Research Article

# Gingeer and Kalojeera as a Growth Promoter to Broilers and its Effect on Hematological Parameter

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**Abstract** | The study was conducted in terms of knowing the growth performance of broilers supplemented with Ginger and kalojeera and their effect on hematological parameters (TEC, Hb, ESR, PCV, and DLC). A total of 100 day-old Cobb 500 commercial broiler chicks were randomly divided into five groups (T0, T1, T2, T3, T4) and each treatment contain 20 broilers to carry out the work. The average initial weight of the chicks in all experimental groups was about the same. Weekly observations were recorded for live body weight up to 35 days and blood parameters of birds at day 14th, 21th and 35th days. The result showed comparatively better live weight in T4 which is treated with Kalojeera and Ginger having a satisfactory feed conversion ratio (FCR) of 1.68. The better feed conversion ratio (FCR) value was recorded by chicks fed diet supplemented with antibiotics in T1. The hematological parameters TEC, ESR, and DLC value of treatment group shows a significant difference, while Hemoglobin estimation does not show a significant difference from the control group. It could be concluded that Kalojeera and Ginger could act as growth promoters and alternatives to antibiotics in broilers.

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## Introduction

Broilers are birds raised only for meat production, ranging in size from little fryers to big roasters (Begum *et al*., 2010). Production of broiler meat has increased considerably over the last two decades, thanks to several studies and breeding programs that have improved feed consumption, growth rate, and low activity levels. High-performance commercial hybrids now require high-energy diets to fully exhibit their genetic potential (Sadeghi and Tabiedian, 2005). A manipulation of gut function and microbial habitat

of domestic animal with feed additives has been recognized as an important tool for improving growth performance and feed efficiency (Omar *et al*., 2016). But there is a prohibition of antibiotics, and people are interested in using natural herbs like ginger and garlic to feed poultry diets as a growth promoter (Joke and Susan, 2007). Many of these synthetic drugs and growth promoters are added to broiler diets to increase growth performance, but their use has shown many disadvantages like high cost, adverse side effects on the health of birds and extended residual properties, and carcinogenic effects in humans (Butaye *et al*., 2003) some are also limited in many countries having residual effects (Diarra *et al*., 2011). Feed additives derived from plants, including aromatic plants and essential oils (EO), have gained popularity since 2006 when European union legislations phased out the use of antibiotics as feed additives in poultry feed legislation (European Probiotic Association, 2012). So, researchers are now currently focusing on using our ancient medicinal system to find useful herbs and plants which can be safely used to increase production. In the last decade, herbs and phytogenic compounds have attracted a lot of attention for their potential role as alternatives to antibiotic growth promoters in monogastric animals (Khan and Naz, 2013). Medicinal plants are economical and renewable sources of pharmacologically-active substances materials and are known to produce certain chemicals that are naturally toxic to bacteria (Basile *et al*., 1999). Kalojeera (*Nigella sativa*) has been reported to have many biological properties (Nair *et al*.,2005) where the use of ginger act as a growth promoter, increasing the palatability of feed as well as the flow of gastric juice (Owen and Amakiri, 2011). The extracted oil from the Kalojeera is scientifically proven to contain many naturally occurring ingredients, such as carbohydrates, proteins, glucose, rhamnose, xylose, arabinose, and vitamins, particularly thiamine, niacin, riboflavin, pyridoxine, and folic acid (El-Naggar *et al*., 2010). Essential oil of N. sativa seeds contains thymoquinone (TQ), dithymoquinone, thymohydroquinone, thymol, carvacrol, nigellimine N-oxide, nigellicine, nigellidine, and alpha hederin (Al-Jabre *et al*., 2015; Kokoska *et al*., 2008; Younus, 2018). The presence of thymoquinone (TQ) is the therapeutic properties and major active chemical component of the essential oil. On the other side, Ginger is rich in beneficial bioactive compounds and essential oils (Ogbuewu *et al*., 2017). The main important compounds in ginger are gingerol, gingeriol and gingerdione which have the ability to stimulate digestive enzymes, attack the microbial activity and having anti oxidative activity (14) when used in broiler diets (Dieumou *et al*., 2009). Ginger improves body weight gain due to stimulation of digestive enzymes and improvement of overall digestion, inhibits the growth of harmful bacteria in the intestinal tract due to antimicrobial activity lead to assimilation of nutrients, improves carcass traits, decreases abdominal fat; immunomodulation increases the activity of lysozyme; chemopreventive effect (El-Hack *et al*., 2020). In view of these, the present work has been undertaken to investigate the growth performance of broilers supplemented with Ginger and Kalojeera as well as to examine the effect on hematological parameters (TEC, ESR, Hb, and DLC).

