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Original Research

Effect of Cardamom and Ginger Powder Supplementation on Growth Performance in Caged Broilers

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Abstract

Use of antibiotics has been found to have negative effects on broiler health and its production therefore; there is a need for supplementation of herbal ingredients in broiler feed. An experiment was conducted on herbal dietary supplementation of Cardamom and Ginger powder to study its effect on growth performance in caged broilers. A total of 48-day old broiler chicks of same hatch were procured and randomly divided into four groups with three sub groups comprising of 3 chicks in each to serve as replicates T0 (control) had standard ration as per NRC; T1 ration was supplemented with 0.5g Cardamom powder /kg feed; T2 ration was supplemented with 0.5g Ginger powder /kg feed and T3 ration was supplemented with 0.25g Cardamom+ 0.25g Ginger powder /kg feed. The birds were reared in battery type cages under standard management practices from day-old to five weeks of age. Statistically analyzed data shown that the average body weight was significantly ($p<0.05$) highest in T3 group followed by T1, T2 and T0 group. Similar trend was seen in the case of feed intake where significantly higher ($p<0.05$) feed intake was found in T3 group followed by T1, T2 and T0 group. It can be concluded from this study that caged broilers supplemented with 0.25g Cardamom+ 0.25g Ginger powder /kg feed may perform well in caged conditions in terms of improved body weight and feed intake.

Keywords: Body Weight, Caged Broilers, Cardamom, Ginger, Feed Intake

Introduction

The poultry industry in India has undergone a major shift in structure and operation during the last two decades. It has transformed from a mere backyard activity into a major commercial activity with growing presence of large integrated players and successful implementation of contract poultry farming on a large scale. There is a great demand to produce high quality poultry meat and egg at low prices without having to rely on antibiotics and other growth promoters (Mehala and Moorthy, 2008).

Poultry is one of the fastest growing segments of the agricultural sector in India today. The production of agricultural crops has been rising at a rate of 1.5 to 2% per annum that of eggs and broilers has been rising at a rate of 8 to 10 percent per annum. Poultry products in recent years have become an important and popular food for non-vegetarian population (Adbhai *et al.,* 2019). As a result, India is now the world's third largest egg producer and the seventh largest producer of broiler. Rise in the availability and demand of poultry products have boosted poultry growth of the country (Mehta *et al*., 2003). Poultry population of India has reached to 851.81million in number (BAHS, 2019).

Cardamom belongs to family *Zingiber aecea*, it is a sweet spice and is employed as a medicinal flavoring agent, and it has been reported to possess antioxidant, anti-inflammatory, digestive, appetite stimulant, carminative properties and it has positive effect when used as feed additive for poultry (Arshad *et al*., 2010). Historically Cardamom was known as the "Queen of all spices". Cardamoms have antibacterial probiotics for gram negative bacterium (Martha *et al.,* 2012). Elaichi (cardamom) is a good aromatic, digestive stimulant and carminative. All these medicinal properties are due to the essential oil present in cardamom. Other properties include: diuretic, antispasmodic, expectorant, antitussive, antacid antiemetic and antioxidant. Elaichi (cardamom) increases blood circulation, reduces toxin in the blood and increases elimination of these toxins by inducing mild diuresis. It also has anti-allergic effects.

Ginger (*Zingiber officinale)* is a perennial herb which is used widely as a spice, for pickles, candies, preservatives and many medicinal purposes. The plant belongs to the family Zingiberacy; which are aromatic herbs with fleshy, tuberous or non-tuberous rhizomes and, often have tuber bearing root (Mohamed *et al*., 2012). Ginger acts as a gastric stimulator (Kumar *et al.,* 2014). The rhizome contain a spectra of biologically active compounds such as curcumin, 6 gingerol *i.e.* (5-hydroxy-1-4-hydroxy -3-methoxy phenyl), 6-shogoals, zingiberene, bisaboline and several other types of lipids that confers on ginger the characteristics medicinal properties of being pungent and a stimulant (Ahmad *et al*., 2015). The major components of ginger are zingiberene and gingerol that can stimulate the digestive system by controlling the digestive pH and the activity of digestive enzyme including microbial activity.

