



Research in

ISSN : P-2409-0603, E-2409-9325

AGRICULTURE, LIVESTOCK and FISHERIES

An Open Access Peer-Reviewed International Journal

Article Code: 506/2025/RALF

Article Type: Research Article

Res. Agric. Livest. Fish.

Vol. 12, No. 3, December 2025: 449-454.

Effects of Green Tea (*Camellia sinensis*) Powder Supplementation on Growth Performance of Broiler Chicken

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ARTICLE INFO

Received

24 November 2025

Revised

06 December 2025

Accepted

06 December 2025

Key words:

Broiler
Green tea
Growth performance
Feed conversion ratio
Hematology
Antibiotic alternative

ABSTRACT

This study evaluated the impact of dietary green tea (*Camellia sinensis*) powder supplementation on growth performance and hematological parameters in broiler chickens. A total of 150 Cobb-500 chicks were randomly assigned to three dietary treatments: a control group (T_0 ; basal diet), an antibiotic-supplemented group (T_1 ; basal diet + amoxicillin 30% at 1 g/kg feed), and a green tea-supplemented group (T_2 ; basal diet + 0.5% green tea powder). All birds were reared for 35 days under uniform management conditions. Performance indicators—including body weight gain, feed intake, feed conversion ratio (FCR), dressing percentage, offal weight, intestinal length-and hematological variables (TEC, Hb, PCV, SGOT, and SGPT) were recorded. Broilers receiving green tea exhibited significantly higher ($P < 0.001$) final body weight (2004.88 ± 6.96 g) and the lowest FCR (1.49), outperforming both the antibiotic (1.54) and control groups (1.61). Hematological profiles also improved markedly ($P < 0.001$) in the green tea group. Green tea supplementation increased dressing and offal weight percentages without negative effects on bird health. Overall, the findings suggest that inclusion of 0.5% green tea powder in broiler diets enhances growth and physiological status and may serve as a promising natural alternative to antibiotic growth promoters (AGPs).

To cite this article: Shuvo Datta, Md. Aktaruzzaman, Md. Siddiqul Islam and Md. Anwar Hossain, 2025. Effects of Green Tea (*Camellia sinensis*) powder supplementation on growth performance of broiler chicken. Res. Agric. Livest. Fish. 12(3): 449-454.

DOI: <https://doi.org/10.3329/ralf.v12i3.86166>



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Introduction

Global poultry production continues to expand rapidly, driven by increasing demand for affordable animal protein. Broiler chickens are particularly important due to their fast growth, efficient feed utilization, and consumer preference for lean meat (Ariana et al., 2011). However, intensive production exposes birds to various stressors that can compromise health and productivity (Toghyani et al., 2010). Traditionally, antibiotics have been used as growth promoters to enhance feed efficiency and disease resistance, but their use has been restricted due to the risk of antimicrobial resistance and consumer health concerns (Ariana et al., 2011). Phytopreventive feed additives, including herbs and plant extracts, have gained attention as natural alternatives to antibiotics. Green tea (*Camellia sinensis*) is rich in catechins, particularly epigallocatechin gallate (EGCG), known for its antimicrobial, antioxidant, and immunomodulatory properties (Abdul-Azeem, 2005; Guo et al., 2004). Previous studies have suggested that green tea may improve growth performance and carcass quality in broilers, though findings remain inconsistent (Sarker et al., 2010). This study aimed to evaluate the effects of green tea powder supplementation on growth performance, feed efficiency, carcass traits, and hematological profiles of broiler chickens, with the goal of determining its potential as a natural antibiotic substitute (Ariana et al., 2011).

Materials and Methods

Experimental Design and Management

The experiment was conducted at Aziz Poultry Farm, Magura Sadar, under the supervision of the Department of Pharmacology and Toxicology, Sylhet Agricultural University, Bangladesh. One hundred fifty-day-old Cobb-500 chicks were randomly allocated to three groups ($n = 50$ per group):

- T_0 : Control (basal diet only)
- T_1 : Antibiotic (basal diet + amoxicillin 30%, 1 g/kg feed)
- T_2 : Green tea (basal diet + 0.5% green tea powder, 5 g/kg feed)

Birds were reared for 35 days under identical management conditions with ad libitum feed and water. Standard commercial pre-starter, starter, and grower feeds (Nourish Feed Ltd.) were used.

Data Collection

Live body weight was recorded weekly. Feed intake and feed conversion ratio (FCR) were calculated at 7-day intervals. At day 35, five birds per group were randomly selected for slaughter to measure dressing percentage.

