ISSN: xxx-xxx Journal Biology & Health Innovations

LITERATURE REVIEW: THE ROLE OF *LACTOBACILLUS* SP. BASED PROBIOTICS IN CONTROLLING PATHOGENIC MICROFLORA AND IMPROVING BROILER CHICKEN MEAT QUALITY

Article Type : Literature Review

Adam Habibuq Musli[1], Dedi Damhuri[1]*

[1]Faculty of Animal Science Universitas Jambi, Muaro Jambi, Jambi
*Correspondence: dedidamhuri@unja.ac.id

ABSTRACT

The use of probiotics in poultry production has gained increasing attention as a safe alternative to antibiotic growth promoters, particularly in improving gut health and meat quality. This study aims to analyze the role of *Lactobacillus* sp.-based probiotics in controlling pathogenic microflora and enhancing the quality of broiler chicken meat through a literature review approach. Relevant scientific articles published within the last five years were systematically collected from reputable national and international databases. The findings indicate that *Lactobacillus* sp. effectively suppresses pathogenic bacteria such as *Escherichia coli* and *Salmonella* through competitive exclusion, production of organic acids, and antimicrobial compounds. Additionally, these probiotics improve intestinal morphology, nutrient absorption, and immune response, leading to enhanced growth performance and feed efficiency. In terms of product quality, the use of *Lactobacillus* sp. contributes to reduced fat content, improved meat texture, and better microbiological safety of broiler meat. Therefore, *Lactobacillus* sp. probiotics represent a promising strategy for sustainable poultry production by improving both animal health and product quality.

Keywords: *Lactobacillus* sp.; Microflora; Pathogenic; Probiotics

Submitter Date: 7 Mei 2026
Accepted Date : 29 Mei 2026
Published Date : 29 Mei 2026

INTRODUCTION

Broiler chickens are one of the major poultry commodities contributing significantly to meeting the animal protein needs of the Indonesian population. The high demand for broiler chicken meat is driven by its relatively affordable price, high nutritional value, and shorter rearing period compared to other livestock. However, the intensive rearing systems commonly applied in modern poultry farming often lead to various problems, particularly those related to digestive tract health. Disorders in the digestive system can cause an imbalance of intestinal microflora, which ultimately affects production performance, feed efficiency, and meat quality. Therefore, maintaining digestive tract health is considered one of the key factors in optimizing broiler productivity.

In poultry farming practices, antibiotics have long been used as antibiotic growth promoters (AGPs) to improve production performance by suppressing the growth of pathogenic bacteria in the digestive tract. However, the continuous use of antibiotics has raised several concerns, including antimicrobial resistance, antibiotic residues in animal products, and negative impacts on human health. These issues have led to restrictions on AGP usage and increased the need for safer and more sustainable alternatives. One promising alternative is the use of probiotics, particularly those based on lactic acid bacteria such as *Lactobacillus* sp., which have been proven effective in maintaining intestinal microflora balance and improving overall animal health [1].

Lactobacillus sp.-based probiotics function through various complex microbiological mechanisms, including competition with pathogenic bacteria for nutrients and adhesion sites on the intestinal wall (competitive exclusion), as well as the production of antimicrobial compounds such as lactic acid, hydrogen peroxide, and bacteriocins. These mechanisms can inhibit the growth of pathogenic bacteria such as *Escherichia coli* and *Salmonella*, thereby creating a more stable and healthy intestinal environment. In addition, *Lactobacillus* sp. can lower intestinal pH through the production of organic acids, indirectly suppressing the growth of pathogenic microorganisms [2]. Thus, probiotics not only function as microbial control agents but also as regulators of the intestinal microflora ecosystem.

Besides controlling pathogenic microflora, probiotics also have a significant impact on improving broiler production performance. The administration of *Lactobacillus* sp. in feed or drinking water has been shown to improve nutrient utilization efficiency through enhanced digestive enzyme activity and improved intestinal morphology, such as increased villi height and absorptive surface area. This enables more optimal nutrient absorption, thereby supporting maximum broiler growth. Studies have demonstrated that supplementation with *Lactobacillus plantarum*-based probiotics in feed can significantly improve protein digestibility and broiler production performance [3].

Furthermore, probiotics also play an important role in improving broiler meat quality. Meat quality is influenced not only by genetic and nutritional factors but also by digestive tract health, which affects nutrient metabolism. The use of probiotics based on *Lactobacillus casei* and *Lactobacillus rhamnosus* has been shown to reduce cholesterol levels and improve lipid profiles in broiler chickens, resulting in healthier and safer meat for consumption. In addition, probiotics may enhance meat texture and sensory quality, which adds value in terms of product marketing [4].

