

Effect of Dietary Supplementation of Lemongrass Oil (*Cymbopogon citratus*) on the Performance of Commercial Broiler Chicken

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ABSTRACT

An experiment was conducted to evaluate the effect of dietary supplementation of Lemongrass oil (*Cymbopogon citratus*) on the performance of commercial broiler chicken. A total of 144 straight-run day-old chicks were randomly assigned to six treatments, each consisting of 4 replicates with 6 chicks totalling 24 chicks per treatment. Birds in treatment T₁ (control) were fed a control basal diet. In the remaining treatments, an Antibiotic growth promoter (Avilamycin) was supplemented with the basal diet @ 0.01% in T₂, while Lemongrass oil was supplemented with the basal diet @ 0.1%, 0.2%, 0.3% and 0.4% in T₃, T₄, T₅ and T₆ groups, respectively. At the end of 6th week, no significant differences were recorded in the body weights or body weight gains of all the treatment groups. However, apparently highest values of both were recorded in birds of T₃ group followed by T₄, T₅, T₆, T₂ and T₁ groups. There was no significant difference in total feed consumption and feed conversion ratio among the birds fed with different dietary treatments. However, apparently improved FCR was recorded in T₄ diet followed by T₃, T₆, T₁, T₂ and T₅ diets. The highest livability was observed in T₄, T₅ and T₆ groups. The highest return over feed cost was obtained in the birds fed with T₃ (0.1 % Lemongrass oil) diet followed by T₁, T₄, T₅, T₂ and T₆ diet, respectively. Based on the study, it can be concluded that supplementation of Lemongrass oil @ 0.1% in the diet of broiler birds can be considered a viable natural alternative to antibiotic growth promoters.

Key words: Antibiotic growth promoter, Commercial broiler chicken, Growth performance, Lemongrass oil.

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INTRODUCTION

Poultry production is a rapidly expanding sector that plays a major role in food security and economic development. Broiler chickens are preferred for their rapid growth, efficient feed conversion and short production cycle. With rising consumer demand for safe, high-quality and antibiotic-free meat, the industry is shifting toward natural feed additives that enhance growth, health and profitability (Sharma *et al.*, 2020; Parmar *et al.*, 2026). Essential oils have gained attention as alternatives to synthetic growth promoters due to their antimicrobial, antioxidant and immunomodulatory properties. Among these, Lemongrass oil (*Cymbopogon citratus*), rich in bioactive compounds such as citral, limonene and myrcene has shown strong antimicrobial and antioxidant activities that support improved gut health, nutrient utilization and immune function (Mukhtar *et al.*, 2012).

Research indicates that dietary supplementation of lemongrass oil can improve growth rate, feed conversion ratio, carcass quality and meat shelf-life in broiler chickens (Shah *et al.*, 2011). Its ability to suppress harmful gut bacteria while promoting beneficial microflora leads to better digestion and enhanced performance (Cross *et al.*, 2007; Mmereole, 2010). Considering challenges such as rising feed costs, food safety concerns and the ban on antibiotic growth promoters, Lemongrass oil represents a promising, eco-friendly

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alternative. The present study was aimed to evaluate its impact on growth performance, feed efficiency, overall health and economics in commercial broilers, contributing to sustainable and natural poultry production practices.

MATERIALS AND METHODS

The study was conducted at Poultry Research Station, College of Veterinary Science and Animal Husbandry, Kamdhenu

University, Anand, Gujarat (India) for duration of six weeks (15th August to 25th September, 2025). Total one hundred and forty-four (144) straight-run day-old commercial broiler chicks of a single hatch were purchased from a private hatchery for experiment and were housed in a separate deep litter pen. Each treatment group consisted of four replicates with 6 chicks/replicate such that to have 24 chicks per treatment. Six diets (T₁, T₂, T₃, T₄, T₅ and T₆) were formulated and provided *ad libitum* to the birds of respective treatments as starter, grower and finisher diets during 0-10 days, 11-21 days and 22-42 days of age, respectively. T₁ (Basal diet without Antibiotic growth promoter and Lemongrass oil), T₂ (Basal diet supplemented with Antibiotic growth promoter - Avilamycin @ 0.01%), while diets T₃, T₄, T₅, and T₆ consisted of Basal diet supplemented with Lemongrass oil @ 0.1%, 0.2%, 0.3% and 0.4%, respectively.