Hematological and Biochemical Analysis

Blood samples were collected from wing veins at day 35. Parameters analyzed included Total Erythrocyte Count (TEC), Hemoglobin (Hb), Packed Cell Volume (PCV), Serum Glutamate Oxaloacetate Transaminase (SGOT), and Serum Glutamate Pyruvate Transaminase (SGPT), using standard methods Lamberg and Rothstein (1977); Coffin (1995); Gupta and Charan (2007).

Statistical Analysis

Data were analyzed using one-way ANOVA (Minitab v20), and mean differences were determined using Tukey's test. Significance was set at $P < 0.001$.

Results and Discussion

Growth Performance

Broilers supplemented with green tea (T_2) exhibited significantly higher ($P < 0.001$) body weight gain (2004.88 g) compared to antibiotic (1964.86 g) and control groups (1914.75 g).

Table 1. Comparison of live body weight among the group

Group	Mean Live Weight gain (g)				
	Day 7	Day 14	Day 21	Day 28	Day 35
T_0 (N=50)	167.55b	463.27c	899.46c	1462.18c	1914.75c
T_1 (N=50)	179.27a	475.78b	921.44b	1487.49b	1964.86b
T_2 (N=50)	182.07a	485.05a	940.63a	1518.56a	2004.88a
SEM	1.34	1.77	3.25	4.44	6.69
Level of Significance	***	***	***	***	***

T = Control group, T_1 = Antibiotic supplemented group, T_2 = Green Tea supplemented group, N= Number of birds, SEM= Standard Error of Mean

***Values in rows with different superscripts differ significantly ($p < 0.001$)

Carcass Traits

The highest dressing weight (1443.51 g) and dressing percentage (72%) were recorded in the green tea group. Offal weights (heart, liver, spleen) were also significantly higher ($P < 0.001$) in T_2 , while gizzard weight was slightly lower. The intestinal length was longest in T_2 (160.48 cm) compared with T_0 (145.30 cm).

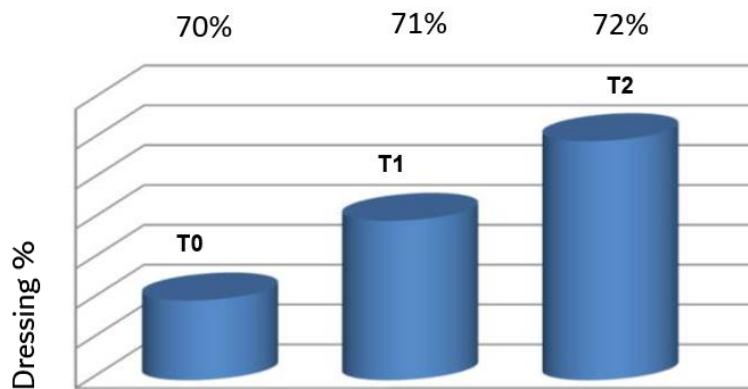


Figure 1. Carcass traits in percentage

Feed Intake

All the feed intake values are presented in Table 2. Feed was supplied in different groups T_0 , T_1 and T_2 separately. Every 7 days interval total consumed feed amount of each group are calculated from total feed stock. Feed intake was slightly lower in the green tea group (2987 g) compared to the control (3086 g).

Table 2. Comparison of feed intake among the group

Group	Average feed intake (g/bird)				
	Day 7	Day 14	Day 21	Day 28	Day 35
T ₀ (N=50)	150	535	1180	2150	3086
T ₁ (N=50)	156	540	1165	2125	3026
T ₂ (N=50)	160	555	1152	2100	2987

Feed Conversion Ratio (FCR)

All the FCR values are presented in Table 3. FCR improved significantly in the green tea group (1.49) compared with antibiotic (1.54) and control (1.61). Use of dietary green tea improves feed conversion ratio.