Ginger (*Zingiber officinale*) rhizome is widely used as spice or condiment (Martha *et al*., 2012) and medical treatment for certain diseases (Ademola *et al*., 2009; Herawati, 2010; Sadeghi *et al*., 2013). Ginger contains several compounds such as gingerol, gingerdiol, and gingerdione that possess strong antioxidant activity (Ademola *et al*., 2009). Ginger is the rhizome of the plant *Zingiber officinale*, consumed as a delicacy, medicine, or spice. The use of ginger as substitute for antibiotic growth promoter is desirable for greater productivity of poultry, increased palatability of feed, nutrient utilization, appetite stimulation, increase in the flow of gastric juice and piquancy to tasteless food (Onu, 2010). The rhizome of *Zingiber officinale* Roscoe, commonly known as ginger is an important kitchen spice and also possesses a myriad health benefits. The rhizomes have been used since antiquity in the various traditional system of medicine to treat arthritis, rheumatism, sprains, muscular aches, pains, sore throats, cramps, hypertension, dementia, fever, infectious disease, catarrh, nervous diseases, gingivitis, toothache, asthma, stroke and diabetes. Ginger is also used as home remedy and is of immense value in treating various gastric ailments like constipation, dyspepsia, belching, bloating, gastric, epigastric discomfort, ulcerations, indigestion.

Studies on supplementation of cardamom and ginger powder on performances of broilers are scanty. Therefore, this study was framed to study the effects of supplementation of cardamom and ginger powder and their combination on feed intake and body weight on week basis in caged broilers.

Materials and Methods

The present experiment entitled **"**Effect of Cardamom and Ginger Powder Supplementation on Growth Performance in Caged Broilers" was carried out in small animal laboratory of Department of Animal Husbandry & Dairying

SHUATS, Prayagraj, India.

Distribution of Broilers

The experiment commenced on 18th April 2019 and continued till 22nd May 2019 for the period of five weeks. A total no. of 48-day-old broiler chicks (DOC) of same hatch were procured. The chicks were weighed, leg banded and distributed randomly into four groups with four sub groups comprising of three chicks. Statistically similar body weight chicks were taken for this experimentation as shown in Table 1. Chicks were fed starter ration up to 3weeks age (1 to 21days) and then broiler finisher ration up to 3-5 weeks age (22-35 days) as per the following dietary regimes:

Table 1: Average Body weight (g) of day-old chicks in different treatments

Replication	Body weight of DOC (g)				
	T0	**T1**	**T2**	**T3**	**Mean**
R1	47.33	48.66	48.66	48.66	48.33 [a]
R2	47.33	48.66	50	44	47.50 [a]
R3	50	49.33	44	49.33	48.17 [a]
R4	47.33	48.66	45.33	50.33	47.91 [a]
Mean	48.00[a]	48.83 [a]	47.00 [a]	48.08 [a]	

Means bearing similar superscripts are similar (p>0.05) under different rows and columns

Details of Dietary Treatments

The experimental birds were subjected to the following dietary treatments-

T_0 (control)	**Standard ration as per NRC**
T_1	Ration supplemented with 0.5g Cardamom powder /kg feed
T_2	Ration supplemented with 0.5g Ginger powder /kg feed
T_3	Ration supplemented with 0.25g Cardamom+ 0.25g Ginger powder /kg feed

El-Deek *et al.* (2002) and Moorthy *et al.* (2009) utilized 1g/ kg feed and 2g/ feed Ginger and other herbal feed additive powders individually or in combination of the diet of broiler feed. We aimed to test the supplementation of 0.5 g/ kg feed with Ginger and Cardamom powder individually and 0.25g Cardamom+ 0.25g Ginger powder of the diet of broiler feed. The birds were reared in battery type cages under standard managemental practices from day-old to five weeks of age. Cardamom and Ginger was supplemented as per dietary regimes of treatments. Broiler starter ration containing CP: 22 per cent and, ME: 2900k.cal./kg. Feed was fed up to three weeks of age and broiler finisher ration containing CP: 19 percent and ME: 3000 k.cal./kg. fed up to five weeks as shown in Table 2.

