

International Journal of Agriculture Extension and Social Development

Volume 9; SP-Issue 7; July 2026; Page No. 107-110

Received: 22-04-2026
Accepted: 25-05-2026

Indexed Journal
Peer Reviewed Journal

Evaluation of a Photobiotic blend as a natural alternative to antibiotic growth promoters in broiler chickens

¹Prateek Singh, ²Vijay Kumar Singh and ³Virendra Bahadur Singh

¹Subject Matter Specialist (Animal Husbandry), Krishi Vigyan Kendra, Chandauli, ANDUA&T, Kumarganj, Ayodhya, Uttar Pradesh, India

²Professor and head, Department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, ANDUA&T, Kumarganj, Ayodhya, Uttar Pradesh, India

³Key Account Technology Lead-Dairy Nutrition, Cargill India

DOI: <https://doi.org/10.33545/26180723.2026.v9.i7Sb.3924>

Corresponding Author: Prateek Singh

Abstract

The present study was conducted to evaluate the effect of dietary supplementation of a 2% phytobiotic mixture on the productive performance and economic efficiency of broiler chickens under farmers' field conditions. The on-farm trial was carried out in Chandauli district of Uttar Pradesh, India, involving five poultry farmers. A total of 1000 day-old commercial broiler chicks were randomly allocated into two experimental groups: control (T₁), fed a basal commercial diet, and treatment (T₂), fed the same diet supplemented with a 2% phytobiotic mixture. Productive performance parameters including body weight, average daily gain (ADG), feed conversion ratio (FCR), mortality and benefit:cost (B:C) ratio were recorded and analysed.

The initial body weight did not differ significantly ($p > 0.05$) between the two groups. However, phytobiotic supplementation significantly ($p < 0.05$) improved growth performance. Broilers in the treatment group attained a higher final body weight (2299.92 ± 16.73 g) than those in the control group (2189.88 ± 14.22 g), representing an increase of approximately 5.02%. Similarly, ADG was significantly higher in the treatment group (54.76 ± 0.40 g) than in the control group (52.14 ± 0.34 g). Feed conversion ratio was significantly improved, with the treatment group recording a lower FCR (1.56 ± 0.01) than the control (1.60 ± 0.01). Mortality was numerically lower in the phytobiotic-supplemented birds ($3.00 \pm 0.32\%$) than in the control group ($3.60 \pm 0.40\%$), although the difference was not statistically significant ($p > 0.05$). Economic analysis revealed that phytobiotic supplementation significantly improved the benefit–cost (B:C) ratio from 1.22 ± 0.01 in the control group to 1.25 ± 0.01 in the treatment group ($p < 0.05$).

The findings demonstrate that dietary supplementation of a 2% phytobiotic mixture enhances growth performance, improves feed utilization efficiency and profitability, and can serve as a safe and economically viable alternative to antibiotic growth promoters in commercial broiler production.

Keywords: Broiler, phytobiotic mixture, average daily gain, feed conversion ratio, benefit ratio, economic efficiency

1. Introduction

The increasing global population has intensified the demand for affordable and high-quality sources of animal protein. Among the various livestock products, broiler chicken meat is recognized as one of the most economical and efficient sources of dietary protein. Consequently, the poultry industry has undergone rapid expansion and commercialization over the past few decades. However, intensive broiler production systems are frequently associated with several challenges, including increased disease susceptibility, reduced immune competence, environmental stress, poor growth performance, and economic losses resulting from higher mortality.

To improve growth performance and production efficiency, synthetic growth promoters and various chemical feed additives have traditionally been incorporated into broiler diets. Although these additives have contributed to enhanced growth and feed utilization, their prolonged use is

associated with several limitations, including increased production costs, adverse effects on bird health, and the risk of chemical residues in poultry products (Bhujbal *et al.*, 2009) [3]. In addition, antibiotic growth promoters (AGPs) have long been used to improve growth rate, feed efficiency, and overall productivity in broiler production. However, the continuous use of AGPs has raised serious concerns regarding the emergence of antimicrobial-resistant bacteria and the presence of antibiotic residues in poultry products. These concerns pose significant risks to both animal and public health, leading to restrictions on the routine use of AGPs in several countries and encouraging the search for safer and sustainable alternatives.