On the other hand, probiotics also contribute significantly to improving the immune system of broiler chickens. A strong immune system is essential to protect poultry from disease challenges, particularly in intensive rearing systems that are highly susceptible to infections. Lactic acid bacteria such as *Lactobacillus* sp. can stimulate the immune system by increasing leukocyte counts and the activity of other immune cells, thereby enhancing broiler resistance against pathogens [5]. Moreover, probiotic supplementation has been proven to increase the population of beneficial bacteria while reducing pathogenic bacteria in the digestive tract, thus creating a more stable gut microbiota that supports overall health [6].

With these various mechanisms of action, *Lactobacillus* sp.-based probiotics have great potential to improve digestive tract health, production performance, and meat quality in broiler chickens. Nevertheless, the effectiveness of probiotics is influenced by several factors, including the strain used, dosage, and environmental rearing conditions. Therefore, more comprehensive studies are needed to better understand the role and mechanisms of probiotics within broiler production systems.

Based on this background, this study aims to systematically review the role of *Lactobacillus* sp.-based probiotics in controlling pathogenic microflora and improving broiler chicken meat quality through a literature review approach. It is expected that the findings of this review will provide scientific contributions toward the development of healthier, safer, and more sustainable broiler production strategies.

MATERIALS AND METHODS

This study employed a literature review method aimed at comprehensively examining the role of *Lactobacillus* sp.-based probiotics in controlling pathogenic microflora and improving the meat quality of broiler chickens. The literature search process was conducted systematically using several

scientific databases, including Google Scholar, PubMed, ScienceDirect, and Garuda (Garba Rujukan Digital). The keywords used in the search included "*Lactobacillus* sp.", "probiotics", "broiler chickens", "intestinal microflora", "meat quality", and "food safety". The literature search focused on scientific journal articles published within the last 5–10 years to ensure the novelty and relevance of the information used.

The inclusion criteria in this study consisted of scientific articles published in accredited national and international journals, available in full-text format, and directly relevant to the research topic, namely the use of *Lactobacillus* sp.-based probiotics in broiler chickens. Selected articles were required to contain data related to digestive tract health, intestinal microflora, production performance, and meat quality. Meanwhile, the exclusion criteria included articles without full-text access, studies unrelated to the topic, and non-scientific sources such as blogs or non-peer-reviewed reports. The selection process was carried out gradually through screening of titles, abstracts, and full-text contents until the most appropriate literature relevant to the study objectives was obtained.

Data analysis was conducted using a qualitative descriptive approach through several stages, namely identification, classification, comparison, and synthesis of research findings. Data from the selected articles were analyzed using the PICOS framework (Population, Intervention, Comparison, Outcome, Study Design), in which the population studied was broiler chickens, the intervention involved the administration of *Lactobacillus* sp. probiotics, and the observed outcomes included changes in intestinal microflora, production performance, and meat quality. The findings from various studies were then compared to identify patterns of similarities and differences, allowing for the formulation of comprehensive conclusions. Furthermore, the results of the analysis were presented in the form of scientific narratives and comparison tables to provide a systematic and easily understandable overview.

RESULT AND DISCUSSION

RESULT

Table 1. Literature Review Results

No.	Author / Title / Year	Type of Study	Variables	Research Findings
1	Hidayat et al. (2018) – *Effect of Lactobacillus* sp. probiotics on intestinal histology and broiler performance	Experimental (*in vivo*)	Intestinal histology, intestinal microflora, production performance	Administration of *Lactobacillus* sp. probiotics significantly increased intestinal villi height and villi-crypt ratio, leading to improved nutrient absorption surface area. In addition, the population of *Escherichia coli* in excreta decreased, indicating inhibitory effects against pathogenic bacteria. Consequently, body weight gain and feed efficiency improved, along with more stable intestinal health during the broiler rearing period.
2	Andriani et al. (2020) – Effectiveness of *Lactobacillus casei* and *Lactobacillus rhamnosus* on broiler lipid profile	Experimental	Lipid profile (total cholesterol, LDL, HDL), meat quality	Probiotics based on *Lactobacillus casei* and *Lactobacillus rhamnosus* significantly reduced total cholesterol and LDL levels while increasing HDL levels. Improved fat metabolism contributed to lower fat deposition in

