

Effects of Black Cardamom (*Amomum subulatum*) on Productive Parameters and Health State of Broiler Chickens

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Abstract—The Study was designed to know the effect of black cardamom (*Amomum subulatum*) on the health and productivity of poultry, which may have positive effects on poultry. 180 unsexed broiler (Rose 308) were divided into three groups: the first group was T0 (control group), the second group T1 had 0.2% Indian black cardamom added to their ratio, and the third group T2 had 0.4% Indian black cardamom added to their ratio. The experiment was conducted at a private poultry farm in the Al-Kamaliyah area 15/11/2025. The study showed a significant increase among the groups ($P = 0.012$) regarding body weight. Group T1 showed the highest body weight, followed closely by T2 compared with T0. No significant difference was observed between T1 and T2. The weights were as follows: T₂(2076.33), T₁(2062.53) than T₀(1939.27). The statistical results for the rate of weight gain also showed a significant increase among the groups ($P = 0.007$). Groups T1 and T2 demonstrated high significant in weight gain compared to T0, while the difference between T1 and T2 was not statistically significant. T₀(531.47), T₁(652.53) and T₂(66.33). The rate of feed consumption, the results showed that feed consumption reached its highest levels across all groups, with T1 recording the greatest consumption, followed by T2, whereas T0 remained comparatively lower. In the fifth week, a highly significant difference was detected ($P = 0.000$). T1 (910 ± 19.354) and T2 (898 ± 10.499) demonstrated higher feed consumption compared with T0 (800 ± 14.15). On other hand feed conversion efficiency showed that group T2(1.39) performed best compared to groups T1(1.50) and T0(1.59). The study concluded the Indian black cardamom plant has the ability to positively influence the productive traits of broiler chickens, thus enhancing the positive impact on the poultry industry. The results also showed significant differences in the growth of harmful bacteria when culturing *E. coli* T₀(77.20), T₁(36.60) and T₂(41.40). While *Lactobacillus* in T₀ (28.00), T₁(52.00) and T₂(124.00).

Keywords: Black cardamom, Broiler, production parameter, feed consumption ratio, poultry.

INTRODUCTION

Black cardamom (*Amomum subulatum*) is extracted from a herbaceous plant belonging to the Zingiberaceae family and is widely used in traditional Indian medicine to treat gastrointestinal disorders and inflammation (1,2). This plant contains a wide range of phytochemical compounds, such as flavonoids, phenols, terpenoids, and alkaloids, which contribute to its antioxidant and immune-enhancing properties (3,4). Recent studies have focused more on cardamom essential oil (CEO) because it has strong pharmacological effects as an antispasmodic, antimicrobial, and anti-inflammatory (5,6). Feed additives are defined by the European Union as substances, microorganisms, or preparations added to feed or water to improve the nutritional or health properties of animals or animal products (7). Among these additives, plant-based additives (PFAs) stand out as promising alternatives to synthetic additives. These include herbs, plants, essential oils, and oleoresins (8). These substances possess antioxidant, antimicrobial, and immune-enhancing properties, and improve digestive health and growth performance in poultry (9,10).

MATERIALS AND METHODS

The experiment was conducted on a private poultry farm in the Al-Kamaliyah area of Karbala, according to the criteria and rules of animal care. used in this experiment, 180 unsexed one-day-old broiler chicks will be used. The chicks will be distributed into three equal groups, with 60 chicks per group. Each group will be divided into two subgroups (replicates), with each subgroup containing 30 chicks. The first group (T1) will be fed a special feed made from grains with 0.2% Indian cardamom added to it. The second group (T2) will be fed a special feed made from grains with 0.4% Indian cardamom added to it, the control group (T0) will be fed a special feed made from grains without adding Indian cardamom. All animals of groups were in chicken sheds with the same conditions (feeding, libitum and water). SPSS 22.0 software was used to analyze the data using the general linear model (GLM) method and one-way ANOVA (11). Using a "protected" Duncan's analysis at the 0.05 significance level, four treatment means were determined. The chicks were weighed individually on the first day of the experiment, and

the weighing process continued at the end of each week. The weights were recorded for each replicate (12), the weight gain was calculated using the following equation: Weight at the end of the week – Weight at the beginning of the week. (13). Based on the feed consumed by chicks in each repeat run, as described by (14), using the following equation: Total feed added at the beginning of the week – Total feed remaining at the end of the week and Feed Conversion Ratio (F.C.R) % it is calculated by applying the following equation. (15)

$$FCR = \frac{\text{mean weekly feed intake (gm)}}{\text{mean weekly body weight gain (gm)}}$$