## Materials and Methods

This study was executed at the Department of Physiology, Khulna Agricultural University, Bangladesh, from 14th April 2021 to 18th May 2021.

### *Management of experimental shed and broilers*

The experimental units were kept on a floor litter system in separate pens, each measuring 3 x 4 square feet. A total 100-day-old Cobb 500 broiler chicks were purchased from a local hatchery. Day-old broiler chicks were brought into the experimental shed. All the birds were provided the same management conditions like floor space, temperature, relative humidity, ventilation, and light. Vitamin C and glucose chicks were given immediately after unloading from the chick boxes, the to prevent the stress from occurring during transport. The starter and finisher broiler rations were supplied to the broiler chicken adequately. The provided feed and remaining feed was collected to calculate the feed consumption of the birds.

### *Collection and processing of kalojeera and ginger*

Kalojeera seeds and fresh ginger rhizomes were acquired at a local market in Khulna, Bangladesh, cleaned, dried, and ground into powder in a mortar pestle. The powdered was stored in air tight bag for further use.

### *Experimental design*

The experiment was conducted according to a completely randomized design, and data about per replicate body wt., weekly body wt., and weekly feed consumption. Broilers chicks of control and treatment

groups were weighed with a spring weighing machine. During the 35 days experimental period, growth performance was evaluated. Body weight and feed consumption were recorded on Day 1st, 7th, 21th, and 35th days and body gain and feed conversion were then calculated using the methods of Contreras-Castillo et. al. (2008). Mortality was recorded throughout the study.

*Hematological parameters*

On day 14th, 21st, and 35th days, blood samples were taken from the wing veins of both control and treatment chickens to investigate the hematological parameters. The Total Erythrocyte Count (TEC), Hemoglobin Estimation (Hb), Erythrocyte Sedimentation Rate (ESR), Packed Cell Volume (PCV), and Differential Leukocyte Counts (DLC) were measured using Lamberg and Rothstein's (1977). All data were calculated using five different samples' mean and standard deviation. R program was used to accomplish the statistical analysis. The student's t-test was used to perform a significant analysis at the $P < 0.05$ level.

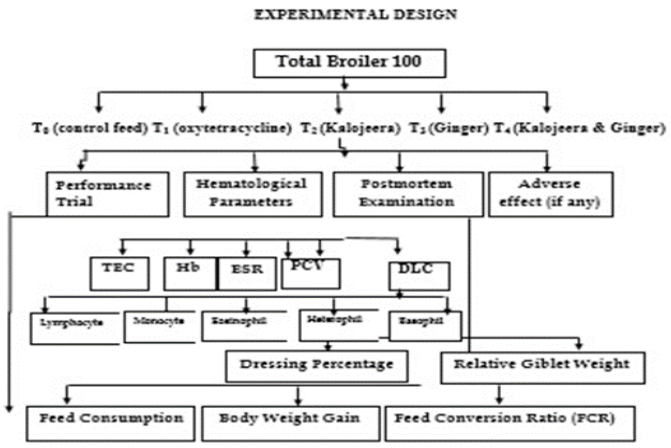


**Figure 1:** *Layout of the experiment.*

## Results and Discussion

The birds using drinking water were supplemented Ginger and kalojeera gained the highest live weight (Table 1). In $T_0$, the final live weight was 1.921±0.013 Kg (Table 1), and the feed conversion ratio (FCR) was1.87 (Figure 2). In the $T_1$ group final live weight 1.988±0.067Kg (Table 1), and the feed conversion ratio (FCR) was 1.63 (Figure 2). In the $T_2$ group, the final live weight was 1.871±0.0309 Kg (Table 1), and the feed conversion ratio (FCR) was 1.81 (Figure 2). In the $T_3$ group, final live weight was 1.838±0.049 Kg (Table 1), and the feed conversion ratio (FCR) was 1.78 (Figure 2). The birds using drinking water were supplemented with 1% ginger, and kalojeera ($T_4$) utilized their feed statistically significantly (at 1% level) more efficiently than the other group, final live weight of 1.965±0.0365 Kg (Table 1) and feed conversion ratio (FCR) was 1.68 (Figure 2).