The average temperature during the study period was 28.6 °C and relative humidity 82.5%. After arrival, chicks were wing-banded and weighed individually. Standard medication protocols were followed. All essential biosecurity measures were implemented. The birds were immunized against Ranikhet Disease (RD) and Infectious Bursal Disease (IBD) according to the standard schedule. During the experiment, body weight, body weight gain, viability, feed consumption and feed conversion ratio (FCR) were recorded, and the return over feed cost was worked out.

The data were analyzed using Completely Randomized Design as per Snedecor and Cochran (2014). The mean of replicates under each treatment were considered for analysis.

RESULTS AND DISCUSSION

Body Weight (BW)

The mean body weight (BW) at day old age did not differ significantly among treatment diets. At the end of 4th week, the body weight of birds fed with diet supplemented with 0.1, 0.2, 0.3 and 0.4% Lemongrass oil was significantly ($p < 0.05$) higher than birds fed with diet supplemented with antibiotic growth promoter, but was statistically at par with the birds fed with control diet (Table 1). At the end of 6th week, non-significant differences were recorded in body weights of all groups. However, apparently highest body weight was recorded in birds fed with diet supplemented with 0.1% Lemongrass oil followed by birds fed with diet supplemented with 0.2%, 0.3%, and 0.4% Lemongrass oil, 0.01% antibiotic growth promoter and control diet. The present findings are in agreement with Mmereole (2010), Tiwari *et al.* (2018) and Diogo *et al.* (2022), who found that the broiler birds fed with diets supplemented with Lemongrass oil showed no significant effects on body weight in treatment groups. However, contrary to the present findings, Giridharrao (2015), Alagbe (2020) and Ghanima *et al.* (2021) found that broiler birds fed with diets supplemented with Lemongrass had

significantly ($p < 0.05$) higher final body weight as compared to birds fed with control diet.

Table 1: Body weight (BW) of broilers supplemented with various treatment rations

Treatments	BW ₀ (g)	BW ₄ (g)	BW ₆ (g)
T ₁	42.79±0.65	1041.75 ^{ab} ±29.71	2032.63±37.06
T ₂	43.94±0.46	982.75 ^b ±24.99	2047.21±36.94
T ₃	44.62±0.95	1080.33 ^a ±27.70	2167.13±28.98
T ₄	43.86±1.02	1072.00 ^a ±27.47	2123.58±47.13
T ₅	44.26±0.47	1099.33 ^a ±28.51	2084.33±42.44
T ₆	44.77±0.56	1081.33 ^a ±26.33	2049.50±38.76

Means with different superscripts within a column differs significantly ($p < 0.05$).

Body Weight Gain (BWG)

During the starter phase (0-10 days), body weight gain (BWG) was non-significantly different for all the groups. In grower phase (11-21 days) the body weight gain of birds fed with diet supplemented with 0.1%, 0.3% and 0.4% Lemongrass oil was significantly ($p < 0.05$) higher than diets supplemented with 0.01% Antibiotic growth promoter, which did not differ significantly from control diet and diet supplemented with 0.2% Lemongrass oil. During finisher phase (22-42 days) no significant differences were observed in body weight gain among all treatment groups. However, apparently higher body weight gain was recorded in birds fed with diet supplemented with 0.1% Lemongrass oil followed by birds fed with diet supplemented with 0.2% Lemongrass oil, 0.01% Antibiotic growth promoter, control diet, and birds fed with diet supplemented with 0.3% and 0.4% Lemongrass oil (Table 2). The results of the present study are in agreement with the findings of Alzawqari *et al.* (2016), Tiwari *et al.* (2018) and Olabode and Okelola (2020), who observed that the birds fed with diets supplemented with Lemongrass oil showed no significant effects on body weight gain in treatment groups. However, the current results were in contrast to Mukhtar *et al.* (2012), Giridharrao (2015), Alagbe (2020), Pappula *et al.* (2023) and El-Sahn *et al.* (2024), who found that broiler birds fed with diets supplemented with Lemongrass oil had significantly ($p < 0.05$) higher final body weight gain as compared to birds fed with control diet.

