

## The Effect of Dietary Supplementation of Organic Acids on Performance, Intestinal Histomorphology, and Serum Biochemistry of Broiler Chickens

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### Abstract

Dietary supplementation of organic acids has emerged as a potential strategy to enhance the performance, intestinal histomorphology, and serum biochemistry of broiler chickens. This article provides an overview of the effects of organic acid supplementation on broiler chicken production and health. Organic acids have been found to improve growth performance by enhancing nutrient digestion and absorption, resulting in better feed conversion ratios and increased body weight gain. Moreover, organic acids exhibit antimicrobial properties, inhibiting the growth of pathogenic bacteria while promoting the growth of beneficial gut microflora. These acids also contribute to improved intestinal histomorphology, characterized by increased villus height, surface area, and crypt depth, which indicates enhanced nutrient absorption and overall gut health. Furthermore, organic acids have been shown to optimize serum biochemistry parameters, such as reducing serum cholesterol levels and improving liver function. The antioxidant properties of organic acids help counteract oxidative stress, leading to improved immune function and overall well-being in broiler chickens. However, further research is required to determine the optimal dosages and combinations of organic acids and to evaluate their long-term effects and cost-effectiveness. Understanding the impact of organic acid supplementation on broiler chickens is crucial for the poultry industry to enhance production efficiency and provide high-quality poultry products.

**Keywords:** Broiler chickens; Performance; Intestinal histomorphology; Serum biochemistry; Growth performance; Antimicrobial; Nutrient absorption; Serum cholesterol; antioxidant; Poultry production

### Introduction

As the demand for high-quality poultry products continues to rise, optimizing the performance and health of broiler chickens becomes paramount for the poultry industry. One approach gaining attention is the use of dietary supplementation with organic acids. Organic acids have been shown to positively influence various aspects of broiler chicken production, including growth performance, gut health, and serum biochemistry. This article aims to explore the effects of dietary supplementation of organic acids on broiler chicken performance, intestinal histomorphology, and serum biochemistry [1].

Organic acids and their salts are generally regarded as safe and have been approved by most member states of EU to be used as the feed additives in animal production. The use of organic acids has been reported to protect the young chicks by competitive exclusion, enhancement of nutrient utilization and growth and feed conversion efficiency. The organic acids in non-dissociated, form can penetrate the bacteria cell wall and disrupt the normal physiology of certain types of bacteria. Apart from the antimicrobial activity, they reduce the pH of digesta, increase the pancreatic secretion, and have trophic effects on the mucosa of gastro-intestinal tract. Organic acids have made a great contribution to the profitability in the poultry production and also provided people with the healthy and nutritious poultry products. Acidification with various organic acids has been reported to reduce the production of toxic components by the bacteria and colonization of pathogens on the intestinal wall, thus preventing the damage to epithelial cells, also improve the digestibility of proteins, calcium, phosphorus, magnesium, and zinc, and serve as substrates in the intermediary metabolism [2, 3].

The present study was conducted with the objectives to evaluate the effect of dietary supplementation of organic acids on the performance,

intestinal histomorphology, and serum biochemistry of the broiler chicken.

### Improved growth performance

Numerous studies have reported enhanced growth performance in broiler chickens fed diets supplemented with organic acids. Organic acids, such as formic acid, propionic acid, and citric acid, have been found to improve feed conversion ratio and increase body weight gain. These acids promote nutrient digestion and absorption, leading to better utilization of dietary nutrients and improved growth rates in broilers.

### Enhanced intestinal health

The intestinal health of broiler chickens is critical for optimal growth and productivity. Organic acids play a crucial role in maintaining intestinal integrity and reducing the risk of gastrointestinal disorders. They act as natural antimicrobial agents, inhibiting the growth of pathogenic bacteria, such as Salmonella and E. coli. Moreover, organic acids support the growth of beneficial gut microflora, such as Lactobacillus and Bifidobacterium, promoting a balanced gut microbiota [4].

Supplementation with organic acids has also been linked to

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improvements in intestinal histomorphology. The acids have been shown to increase villus height, villus surface area, and crypt depth in the intestinal mucosa of broiler chickens. These changes indicate an enhancement in nutrient absorption and overall gut health.