**Table 1:** *Efficacy of kalojeera seeds and ginger on the body weight (kg) in broiler.*

| Variable days | Treatment | Avg weight Mean±SD | Adjusted R-squared | P-Value |
|---|---|---|---|---|
| 01 | $T_0$ | 0.039±0.0021 | 0.714 | 0.000993 |
| | $T_1$ | 0.041±0.0025 | | |
| | $T_2$ | 0.040±0.0030 | | |
| | $T_3$ | 0.041±0.0015 | | |
| | $T_4$ | 0.042 ±0.003 | | |
| 07 | $T_0$ | 0.1896±0.0034 | 0.298 | 0.09516 |
| | $T_1$ | 0.1873±0.0032 | | |
| | $T_2$ | 0.186±0.004 | | |
| | $T_3$ | 0.185±0.0043 | | |
| | $T_4$ | 0.1915±0.0021 | | |
| 21 | $T_0$ | 0.842±0.012 | 0.5606 | 0.009321 |
| | $T_1$ | 0.870 ±0.0138 | | |
| | $T_2$ | 0.829±0.00837 | | |
| | $T_3$ | 0.8145±0.00709 | | |
| | $T_4$ | 0.866±0.0428 | | |
| 35 | $T_0$ | 1.921±0.0131 | 0.9996 | 0.0000 |
| | $T_1$ | 1.988 ±0.067 | | |
| | $T_2$ | 1.871±0.0309 | | |
| | $T_3$ | 1.838±0.049 | | |
| | $T_4$ | 1.965±0.0365 | | |

**Table 2:** *Efficacy of kalojeera seeds and ginger on TEC (Mill/Cumm) in broiler.*

| Treatment | Group (Mean ± SD) | | | | |
|---|---|---|---|---|---|
| | $T_0$ | $T_1$ | $T_2$ | $T_3$ | $T_4$ |
| Day 14 | 2.54± 0.05 | 2.58 ± 0.08 | 2.34 ± 0.07 | 2.42 ± 0.08 | 2.36 ± 0.07 |
| Day 21 | 2.39 ± 0.07 | 2.37 ± 0.08 | 2.42 ± 0.05 | 2.51 ± 0.07 | *2.43 ± 0.05 |
| Day 35 | 2.78± 0.08 | *2.62 ± 0.07 | *2.54 ± 0.07 | 2.42 ± 0.05 | *2.61 ± 0.04 |

** Significant at $P < 0.05$ level in compares to day 0 of respective group.*

Observation of hematological parameters (TEC, Hb, PCV, ESR, and DLC) on days 14th, 21th, and 35th showed some significant difference between groups (Tables 2, 3, 4, 5, and 6). Total erythrocyte count

has a significant relation with treatment group in compare to control group. However, Haemoglobin concentration did not show any significant changes. On the other hand, feed treated with ginger had a significant effect on PCV%. In case of leukocyte count all treated group had not any significant effect.