Among the available alternatives, phytobiotics, also known as phyto-genic feed additives, have gained considerable attention as natural substitutes for antibiotic growth promoters. These plant-derived bioactive compounds contain a diverse range of secondary metabolites, including

essential oils, flavonoids, alkaloids, tannins, saponins, and phenolic compounds, which possess antimicrobial, antioxidant, anti-inflammatory, antiviral, and immunomodulatory properties. By maintaining a balanced intestinal microflora (eubiosis), probiotics improve nutrient digestion and absorption, stimulate digestive enzyme secretion, enhance feed utilization, and strengthen the immune system. These combined effects ultimately improve growth performance, feed conversion efficiency, and the overall health status of broiler chickens.

Several medicinal plants have been extensively investigated for their growth-promoting and therapeutic potential in poultry production. Supplementation of tulsi (*Ocimum sanctum*) has been reported to improve body weight gain, feed intake, feed efficiency, and overall growth performance in broilers (Islam *et al.*, 2013; Hasan *et al.*, 2016)^[9, 6]. These beneficial effects are likely attributable to the antimicrobial and antiprotozoal properties of tulsi (Kale *et al.*, 2003)^[12], which help reduce the intestinal microbial load, thereby improving nutrient utilization, feed consumption, and overall feed efficiency (Pushpagadan and Sobti, 1977)^[17]. Dietary supplementation with turmeric (*Curcuma longa*) has also been shown to improve feed conversion ratio and promote growth performance (Zeinali *et al.*, 2009)^[22]. Likewise, *Nigella sativa* supplementation has been reported to increase body weight gain, enhance immune response, and reduce plasma cholesterol concentration in poultry (Durrani *et al.*, 2007; Hassan *et al.*, 2004)^[4, 7]. Other medicinal plants, including neem (*Azadirachta indica*), ashwagandha (*Withania somnifera*), aloe vera (*Aloe barbadensis*), and punarnava (*Boerhavia diffusa*), have also demonstrated beneficial effects owing to their antimicrobial, antioxidant, and immunomodulatory activities. Their bioactive constituents help suppress pathogenic microorganisms, reduce oxidative stress, maintain intestinal integrity, and improve nutrient utilization, thereby enhancing productive performance in poultry.

Considering the growing concerns regarding antibiotic growth promoters and the increasing consumer demand for safe and residue-free poultry products, the evaluation of herbal feed additives under farmers' field conditions has become increasingly important. Therefore, the present study was undertaken to evaluate the efficacy of a phytobiotic blend comprising neem leaves, tulsi leaves, turmeric rhizomes, ashwagandha roots, *Nigella sativa*, aloe vera, and punarnava roots included in the diet at 2% on growth performance, feed conversion ratio, mortality, and economic efficiency in broiler chickens under farmers' field conditions.

Materials and Methods

The present on-farm trial was conducted in Chandauli district, Uttar Pradesh, India, to evaluate the effect of a phytobiotic mixture on the productive performance of broiler chickens under farmers' field conditions. Five poultry farms were selected for the study. A total of 1000 day-old commercial broiler chicks were equally distributed among the five farms. Within each farm, birds were randomly allocated into two experimental groups: a control group (T₁) and a treatment group (T₂), comprising 100 birds per group. Thus, each treatment consisted of a total of 500 birds across all farms. Birds in both groups were managed

according to the feeding and management practices recommended by the Bureau of Indian Standards (BIS).

The birds in the control group (T₁) were fed a standard commercial broiler diet without any supplementation, whereas those in the treatment group (T₂) received the same basal diet supplemented with a phytobiotic mixture at 2% of the diet throughout the experimental period. The phytobiotic mixture consisted of neem leaves (*Azadirachta indica*), tulsi leaves (*Ocimum sanctum*), turmeric rhizomes (*Curcuma longa*), ashwagandha roots (*Withania somnifera*), *Nigella sativa*, aloe vera (*Aloe barbadensis*) and punarnava roots (*Boerhavia diffusa*).

All birds were reared under a deep litter system with ad libitum access to feed and clean drinking water throughout the experimental period. Uniform management practices, including the recommended vaccination schedule, were followed for both experimental groups. Strict biosecurity measures were implemented to minimize the risk of disease. Before chick placement, the poultry houses were thoroughly cleaned and disinfected, followed by fumigation using formalin and potassium permanganate (KMnO₄). Feeders, drinkers, and all other equipment were cleaned, disinfected, and sanitized before use. During the trial, feeders and drinkers were disinfected daily with 0.02% potassium permanganate (KMnO₄) solution, and lime powder was maintained at the entrance of each poultry shed to reduce microbial contamination.

