small and medium scale farms that rely on locally available feed ingredients.

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