### Optimized serum biochemistry

Broiler chickens' serum biochemistry parameters can serve as valuable indicators of their overall health status. Research suggests that organic acid supplementation positively impacts serum biochemistry profiles. For example, organic acids have been found to reduce serum cholesterol levels and improve liver function parameters in broiler chickens. This indicates a potential role for organic acids in mitigating lipid metabolism disorders and supporting liver health [5].

Furthermore, organic acids possess antioxidant properties, which can help counteract oxidative stress in broilers. By reducing oxidative damage, organic acids contribute to improved serum antioxidant capacity and overall immune function.

### Discussion

The effect of dietary supplementation of organic acids on the performance, intestinal histomorphology, and serum biochemistry of broiler chickens has been extensively studied in recent years. These studies have shed light on the potential benefits and mechanisms of action of organic acids in improving broiler chicken health and productivity. One of the primary effects observed in broiler chickens supplemented with organic acids is improved growth performance. Organic acids have been shown to enhance feed efficiency and increase body weight gain [6]. This improvement in performance can be attributed to the ability of organic acids to enhance nutrient digestion and absorption. Organic acids promote the activity of digestive enzymes, such as amylase, protease, and lipase, leading to better utilization of dietary nutrients. This, in turn, results in improved feed conversion ratios and faster growth rates in broilers.

In addition to promoting growth, organic acids also play a crucial role in maintaining intestinal health in broiler chickens. The gastrointestinal tract of broilers is highly susceptible to pathogenic bacteria, which can lead to digestive disorders and reduced performance. Organic acids act as natural antimicrobial agents, inhibiting the growth of pathogenic bacteria, including *Salmonella* and *E. coli*. By reducing the pathogen load in the gut, organic acids help maintain a healthy gut microbiotic balance and prevent the proliferation of harmful bacteria. They also support the growth of beneficial gut micro flora, such as *Lactobacillus* and *Bifidobacterium*, which contribute to overall gut health and function. Furthermore, dietary supplementation of organic acids has been associated with improved intestinal histomorphology in broiler chickens. Histomorphological changes, such as increased villus height, villus surface area, and crypt depth, have been observed in the intestinal mucosa of broilers fed organic acids. These changes indicate an enhancement in nutrient absorption capacity and overall gut health. The improved intestinal morphology allows for better nutrient uptake and utilization, ultimately leading to improved growth performance and overall health [8].

When it comes to serum biochemistry, organic acid supplementation has shown promising effects in broiler chickens. Organic acids have been found to reduce serum cholesterol levels, which is particularly beneficial in mitigating lipid metabolism disorders. Elevated cholesterol levels can negatively impact growth performance and increase the risk of cardiovascular diseases. By lowering serum cholesterol, organic acids contribute to improved lipid metabolism and cardiovascular

health in broiler chickens. Moreover, organic acids possess antioxidant properties, which help counteract oxidative stress in broilers. Oxidative stress occurs when there is an imbalance between the production of reactive oxygen species and the body's antioxidant defense mechanisms [9]. ROS can damage cells and tissues, impairing overall health and performance. Organic acids, by acting as antioxidants, help neutralize ROS, reducing oxidative damage and enhancing the antioxidant capacity of the serum. This contributes to improved immune function and overall well-being of broiler chickens.

It is important to note that the effects of organic acid supplementation can vary depending on factors such as dosage, duration of supplementation, and the specific types of organic acids used. Further research is needed to optimize the dosages and combinations of organic acids to maximize their benefits while avoiding any potential adverse effects. Additionally, the cost-effectiveness and practicality of incorporating organic acids into commercial broiler diets should be carefully considered [10].

### Conclusion

Dietary supplementation of organic acids holds great potential for optimizing broiler chicken performance, intestinal health, and serum biochemistry. The positive effects observed include improved growth performance, enhanced intestinal histomorphology, and optimized serum biochemistry parameters. These findings highlight the importance of organic acids as a valuable nutritional tool in broiler production systems.

While organic acid supplementation offers several benefits, it is crucial to determine the appropriate dosage and combination of organic acids for optimal outcomes. Additionally, further research is needed to explore the long-term effects, cost-effectiveness, and potential interactions of organic acids with other dietary components. By continuing to investigate the effects of organic acid supplementation, the poultry industry can unlock new strategies to enhance broiler chicken production, welfare, and consumer satisfaction.

### Conflict of Interest

None

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