The experiment was conducted to evaluate the effect of dietary phytobiotic supplementation on growth performance, feed conversion ratio (FCR), mortality and economic efficiency of broiler chickens under farmers' field conditions. The experimental data were analyzed using the Statistical Package for the Social Sciences (SPSS) software. Statistical significance was declared at $p < 0.05$.

Results and Discussion-

The effect of dietary supplementation of a 2% phytobiotic mixture on the productive performance of broiler chickens under farmers' field conditions is presented in Table 1. The results demonstrated that supplementation of the phytobiotic blend significantly improved growth performance, feed efficiency and economic efficiency without adversely affecting bird health.

The average initial body weight of chicks did not differ significantly ($p > 0.05$) between the control (41.00±0.63 g) and treatment (43.00±0.82 g) groups, indicating that chicks were uniformly distributed at the commencement of the experiment. Thus, the observed differences in productive performance at the end of the trial can be attributed primarily to the dietary supplementation of the phytobiotic mixture rather than to any initial variation in body weight.

Dietary supplementation of the phytobiotic mixture resulted in a significant ($p < 0.05$) improvement in growth performance. Broilers receiving the phytobiotic blend attained a significantly higher final body weight (2299.92±16.73 g) compared with the control birds (2189.88±14.22 g), representing an increase of approximately 5.02% in live body weight. Likewise, the average daily gain was significantly ($p < 0.05$) greater in the treatment group (54.76±0.40 g) than in the control group (52.14±0.34 g). The improved growth performance observed in the present study may be attributed to the

synergistic action of bioactive phytochemicals present in the herbal mixture, which stimulate digestive enzyme secretion, improve intestinal morphology, maintain a favourable gut microbial ecosystem and enhance nutrient digestion and absorption. In addition, phytobiotics possess antioxidant, antimicrobial and anti-inflammatory properties that reduce oxidative stress and improve metabolic efficiency, thereby promoting better growth and body weight gain in broiler chickens. Mortality was numerically lower in the phytobiotic-supplemented birds ($3.00 \pm 0.32\%$) than in the control group ($3.60 \pm 0.40\%$); however, the difference was statistically non-significant ($p > 0.05$). The lower mortality recorded in the treatment group may be associated with the immunomodulatory and antimicrobial activities of phytobiotics, which help improve disease resistance and maintain gut health under field conditions. Although the reduction was not statistically significant, the trend suggests that phytobiotic supplementation may contribute to improved flock health and survivability under commercial production systems.

Feed conversion ratio (FCR) was significantly ($p < 0.05$) improved following phytobiotic supplementation. Birds receiving the phytobiotic mixture recorded a lower FCR (1.56 ± 0.01^b) than those in the control group (1.60 ± 0.01^a), indicating superior feed utilization efficiency. Improved FCR reflects the enhanced ability of birds to convert feed nutrients into body mass. This improvement is likely due to increased digestive efficiency, stimulation of digestive enzyme activity, improved intestinal absorptive capacity and suppression of pathogenic microorganisms and better maintenance of intestinal integrity by phytochemicals. Enhanced feed efficiency ultimately contributes to higher production efficiency and reduced feed cost per unit of body weight gain.

Economic analysis further revealed that supplementation of the phytobiotic mixture substantially improved profitability. Similarly, the benefit: Cost (B:C) ratio was significantly ($p < 0.05$) higher in the treatment group (1.25 ± 0.01^a) than in the control group (1.22 ± 0.01^b). The higher B:C ratio clearly demonstrates that the additional expenditure incurred on phytobiotic supplementation was effectively compensated by improved growth performance and feed efficiency, thereby improving the economic efficiency of broiler production. These findings indicate that dietary supplementation of phytobiotics is not only biologically effective but also economically viable under farmers' field conditions.

The findings of the present investigation are in close agreement with those reported by Javed *et al.* (2009), who observed significantly higher body weight gain, dressing percentage, breast weight and leg weight in broilers supplemented with herbal formulations containing *Withania somnifera* (Ashwagandha). Similarly, Srivastava *et al.* (2013) [20] reported significant improvements in dressing percentage following herbal supplementation. The enhanced growth performance observed in the present study is also consistent with the reports of Prajapat *et al.* (2018), Nagar *et al.* (2021) and Ayalew *et al.* (2022) [16, 15, 2] who attributed improved body weight gain to enhanced digestive activity, improved nutrient absorption, antimicrobial effects and antioxidant properties of phytochemical feed additives.