Bacterial count Random samples were taken from all groups and their replicates to determine the number of beneficial and pathogenic bacteria. Samples were collected from vents at 35 days of age. (16)

Study desing;

180 unsexed one-day-old broiler chicks

T060 Chicks	T1 60 Chicks	T260 Chicks
T0	T1	T2
Chick will be fed special feed mad from grains without adding Indian cardamom	Chick will be fed a special feed made from grains with 0.2% Indian cardamom added to it	Chick will be fed a special feed made from grains with 0.4% Indian cardamom added to it

RESULT AND DISCUSSION

The impact of introducing various medicinal herbs on the feed consumption and feed conversion efficiency of broiler chickens has been discussed in a number of recent research. According to a study conducted in 2025 by Al-Furat University, the addition of various medicinal herbs to broiler chicken feed improved production performance, live weight, feed consumption, and feed conversion efficiency when compared to the control group. Another investigation on the subject revealed that, in comparison to control animals, the overall feed conversion ratio has improved. The degree to which the bird gains weight from the feed it consumes is indicated by the feed conversion ratio. (17,18). There are currently no studies that specifically relate Indian black cardamom (*Amomum subulatum*) to feed intake or feed conversion ratio in broiler chickens. However, because it is a medicinal herb with antibacterial and digestive assist qualities, its effects could be comparable to those of the aforementioned research. Aromatic plants, herbs, and spices contain numerous active compounds such as essential oils, phenols, and terpenes, which have been shown to affect the digestive system, gut microbiota, and oxidative stress in poultry (19). Due to the

presence of the active ingredient in Indian black cardamom (1,8-cineole), which plays a role in modifying the gut microbiome, body weight gain was improved in broiler chickens fed feed supplemented with Indian black cardamom. Other active compounds such as terpenoids, phenolic acid, alkaloids, and cardamom aromatic decoction oil reduce the number of harmful gut bacteria, protect amino acids from oxidation, and improve the activity of digestive enzymes, thus enhancing broiler chicken performance (20). Consequently, it significantly improved ($p < 0.05$) feed intake and feed conversion ratio in broiler chickens. This indicates an improvement in the efficiency of the intestinal microbial barrier, as beneficial bacteria lower the intestinal pH, creating an unfavorable environment for pathogenic bacteria. These results are consistent with a study by (21).

The table 1, 2, 3, and 4 show the results of the experiment in response to feed consumption, body weight, weight gain and feed conversion ratio over the five-week trial period. In general, the performance indicators of the birds that consumed a diet containing 0.2% and 0.4% Indian black cardamom were superior to the birds in treatment. The increases in performance indicators observed in the results can be attributed to the addition of Indian black cardamom, which enhances the efficiency of the digestive system. Including modifying the intestinal microbial community by reducing pathogens, increasing beneficial bacteria, increasing villus length and the villus: crypt ratio (thus increasing the absorption surface area), improving digestive enzyme activity, and enhancing the secretion of bile and liver enzymes responsible for metabolism (22).as phenolic compounds, act as inhibitors of pathogen bacteria and support the growth of beneficial bacteria. This improves intestinal health and reduces disease outbreaks (23). The results of the experiment also showed an increase in the number of beneficial bacteria in groups T1 and T2 compared to the control group, as shown in Table 5. The increased secretion of mucus in the intestinal lining as a result of the addition of plant-based feed also leads to strengthening the intestinal mucous barrier, as it acts as a protective layer against pathogenic bacteria and fungi adhering directly to the intestinal wall, thus improving intestinal health. In addition, these substances exhibit antimicrobial and antioxidant activities, which contribute to improving the productive performance of broiler chickens (24). Aromatic plants also possess antioxidant and coccidiostat properties, and improve digestive juice production, blood circulation, and immunity (25). 1,8-Cineole also stimulates feed intake, increases digestive enzyme activity, supports the health of beneficial gut bacteria, and reduces harmful bacteria, leading to improved digestion and nutrient absorption (26). Numerous elements, such as the environment and nutrition, have an impact on immune cells. Because of this, herbal nutrients particularly medicinal ones—play a significant role in disease resistance (27).