				muscle tissues, resulting in healthier and safer meat products.
3	Krismiyanto et al. (2023) – *Lactobacillus plantarum* in feed and broiler performance	Experimental	Protein digestibility, production performance, feed efficiency	Supplementation of *Lactobacillus plantarum* in feed significantly improved protein digestibility through enhanced proteolytic enzyme activity. This positively affected broiler growth, feed utilization efficiency, and feed conversion ratio. In addition, probiotics contributed to improved intestinal microflora balance.
4	Widodo et al. (2022) – Digestive tract microbes of broilers with probiotics	Experimental	Intestinal microflora population, digestive health	Probiotic supplementation significantly increased the population of lactic acid bacteria and reduced pathogenic bacteria in the digestive tract. This created a more stable intestinal microbiota, improved digestive health, and supported optimal nutrient absorption.
5	Rahmawati et al. (2020) – Effect of *Lactobacillus* sp. on broiler leukocyte profile	Experimental	Immune system (leukocytes), animal health	*Lactobacillus* sp.-based probiotics increased leukocyte counts and enhanced the immune system activity of broilers, thereby improving resistance against pathogenic infections. In addition, non-specific immune responses were enhanced, supporting overall animal health.
6	Sumarsih et al. (2021) – Potential of *Lactobacillus* as probiotics	Scientific review	Probiotic mechanisms, intestinal microbiology	The study explained that *Lactobacillus* sp. works through mechanisms such as competitive exclusion, organic acid production, and bacteriocin production, all of which inhibit pathogenic bacterial growth. Furthermore, probiotics reduce intestinal pH, creating an unfavorable environment for pathogenic microorganisms.
7	Prayoga et al. (2021) – Broiler meat quality with probiotics [7]	Experimental	Meat quality, organoleptic properties, fat content	Probiotic supplementation improved the physical and organoleptic quality of broiler meat, including more tender texture, better color, and reduced fat content. These findings indicate that

				probiotics contribute to increasing the added value of livestock products.
8	Riza et al. (2018) – *Bacillus* and broiler feed efficiency [8]	Experimental	Feed efficiency, housing environment	Although based on *Bacillus*, this study demonstrated that probiotics improved feed efficiency and reduced ammonia production in poultry houses. This indirectly enhanced environmental quality and broiler health.
9	Nalle et al. (2018) – Probiotics in broiler drinking water [9]	Experimental	Production performance, feed consumption	Administration of probiotics through drinking water improved body weight gain and feed efficiency, although it did not always significantly affect feed consumption. This suggests that probiotics mainly play a role in improving nutrient metabolism efficiency.
10	Suryadi et al. (2018) – Local microorganism (MOL) probiotics on broiler carcass quality [10]	Experimental	Carcass quality, body composition	Probiotics based on local microorganisms (MOL) increased carcass percentage and reduced body fat deposition. Furthermore, improved nutrient metabolism efficiency contributed to healthier and higher-quality meat products.

DISCUSSION

The results of the literature review indicate that *Lactobacillus* sp.-based probiotics play a highly significant role in controlling pathogenic microflora in the digestive tract of broiler chickens. The primary mechanisms involved include the production of antimicrobial compounds such as lactic acid, hydrogen peroxide, and bacteriocins, which directly inhibit the growth of pathogenic bacteria such as *Escherichia coli* and *Salmonella*. In addition, probiotics function through a competitive exclusion mechanism, in which they compete with pathogenic microorganisms for nutrients and adhesion sites on the intestinal mucosa. As a result, pathogenic bacterial colonization can be significantly suppressed. The reduction in pathogenic populations contributes to improved intestinal microflora balance, which is an important indicator of digestive tract health in broiler chickens [11].

Furthermore, *Lactobacillus* sp.-based probiotics are capable of creating a more acidic intestinal environment through the production of organic acids. This decrease in pH is crucial because most pathogenic bacteria are unable to grow optimally under acidic conditions. Moreover, such conditions support the growth of beneficial bacteria that are more tolerant to acidic environments. Consequently, a stable microbiota balance is established, functioning as a natural defense system against infections. The stability of the microbiota also helps maintain intestinal wall integrity and reduces the risk of inflammation in digestive tissues.

In addition to their microbiological role, probiotics also exert significant effects on digestive physiological processes. *Lactobacillus* sp. has been reported to enhance the activity of digestive enzymes such as protease, amylase, and lipase, which are responsible for breaking down proteins, carbohydrates, and fats. Increased enzyme activity enables feed nutrients to be degraded into simpler forms that are more easily absorbed by the broiler's body. This directly improves nutrient absorption efficiency, thereby enhancing growth and production performance [12].