The numerical reduction in mortality observed in the present

investigation corroborates the findings of Eevuri and Putturu (2013) [5], who reported improved survivability in broilers supplemented with Aloe vera. The immunomodulatory, antibacterial, antiviral and antioxidant properties of phytobiotics may collectively contribute to improved health status and lower mortality under field conditions. Similar improvements in body weight gain and feed efficiency have also been reported by Mohamed *et al.* (2012), Herawati and Marjuki (2011), Khan *et al.* (2018), Jahejo *et al.* (2019), Sadeghi *et al.* (2011) and Arshad *et al.* (2012) [14, 8, 3, 10, 19, 1], who demonstrated that supplementation of turmeric, ginger, basil and polyherbal mixtures significantly enhanced broiler performance. Furthermore, the significant improvement in FCR observed in the present study agrees with the findings of Urusan and Bolukbas (2017) [21], whereas the enhanced economic efficiency are in accordance with the observations of Rawat *et al.* (2016) [18], who reported improved profitability following supplementation of phytobiotics and organic acids in broiler diets.

Overall, the present findings clearly demonstrate that supplementation of a 2% phytobiotic mixture effectively improved growth performance, feed utilization efficiency and economic efficiency under farmers' field conditions. The results suggest that phytobiotic supplementation can serve as a promising, safe and economically viable alternative to antibiotic growth promoters for sustainable broiler production.

Table 1: Effect of phytobiotic mixture (Neem leaves, tulsi leaves, turmeric rhizomes, ashwagandha roots, *Nigella sativa*, Aloe vera and punarnava roots) supplementation on performance and economics of broiler chickens

Parameters	Control (T ₁)	Treatment (T ₂)
Initial body weight (g)	41.00±0.63	43.00±0.82
Average daily gain (g)	52.14±0.34 ^b	54.76±0.40 ^a
Average final body weight (g)	2189.88±14.22 ^b	2299.92±16.73 ^a
Mortality (%)	3.60±0.40	3.00±0.32
FCR	1.60±0.01 ^a	1.56±0.01 ^b
B:C ratio	1.22±0.01 ^b	1.25±0.01 ^a

Means bearing different superscripts (a, b) within the same row differ significantly ($p < 0.05$)

Conclusions

The findings of the present on-farm trial demonstrated that dietary supplementation of a 2% phytobiotic mixture significantly improved the productive performance and economic efficiency of broiler chickens under farmers' field conditions. Birds receiving the phytobiotic-supplemented diet exhibited significantly higher average daily gain and final body weight, along with a significantly lower feed conversion ratio and a significantly higher benefit–cost (B:C) ratio than those fed the conventional diet. Although the reduction in mortality was not statistically significant, a favourable numerical decline was observed in the treatment group. The improved growth performance, feed efficiency and higher benefit–cost (B:C) ratio indicate the economic viability of phytobiotic supplementation.

Overall, the study suggests that incorporation of a 2% phytobiotic mixture in broiler diets can be recommended as a safe, effective and economically sustainable feeding strategy to enhance productivity under field conditions. Furthermore, phytobiotic supplementation offers a promising natural alternative to antibiotic growth promoters,

thereby supporting sustainable poultry production and addressing the increasing demand for antibiotic-free broiler meat.