Table 3. Effects of treatments on FCR 7 days interval

Group	Feed Conversion Ratio (FCR)				
	Day 7	Day 14	Day 21	Day 28	Day 35
T ₀ (N=50)	0.90	1.15	1.31	1.47	1.61
T ₁ (N=50)	0.87	1.13	1.26	1.43	1.54
T ₂ (N=50)	0.80	1.14	1.22	1.38	1.49

Hematological and Biochemical Parameters

All the hematological values are presented in Table 4. The green tea-supplemented group showed significant increases ($P<0.001$) in Hb (13.75 g/dl), PCV (41.70%), and TEC ($4.85 \times 10^6/\text{mm}^3$) compared to the control. SGOT and SGPT levels were also elevated within physiological ranges, suggesting enhanced liver function. The mean values of hemoglobin increased significantly ($p<0.001$) in all the treated groups and the highest was recorded in group T₂ (13.752g/dl) and lowest in control group T₀ (9.806g/dl). The mean value of PCV (Packed Cell Volume) also increased significantly ($p < 0.001$) in all the treated groups. The highest value was recorded in group T₂ (41.707%) and lowest in control group T₀ (36.463%). The mean values of TEC (Total Erythrocyte Count) in all treated groups were increased significantly ($p < 0.001$) than control group. The highest TEC value was recorded in group T₂ (4.850 million/mm³) and lowest in group T₀ (3.113 million/mm³).

Table 4. Haemato-biochemical parameters in broilers after being treatments

Items	Treatment (Mean)			SEM	Level of Significance
	T ₀ (N=50)	T ₁ (N=50)	T ₂ (N=50)		
Hemoglobin Content (g/dl)	09.806 ^c	11.820 ^b	13.752 ^a	0.315	***
PCV (%)	36.463 ^c	38.866 ^b	41.707 ^a	0.437	***
TEC (million/ ³ mm blood)	03.113 ^b	03.687 ^b	04.850 ^a	0.172	***
SGOT (U/L)	342.80 ^a	332.56 ^b	287.96 ^c	4.440	***
SGPT (U/L)	06.757 ^a	05.743 ^b	04.77 ^c	0.186	***

T= Control group, T= Antibiotic supplemented group, T= Green Tea supplemented group, N= Number of birds, SEM= Standard Error of Mean

***Values in rows with different superscripts differ significantly ($p<0.001$)

The inclusion of 0.5% green tea powder improved body weight gain and feed efficiency in broilers, consistent with findings by Sarker et al., (2010) and Biswas et al., (2000). Green tea catechins may enhance digestive enzyme activity, modulate gut microflora, and reduce oxidative stress, leading to improved nutrient utilization (Abdul-Azeem, 2005; Guo et al., 2004). There was a tendency of Green Tea Powder (GTP) to suppressed feed intake (Biswas et al., 2001) without change of the body weight gain. Sarker et al. (2010) showed feed intake highly decreased by increasing the percentage of green tea powder on diet. Feed intake is more decreased in 1.0% green tea powder than 0.5%. Same observation showed by (Yang et al., 2003) that feed intake decreased more in 1.0% green tea powder than 0.5% green tea powder supplied with normal diet and feed intake more decreased in 0.5% green tea powder supplement diet than control. Reduced feed intake with improved FCR indicates better metabolic efficiency. This has been also observed in other feeding experiments using layers (Biswas et al., 2000; Toghyani et al., 2010). Several experiment (Biswas et al., 2001; Sarker et al., 2010; Yang et al., 2003) showed that increased percentage (0.5%) of green tea powder improved feed efficiency or Feed Conversion Ratio (FCR) than control. Similar result observed in current experiment that dietary 0.5% GTP improved FCR in broiler. The positive effects on hematological indices suggest that green tea promotes hematopoiesis and overall physiological health. Increased Hb, PCV, and TEC values support improved oxygen transport and metabolic activity, aligning with earlier reports (Yang et al., 2003). The increased level of total erythrocyte count, hemoglobin content and packed cell volume might be due to the effects on haemopoietic organs. Enhanced SGOT and SGPT values within normal limits indicate improved liver metabolism without toxicity. Dietary supplementation of green tea also affects offal's weight significantly and increase the intestinal length observed significantly in green tea treatment group (Abdul-Azeem, 2005; Guo et al., 2004). These results confirm that green tea powder can serve as a safe and effective alternative to antibiotic growth promoters, improving productivity and health performance in broilers (Abdul-Azeem, 2005; Guo et al., 2004).

Conclusion

Dietary supplementation of 0.5% green tea powder significantly improved growth performance, feed efficiency, dressing yield, and hematological parameters in broiler chickens. Green tea may serve as a natural and sustainable alternative to antibiotic growth promoters in poultry production.

Conflict of interest

The authors declare that there is no conflict of interests.

Acknowledgments

The authors acknowledge the Department of Pharmacology and Toxicology, Sylhet Agricultural University, and Nourish Poultry & Hatchery Ltd. for laboratory and technical support to conduct the research work.

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