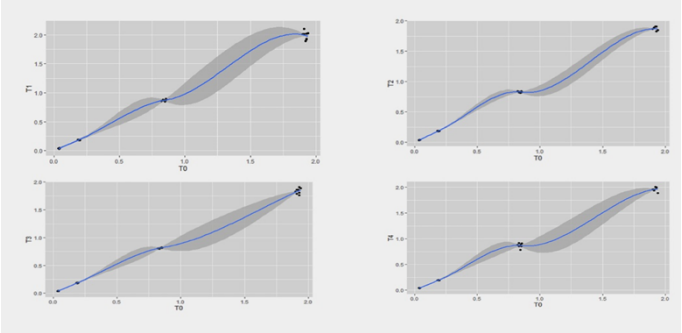

**Figure 2:** *Body weight curve at different days compare to control group.*

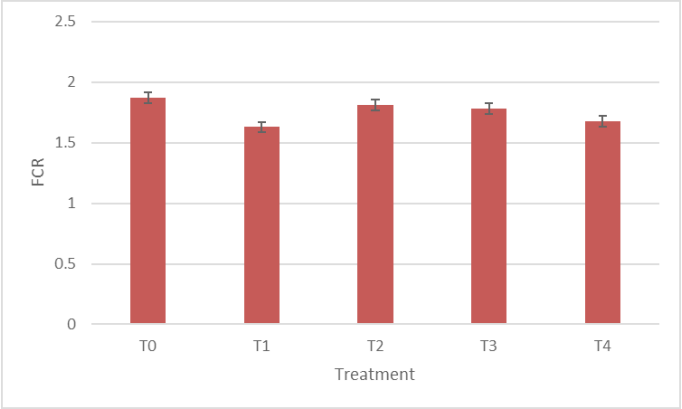


**Figure 3:** *Efficacy of kalojeera seeds and Ginger on the feed conversion ratio (FCR) in broiler.*

**Table 3:** *Efficacy of kalojeera seeds and ginger on hemoglobin (gm/dl) in broiler.*

| Treatment | Group (Mean ± SD) | | | | |
|---|---|---|---|---|---|
| | $T_0$ | $T_1$ | $T_2$ | $T_3$ | $T_4$ |
| Day 14 | 28.6± 0.18 | 24.5± 0.75 | 24.1± 0.77 | 23.4± 0.65 | 23.9± 0.86 |
| Day 21 | 29.2± 0.70 | 26.8± 0.89 | 27.3± 0.70 | 25.7± 0.81 | 24.5± 0.74 |
| Day 35 | 27.1± 0.79 | 23.3± 0.51 | 25.3± 0.80 | 25.7± 0.81 | 25.4± 0.87 |

** Significant at P < 0.05 level in compares to day 0 of respective group.*

In this study, the addition of the herbal growth promoters ginger and kalojeera improved broiler weight gain. These results are consistent with Meraj (1998) findings, who reported higher weight gain in broilers drinking ginger and kalojeera-rich water. Birds fed drinking water supplemented with plant growth-promoting agents such as ginger and kalojeera used food more efficiently than birds fed drinking water without growth-promoting agents. This result may be due to antimicrobial and antiprotozoal properties (Meraj, 1998) Ginger and kalojeera seeds leaves, which help to reduce the microbial load of birds and improved the feed consumption and feed efficiency of the birds (Molla *et al.*, 2012). These results are similar to the findings of Ahmad (2005), who reported high weight gain in broilers fed a garlic-added diet. Broiler's body weight gain increased in the control group by supplementation of both kalojeera and ginger, which is agreed with the study of Akon *et al.* (2019), who reported both growth performances and feed conversion ratio improved in broilers supplemented with Kalojeera. In this study, the use of ginger and kalojeera with drinking water resulted in a greater improvement in the feed conversion ratio of the birds than in the control group, which is in agreement with the findings of Al-Khalifah (2022), who found that body weight gain increased significantly using ginger in the diet. But some other studies of Ademola et al. (2009) have reported contrasting results that the inclusion of ginger in the diet of broiler chickens did not improve weight gain.

**Table 4:** *Efficacy of kalojeera seeds and ginger on PCV (%) in broiler.*

| Treatment | Group (Mean ± SD) | | | | |
|---|---|---|---|---|---|
| | $T_0$ | $T_1$ | $T_2$ | $T_3$ | $T_4$ |
| Day 14 | 9.2 ± 0.46 | *8.3 ± 0.44 | 6.7 ± 0.82 | 6.5 ± 0.54 | 6.2 ± 0.41 |
| Day 21 | 9.7 ± 0.51 | *8.7 ± 0.59 | 8.1 ± 0.62 | 6.8 ± 0.52 | 6.3 ± 0.61 |
| Day 35 | *8.6 ± 0.69 | 7.3 ± 0.91 | 6.7 ± 0.25 | *8.9 ± 0.85 | 6.6 ± 0.56 |

** Significant at P < 0.05 level in compares to day 0 of respective group.*

**Table 5:** *Efficacy of kalojeera seeds and Ginger on ESR (mm in 1st hour) in broiler.*

| Treatment | Group (Mean ± SD) | | | | |
|---|---|---|---|---|---|
| | $T_0$ | $T_1$ | $T_2$ | $T_3$ | $T_4$ |
| Day 14 | 4.6 ± 0.18 | 4.5 ± 0.25 | 4.1 ± 0.77 | 3.4 ± 0.65 | 3.9 ± 0.86 |
| Day 21 | 4.2 ± 0.21 | 4.8 ± 0.19 | 4.7 ± 0.70 | 3.7 ± 0.81 | 4.5 ± 0.74 |
| Day 35 | 4.1 ± 0.79 | 4.3 ± 0.51 | 4.9 ± 0.80 | 3.7 ± 0.89 | 3.8 ± 0.82 |