References

1. Arshad M, Kakar AH, Durrani FR, Akhtar A, Sanaullah S, Niamatullah M. Economical and immunological impact of ginger extract on broiler chicks. *Pakistan Journal of Science*. 2012;64(1):46-48.
2. Ayalew H, Zhang H, Wang J, Wu S, Qiu K, Qi G, et al. Potential feed additives as antibiotic alternatives in broiler production. *Front Vet Sci*. 2022;9:916473.
3. Bhujbal RN, Patil MB, Kank VD, Rande AS, Gadegaonkar GM, Karambele NR, et al. Effects of phytobiotics on the performance of broilers. *Journal of Bombay Veterinary College*. 2009;17:33-35.
4. Durrani FR, Chand N, Zaka K, Sultan A, Khattak FM, Durrani Z. Effect of different levels of feed-added black seed (*Nigella sativa* L.) on the performance of broiler chicks. *Pakistan Journal of Biological Sciences*. 2007;10(22):4164-4167.
5. Eevuri TR, Putturu R. Use of certain herbal preparations in broiler feeds: A review. *Vet World*. 2013;6(3):172-179.
6. Hasan MN, Mostofa M, Sorwar MG, Hasan MT, Das K, Hossain DMN. Effects of tulsi leaf extract on body weight gain in broiler production. *Bangladesh Journal of Veterinary Medicine*. 2016;14(1):21-25.
7. Hassan LL, Askar AA, El-Shourbagy GA. Influence of medicinal plants on performance, physiological and meat quality traits of broiler chicks. *Egyptian Poultry Science Journal*. 2004;24:247-266.
8. Herawati, Marjuki. The effect of feeding red ginger (*Zingiber officinale* Rosc.) as phytobiotic on broiler slaughter weight and meat quality. *Int J Poult Sci*. 2011;10(12):983-986.
9. Islam MR, Mostofa M, Roy RR, Sorwar MG, Mondal KS. Role of Max yeast culture probiotic in potentiating the growth performance of commercial broiler. *Progressive Agriculture*. 2013;24(1-2):131-136.
10. Jahejo AR, Rajput N, Tian W, Naeem M, Kalhor DH, Kaka A, et al. Immunomodulatory and growth-promoting effects of basil (*Ocimum basilicum*) and ascorbic acid in heat-stressed broiler chickens. *Pak Vet J*. 2019;39(3):395-400.
11. Javed M, Durrani FR, Hafeez A, Khan RU, Ahmad I. Effect of aqueous extract of plant mixture on carcass quality of broiler chicks. *Journal of Agricultural and Biological Science*. 2009;4(1):37-40.
12. Kale BP, Kothekar MA, Tayade HP, Jaju JB, Mateenuddin M. Effect of aqueous extract of *Azadirachta indica* leaves on hepatotoxicity induced by antitubercular drugs in rats. *Indian J Pharmacol*. 2003;35(3):177-180.
13. Khan M, Singh VK, Gautam S, Tewari D, Devi R, Singh VB, et al. Influence of dietary incorporation of polyherbal mixture on feed intake, haemato-biochemical parameters and carcass traits in broiler chicken. *Int J Curr Microbiol Appl Sci*. 2018;7(12):4462-4470.
14. Mohamed AB, Alrubae MAM, Jalil A. Effect of ginger (*Zingiber officinale*) on performance and blood serum parameters of broiler. *Int J Poult Sci*. 2012;11(2):143-146.
15. Nagar A, Pandey R, Singh AK, Thakur R. Impact of dietary supplementation of *Asparagus racemosus* and *Withania somnifera* root powder on performance in broilers. *Journal of Animal Research*. 2021;11(2):333-339.
16. Prajapat UK, Jain D, Dhuria RK, Sharma T, Bothra T, Nehra R, et al. Effect of dietary supplementation of tulsi (*Ocimum sanctum*) leaf powder and fenugreek (*Trigonella foenum-graecum*) seed powder on growth performance in broilers. *Veterinary Practitioner*. 2018;19(1):1-5.
17. Pushpagadan G, Sobti SN. Medicinal properties of *Ocimum sanctum* species and some recent investigations of their efficacy. *Indian Drugs*. 1977;14:207-212.
18. Rawat SK, Gupta R, Narain S. Effect of Superliv on feed consumption, feed conversion efficiency and body weight gain in commercial broiler. *Indian Journal of Extension Education*. 2016;16(2):60-64.
19. Sadeghi GH, Karimi A, Jahromi SP, Aziz T, Daneshmand A. Effect of cinnamon, thyme and turmeric infusions on the performance and immune response of male broilers. *Braz J Poult Sci*. 2012;14(1):15-20.
20. Srivastava SB, Niwas R, Singh DP, Bisen B. Impact of herbal based diets on production efficiency of broiler. *The Bioscan*. 2013;8(1):119-122.
21. Urusan H, Bolukbas SC. Effect of dietary supplementation levels of turmeric powder (*Curcuma longa*) on performance, carcass characteristics and gut microflora in broiler chickens. *Journal of Animal and Plant Sciences*. 2017;27(3):732-736.
22. Zainali A, Riasi A, Kermanshahi H, Farhangfar H, Ziaie H. Effect of sodium selenite and turmeric powder on growth performance, carcass quality and blood antioxidant metabolites of heat-stressed broiler chickens. *Animal Science Research Journal*. 2009;19:69-76.