Table1. Effect of black cardamom on body weight(g)in

weeks Group	1st wk M±SE	2 nd wk M ± SE	3 rd wk M ± SE	4 th wk M ± SE	5 th wk M ± SE
T0	181.67 ± 5.153 b	431.07 ± 5.187 b	842.13 ± 20.575 a	1407.80 ± 31.678 a	1939.27 ± 34.300 a
T1	154.80 ± 3.472 b	412.00 ± 6.512 a	798.47 ± 1.386 b	1372.33 ± 14.143 b	2062.53 ± 43.866 a
T2	156.00 ± 4.596 b	442.80 ± 6.753 a	833.33 ± 10.978 b	1410.00 ± 10.044 b	2076.33 ± 24.275 b

broiler:

M = Mean of score, S.E = Standard Error, Non-Significant at P ≥ 0.05 Vertically arranged letters indicate significant differences.

Table2. Effect of black cardamom on body weight gain(g)in broiler:

week Group	1st wk M±SE	2 nd wk M ± SE	3 rd wk M ± SE	4 th wk M ± SE	5 th wk M ± SE
T0	141.67 ± 5.153 a	246.07 ± 5.613 b	411.07 ± 20.694 a	565.67 ± 35.491 a	531.47 ± 22.785 b
T1	114.80 ± 3.472 b	257.20 ± 6.659 a	386.47 ± 6.675 a	573.87 ± 14.384 a	652.53 ± 45.238 a
T2	116.00 ± 4.596 b	286.80 ± 8.971 B	390.53 ± 12.504 a	576.67 ± 16.869 a	666.33 ± 24.601 a

M = Mean of score, S.E = Standard Error, Non-Significant at P ≥ 0.05 Vertically arranged letters indicate significant differences.

Table3. Effect of black cardamom on Feed consumption (g)in broiler:

week Group	1st wk M±SE	2 nd wk M ± SE	3 rd wk M ± SE	4 th wk M ± SE	5 th wk M ± SE
T0	149.99 ± 4.254 a	336.6 ± 4.05 a	353.3 ± 8.632 a	760.3 ± 17.108 a	800 ± 14.15 a
T1	126.6 ± 2.839 b	350 ± 5.532 b	530 ± 0.92 b	840 ± 8.657 b	910 ± 19.354 b
T2	119.99 ± 3.535 b	356.6 ± 5.438 b	525 ± 6.916 b	790 ± 5.628 a	898 ± 10.499 b

M = Mean of score, S.E = Standard Error, Non-Significant at P ≥ 0.05 Vertically arranged letters indicate significant differences.

Table4. Effect of black cardamom on Feed consumption rate (g)in broiler: differences.

week Group	1st wk M±SE	2 nd wk M ± SE	3 rd wk M ± SE	4 th wk M ± SE	5 th wk M ± SE
T0	1.10 ±.044 a	1.39 ±.033 a	1.37 ±.059 a	1.50 ±.084 a	1.59 ±.078 b
T1	1.14 ±.043 a	1.39 ±.042 a	1.38 ±.023 a	1.48 ±.036 a	1.50 ±.100 b
T2	1.08 ±.046 a	1.28 ±.042 a	1.39 ±.051 a	1.40 ±.041 a	1.39 ±.052 a

M = Mean of score, S.E = Standard Error, Non-Significant at P ≥ 0.05 Vertically arranged letters indicate significant

Table 5.Effect of black cardamom on Bactria growth(CFU/ml) in broiler:

Groups	Bactria Growth	E.coli growth in dilution5 M±SE	Lactobacillus growth in dilution5 M±SE
T0		77.20± 3.544 a	28.00± 1.648 a
T1		36.60± 2.230 b	52.00± 2.031 a
T2		41.40± 3.157 b	124.00± 2.560 b

M = Mean of score, S.E = Standard Error, Non-Significant at P ≥ 0.05 Vertically arranged letters indicate significant differences

CONCLUSION

The indian black cardamom stimulate feed intake and support healthy gut bacteria. Improved absorption of digestible nutrients may occur as a result of increased enzyme activity and improved gut bacteria stability. Growth in the groups treated with Indian cardamom (T1 and T2) was lower than in the control group, while Lactobacillus growth in groups T1 and T2 was higher than in the control group (T0)

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