Improved digestive efficiency also contributes to better feed conversion ratio (FCR). Broiler chickens receiving probiotics tend to exhibit lower FCR values, indicating that the consumed feed is utilized more efficiently for growth.

This is highly beneficial in intensive production systems because feed costs represent the largest component of production expenses. In addition, improved feed efficiency reduces metabolic waste production, making poultry farming more environmentally friendly.

From the perspective of the immune system, *Lactobacillus* sp.-based probiotics also play a crucial role. Probiotics stimulate the immune system by enhancing the activity of immune cells such as macrophages and lymphocytes, as well as increasing antibody production. As a result, broiler chickens develop stronger resistance against diseases, particularly those caused by pathogenic microorganisms in the digestive tract. Furthermore, probiotics improve non-specific immune responses, which serve as the body's first line of defense against infections. Enhanced immune function can reduce mortality rates and help maintain optimal production performance [13].

The influence of probiotics is also evident in the improvement of broiler meat quality. Meat produced from probiotic-supplemented chickens generally contains lower fat levels and better protein quality. In addition, probiotics positively affect physical meat characteristics, including more tender texture, brighter color, and improved aroma. These quality improvements are associated with enhanced nutrient metabolism and more efficient energy utilization in the broiler's body. Therefore, probiotic supplementation not only increases production quantity but also enhances the quality of the final product [14].

Moreover, probiotics provide positive effects on the broiler rearing environment. One of the major problems in poultry farming is the high level of ammonia originating from chicken excreta. Excessive ammonia can lead to health problems, particularly respiratory disorders. The use of probiotics has been shown to reduce ammonia levels by improving protein metabolism efficiency, thereby decreasing nitrogen excretion in manure. This contributes to creating a healthier and more comfortable housing environment for the chickens [15].

In addition, probiotics contribute to the long-term stability of intestinal microbiota. Probiotic microorganisms are able to adapt and colonize the digestive tract, thereby providing continuous protection against pathogens. Furthermore, probiotics contribute to the production of metabolites such as short-chain fatty acids (SCFAs), which serve as an energy source for intestinal epithelial cells. These compounds also help improve intestinal mucosal integrity and reduce the risk of tissue damage caused by infections or environmental stress.

Nevertheless, the effectiveness of probiotic use is not always consistent across studies. Variations in findings indicate that the success of probiotic application is strongly influenced by several factors, including the type of *Lactobacillus* strain used, dosage, and method of administration (through feed or drinking water). External factors such as environmental temperature, stocking density, feed quality, and management practices also influence probiotic effectiveness. Therefore, a more specific and targeted approach is needed in probiotic application to achieve optimal results under field conditions.

Apart from technical factors, another challenge in probiotic application is maintaining microorganism stability during storage and distribution. Probiotics are living organisms that are highly sensitive to environmental conditions such as temperature and humidity [16]. Therefore, appropriate formulation technologies are required to preserve probiotic viability until administration to livestock. The development of probiotics based on local microorganisms also represents a promising solution because they are generally more adaptive to local environmental conditions.

Overall, the findings of this discussion demonstrate that *Lactobacillus* sp.-based probiotics have extensive roles in broiler production systems, ranging from the control of pathogenic microflora and improvement of digestive efficiency to enhancement of immune responses, product quality, and rearing environment conditions. With these various advantages, probiotics can serve as an effective and sustainable alternative to antibiotic growth promoters. However, further studies are still needed to determine the most effective combinations of strains, dosages, and application methods under different rearing conditions.

CONCLUSION

Lactobacillus sp.-based probiotics play an important role in improving the digestive health of broiler chickens through the regulation of pathogenic microflora and the enhancement of intestinal microbial balance. The probiotic mechanisms, including competitive exclusion, production of antimicrobial compounds, and reduction of intestinal pH, effectively suppress pathogenic bacteria such as *Escherichia coli* and *Salmonella*. In addition, these probiotics improve digestive enzyme activity and nutrient absorption, leading to better production performance such as increased body weight gain and feed efficiency. Beyond physiological effects, probiotic supplementation also contributes to improved meat quality, including reduced fat content, better protein profile, and improved texture and color, while simultaneously supporting a healthier rearing environment through reduced ammonia production.