Feed Consumption

Feed consumption of the birds did not differ significantly among the various dietary treatments throughout the experimental period, whether evaluated weekly or across different phases (starter, grower and finisher). During whole experimental period (0-6 weeks), the mean total feed consumption of birds fed with T₃ diet recorded the highest feed consumption followed in descending order T₅, T₂, T₄,



T₆ and T₁ diets (Table 2). These findings were in agreement with the observations of Alzawqari *et al.* (2016), Tiwari *et al.* (2018), Diogo *et al.* (2022) and Pappula *et al.* (2023), who also observed that the broiler birds fed with diets supplemented with Lemongrass oil showed no significant effect on total feed consumption in treatment groups. However, contrary to present findings, significantly ($p < 0.05$) lower total feed consumption was observed in diets supplemented with Lemongrass oil in studies of Mmereole (2010), Alagbe (2020) and El-Sahn *et al.* (2024).

Feed Conversion Ratio

Feed conversion ratio (FCR) of birds fed with different diets showed no significant differences among dietary treatments when evaluated phase-wise (starter, grower, finisher) and during the whole experimental period. Feed conversion ratio was numerically improved in birds fed with diet supplemented with 0.2% Lemongrass oil followed by birds fed with diet supplemented with 0.1% Lemongrass oil, 0.4% Lemongrass oil, control diet, 0.01% Antibiotic growth promoter and 0.3% Lemongrass oil (Table 2). These findings were in accordance with Alzawqari *et al.* (2016) and Diogo *et al.* (2022), who also observed that diets supplemented with Lemongrass oil showed no significant effect on total feed conversion ratio in treatment groups. However, contrary to present findings, significantly ($p < 0.05$) improved feed conversion ratio was observed in diets supplemented with

Lemongrass oil by Mmereole (2010), Alagbe (2020), Ghanima *et al.* (2021), Pappula *et al.* (2023) and El-Sahn *et al.* (2024).

Livability

Livability (%) at the end of experiment in T₁, T₂, T₃, T₄, T₅ and T₆ treatment groups was found to be 95.83, 95.83, 95.83, 100, 100 and 100, respectively. The highest livability was observed in the T₄, T₅, T₆ followed by T₁, T₂ and T₃ treatment groups. The present findings are in agreement with Thayalini *et al.* (2011), Tiwari *et al.* (2018), Alagbe (2020), Diogo *et al.* (2022), and Parmar *et al.* (2026), who observed no significant differences in mortality between broiler birds fed with diets containing varying levels of Lemongrass oil or Arginine.

Economics: Return over Feed Cost (ROFC)

The Return over Feed Cost (Rs. per bird) obtained from the birds fed with T₁, T₂, T₃, T₄, T₅ and T₆ diets was 43.11, 38.95, 44.12, 39.96, 28.94 and 26.81, respectively. The highest ROFC (Rs. /bird) was obtained in the broiler birds fed with diet supplemented with 0.1% Lemongrass oil followed by control diet, diet supplemented with 0.2% Lemongrass oil, 0.01% Antibiotic growth promoter, 0.3% Lemongrass oil and 0.4% Lemongrass oil (Table 3). These findings were in agreement with those of Giridharrao (2015), Parade *et al.* (2019), Madavi *et al.* (2021) and El-Sahn *et al.* (2024), who also found higher economic returns when birds were fed treatment diets containing Lemongrass oil.