** Significant at P < 0.05 level in compares to day 0 of respective group.*

**Table 6:** *Efficacy of kalojeera seeds and Ginger on differential leukocyte counts in broiler.*

| DLC (%) | $T_0$ | | | $T_1$ | | | $T_2$ | | | $T_3$ | | | $T_4$ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Days | | | Days | | | Days | | | Days | | | Days | | |
| | 14 | 21 | 35 | 14 | 21 | 35 | 14 | 21 | 35 | 14 | 21 | 35 | 14 | 21 | 35 |
| L | 74.2± 2.78 | 73.2± 2.65 | 74.3± 2.61 | 67.4± 3.98 | 71.4± 0.54 | 68.6± 0.71 | 65.6± 4.56 | 70.8± 0.84 | 67.9± 0.78 | 63.8± 3.97 | 70.4± 1.14 | 68.5± 1.41 | 63.6± 4.16 | 69.6± 0.55 | 69.1± 0.51 |
| M | 4.7± 0.81 | 6.1± 0.94 | 5.6± 0.87 | 3.8± 0.84 | 6.2± 0.84 | 5.5± 0.73 | 3.0± 0.71 | 6.0± 0.71 | 5.8± 0.23 | 3.0± 0.71 | 6.2± 1.09 | 1.7± 1.03 | 3.0± 0.70 | 6.6± 0.55 | 6.2± 0.36 |
| E | 2.0± 0.72 | 1.6± 0.55 | 2.0± 0.57 | 2.6± 1.52 | 1.6± 0.55 | 7.5± 0.18 | 2.8 ± 0.84 | 1.8± 0.84 | 7.1± 0.57 | 3.0± 0.71 | 2.2± 0.84 | 6.9± 0.54 | 3.0± 0.70 | 2.0± 1.0 | 7.5± 0.81 |
| H | 18.3± 2.53 | 17.4± 2.69 | 18.1± 2.54 | 26.4± 2.89 | 20.2± 0.83 | 26.9± 0.86 | 28.0± 4.64 | 21.0± 0.71 | 36.1± 1.54 | 29.6± 3.65 | 20.8± 1.09 | 36.1± 1.19 | 29.2± 3.77 | 21.2± 0.84 | 37.3± 0.13 |
| B | 0.6± 0.55 | 0.4± 0.55 | 0.5± 0.55 | 0.4± 0.55 | 0.6± 0.55 | 0.6± 0.54 | 0.6± 0.55 | 0.4± 0.55 | 0.5± 0.14 | 0.6± 0.55 | 0.4± 0.55 | 0.5± 0.54 | 0.6± 0.55 | 0.6 ± 0.55 | 0.5± 0.53 |

** Significant at P < 0.05 level in compares to Day 0 of respective group. L, Lymphocyte; M, Monocyte; E, Eosinophil; H, Heterophil; B, Basophil.*

A better feed conversion ratio of the broilers using drinking water supplemented with garlic may be allocated to the antibacterial properties of these supplements, that resulted in improved nutrient absorption in the intestine and, as a result, an increase in the feed conversion ratio of the diets. This improves the absorption of nutrients present in the intestines and ultimately improves feed efficiency. Ginger and kalojeera have antibacterial, immunostimulatory, antistress, fungal, insecticidal, and liver tonic properties of garlic extract, reduce the microbial load in birds and feed and feed efficiency in birds (Sivam, 2001). Total Erythrocyte count significantly increased in all treatment groups compared to the control group, which showed an increased rate of blood cell production and increased immunity, which may be responsible for nutrient transportation supported by Jamroz and Kamel (2002). However, this finding is not aligned with another study by M.G. Sorwar *et al.* (2016) stating that kalo jeera seeds extract had no significant effect on the hematological parameters.

## Conclusions and Recommendations

This experiment concluded that broiler supplemented with Ginger and kalojeera had higher body weight and strong immunity without any antibiotics if proper biosecurity is maintained. Ginger and kalojeera with drinking water can be used for broilers' economic and efficient production. The better efficiency of feed utilization, which resulted in more growth and a better feed to gain ratio, ultimately leading to a higher profit margin in the broilers reared on Ginger and kalojeera, may be attributed to an increase in the profit margin of the birds supplied with drinking water containing herbal growth promoters supplemented drinking water.

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## Novelty Statement

This study indicated the effect of Gingeer and Kalojeera using as a feed to the broiler. The growth rate as well as blood parameter was observed which will allow to think that Gingeer and Kalojeera can be used as a growth promoter to the Cobb 500 broilers.

## Author's Contribution

All authors contributed to the experimental design, wrote down and examined the manuscript, and were confirmed liable for any aspect of the manuscript.

*Conflict of interest*

The authors have declared no conflict of interest.

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