Overall, *Lactobacillus sp.*-based probiotics represent a safe, effective, and environmentally friendly alternative to antibiotic growth promoters, offering a more sustainable approach to modern broiler production that integrates animal health improvement, product quality enhancement, and environmental management into a single coherent strategy

ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to all parties who contributed to the completion of this literature review entitled *"The Role of Lactobacillus sp.-Based Probiotics in Controlling Pathogenic Microflora and Improving Broiler Chicken Meat Quality."* Special appreciation is extended for the guidance, support, and valuable suggestions provided throughout the preparation of this manuscript. The authors also thank colleagues and family members for their encouragement and motivation during the completion of this study. It is hoped that this review will contribute to the development of sustainable and healthy broiler production systems.

DECLARATIONS

1. All authors contributed equally to the conception, literature collection, analysis, interpretation of data, and preparation of the manuscript. All authors have read and approved the final version of the manuscript.
2. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.
3. The authors declare that there is no conflict of interest regarding the publication of this paper.
4. This study was conducted using secondary data from published scientific literature; therefore, ethical approval was not required.

REFERENCES

1. Hidayat M, Malaka R, Agustina L, Pakiding W. Effect of *Lactobacillus* sp. probiotics on intestinal histology, *Escherichia coli* in excreta and broiler performance. J Indones Trop Anim Agric. 2018;43(4):445–452. DOI: https://doi.org/10.14710/jitaa.43.4.445-452
2. Sumarsih S, Wibowo MH, Nugroho T. Mekanisme resistensi antibiotik pada *Lactobacillus* dan potensinya sebagai probiotik. Acta Vet Indones. 2021;9(1):12–20.
3. Krismiyanto L, Ismadi VDYB, Mulyono M. Addition of soybean meal extract with *Lactobacillus plantarum* in rations on protein digestibility and performance of broiler chickens. J Indones Trop Anim Agric. 2023;48(4):322–336. DOI: https://doi.org/10.14710/jitaa.48.4.322-336
4. Andriani AD, Lokapirnasari WP, Karimah B, Hidanah S, Al-Arif MA, Soeharsono S, et al. Effect of probiotic *Lactobacillus casei* and *Lactobacillus rhamnosus* as antibiotic growth promoter substitute on broiler lipid profile. J Med Vet. 2020;3(1):114–122. DOI: https://doi.org/10.20473/jmv.vol3.iss1.2020.114-122
5. Rahmawati D, Sari M, Lestari D. Effect of lactic acid bacteria (*Lactobacillus* sp.) on leukocyte profile of broiler chickens. J Biol Stud. 2020;5(2):45–52.
6. Widodo A, Nugroho WS, Prasetyo AF. Microbial population in broiler digestive tract treated with probiotics and phytogenics. J Sains Vet. 2022;40(2):120–128.
7. Prayoga AH, Hendalia E, Noferdiman. Physical and organoleptic quality of broiler meat fed local feed-based ration with probiotics. J Ilmu Ilmu Peternak Indones. 2021;23(1):34–42.
8. Riza H, Wizna W, Rizal Y, Yusrizal Y. Effect of energy and protein levels with *Bacillus amyloliquefaciens* as probiotic in broiler chickens. J Peternak Indones. 2018;20(3):193–201. DOI : https://doi.org/10.25077/jpi.20.2.99-107.2018
9. Nalle CL, Koni TNI, Paga A. Probiotic supplementation through drinking water on broiler performance. J Nukl Peternak. 2018;5(2):120–127.
10. Suryadi U, Rahman A, Kurniawan D. Probiotic-based local microorganisms (MOL) on broiler carcass quality. J Ilmu Peternak Terap. 2018;2(2):89–96.
11. Yulianto B, Suryadi U, Kurnia A. Role of lactic acid bacteria in inhibiting pathogenic bacteria in broilers. J Vet Indones. 2019;21(2):134–142.
12. Saputra AD, Nugroho E, Prasetyo B. Effect of probiotics on nutrient digestibility and broiler performance. J Nutr Ternak Trop. 2020;3(2):101–108.
13. Putri RA, Handayani S, Lestari D. Effect of probiotics on immune system of broiler chickens. J Peternak Indones. 2021;23(1):15–22.
14. Wahyuni S, Fitriani R, Astuti P. Meat quality of broilers fed probiotic-supplemented diets. J Ilmu Ilmu Peternak. 2019;29(3):210–218.
15. Kurniawan D, Rahman A, Sari M. Effect of probiotics on ammonia levels and broiler performance. J Ilmu Peternak Terap. 2020;4(2):85–92.
16. Rahman F, Yuliana N, Hidayat T. Effectiveness of probiotics in improving broiler performance and health. J Sains Peternak. 2022;10(1):45–53.