Table 2: Body weight gain (BWG), Feed consumption (FC) and Feed conversion ratio (FCR) of broilers fed diet with various treatment ratios at different stages of life

Parameter	Treatments	BWG _{0-10d}	BWG _{11-21d}	BWG _{22-42d}	BWG _{0-42d}
Body weight gain (g)	T ₁	204.43±6.34	365.69 ^{ab} ±16.60	1419.71±40.64	1989.83±37.02
	T ₂	219.64±5.63	337.58 ^b ±17.48	1446.04±26.83	2003.27±36.88
	T ₃	211.71±5.19	400.79 ^a ±19.07	1510.00±36.80	2122.51±28.97
	T ₄	214.58±6.12	371.40 ^{ab} ±17.71	1493.75±39.47	2079.73±46.99
	T ₅	215.83±5.52	420.49 ^a ±17.04	1412.08±31.29	2040.07±42.22
	T ₆	219.60±4.44	397.97 ^a ±17.76	1387.17±33.59	2004.74±38.72
Feed consumption (g)	T ₁	291.79±8.59	738.65±21.07	2778.37±109.98	3808.81±130.94
	T ₂	309.71±7.55	687.25±22.84	2856.18±95.20	3853.14±114.49
	T ₃	317.42±2.51	780.50±23.32	2887.18±37.11	3985.10±55.87
	T ₄	309.96±9.90	732.50±20.54	2830.41±78.62	3872.87±97.17
	T ₅	312.63±5.45	774.25±39.05	2860.42±73.14	3947.29±116.69
	T ₆	314.42±6.75	761.50±29.81	2737.37±64.78	3813.29±74.93
Feed conversion ratio	T ₁	1.18±0.02	2.04±0.13	1.96±0.04	1.87±0.04
	T ₂	1.17±0.01	2.08±0.15	1.97±0.05	1.88±0.01
	T ₃	1.24±0.02	1.97±0.10	1.93±0.10	1.84±0.05
	T ₄	1.21±0.03	1.98±0.05	1.90±0.07	1.82±0.04
	T ₅	1.20±0.03	1.92±0.12	2.03±0.06	1.89±0.03
	T ₆	1.19±0.01	1.95±0.12	1.97±0.03	1.86±0.03

Means with different superscripts within a column for a parameter differs significantly ($p < 0.05$).

Table 3: Return Over Feed Cost (ROFC) of birds fed with different treatment diets

Particulars	Treatments					
	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆
Total feed consumption (g)	3808.81	3853.14	3985.10	3872.87	3947.29	3813.29
Actual feed cost (Rs./bird) (A)	139.83	145.30	146.14	141.87	144.44	139.34
Cost of Lemongrass oil (Rs./bird) @ 1200 Rs./litre (B)	0.00	0.00	4.78	9.29	14.21	18.30
Total feed cost/bird (A+B)	139.83	145.30	150.92	151.16	158.65	157.64
Cost of feed (Rs./kg broiler bird)	68.79	70.97	69.64	71.18	76.11	76.92
Average body weight (kg)	2.032	2.047	2.167	2.123	2.084	2.049
Income from selling of birds (@95 Rs./kg body weight)	182.94	184.25	195.04	191.12	187.59	184.46
ROFC (Rs./bird)	43.11	38.95	44.12	39.96	28.94	26.81

CONCLUSIONS

The research findings of the present study revealed that broiler birds fed with the diet supplemented with 0.1% Lemongrass oil showed numerically improved feed conversion ratio and higher return over feed cost (Rs./bird). Hence, it can be supplemented @ 0.1% in the diet of broiler birds as a natural alternative to Antibiotic growth promoter to economize and optimize the overall performance of commercial broilers birds.

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