Table 2: Ingredient and nutrient composition of experimental diet (% DM)

Ingredients (%)	**Broiler Starter (0 – 21 day)**	**Broiler Finisher (22 – 42 days)**
Corn	60	63
Ground nut cake	23.35	18
Fish meal	13	15
Mineral mixture	3	3
Common salt	0.5	0.38
Vitamine Premix (vit. A, B_2, D_3	0.05	0.02
Amprosol	0.05	0.05
Nuvimin	0.05	0.55
Calculated Nutrient Composition		
Moisture (%)	6.29	6.22
Crude protein (%)	22	19
Total ash (%)	8.02	9.34
Crude fiber	5.5	6
ME (Kcal/kg)	2900	3000

The ration was fed *ad-libitum* to the birds. Initial weight of each chick was recorded on arrival and then weekly to obtain the growth rate. The feed consumption was also recorded weekly to determine the feed conversion ratio. The mortality rate was nil.

Housing and Management

Optimum housing condition is necessary for livestock species in broad terms (Singh *et al.*, 2020a; Singh *et al.*, 2020b; Mishra *et al.*, 2017). It is more important for poultry birds as they are more susceptible for climatic change. Before arrival of broilers chicks, the experimental pens, waterers, feeders and floor were cleaned, washed, disinfected and fumigated by using formaldehyde and potassium permanganate. The experimental birds were reared under caged system. The experimental birds were reared under caged system. The uniform standard management practices were followed for all the groups throughout the experimental period. The cage system was supplied with electric bulb in each chamber as a source of heat and light and also temperature was maintained in broiler shed. Hence, chicks under each group received same housing management.

Feeding and Watering

Grinded maize was provided for the first day and thereafter, the feed was offered in chick feeders and then in grower feeders throughout the experiment. The ad-lib feeding and ample of clean drinking water was made available during the experiment. Weighed amount of feed was offered to all the treatments and groups and the left-over feed was collected and weighed separately at the end of the week. From this data, the average weekly feed consumption was calculated.

Feed Consumption

The daily feed consumption of each group was estimated as differences between the total quantity of feed offered and quantity of feed left over during 24 hours period i.e., on daily basis. Feed consumption so recorded was added together for seven days of the week and was considered as weekly feed consumption.

Live Weight Gain

The growth rate of the birds is reflected through the weekly live weight gain. Individual body weight of the birds from each group was taken at weekly interval, starting from the day-old stage. The birds were weighted during morning hours before feeding. The average weekly weight gain of the birds of the different groups was calculated by subtracting the previous week average weight of the group of the birds from the present weekly average weight of the group of birds.

Feed Conversion Ratio

The amount of feed consumed per unit gain (feed conversion ratio) was calculated as the ratio of feed consumed to weight gain during the experimental period feed consumption and weight gain for each week worked out for each treatment separately.

Feed conversion ratio = Quantity of feed Intake / Gain in body weight

Statistical Analysis

The data on various parameters were recorded, tabulated and statistically analyzed using analysis of variance (ANOVA) technique as per Snedecar & Cocharan (1994).

Results and Discussion

Average Weekly Feed Intake (g) of Broilers of Different Treatments

The data regarding average feed intake of broilers randomly distributed into control (T_0) three different treatments (T_1, T_2, T_3) are presented in Table 3. At first week of age the highest average feed intake of broilers was recorded in T_2 (157.96) and followed by T_3 (151.25), T_1 (150.50), T_0 (140.08). At second weeks of age the highest average feed

intake of broilers was recorded in T_1 (564.41) and followed by T_2 (544.25), T_3 (543.30), T_0 (539.92). At third weeks of age the highest average feed intake of broilers was recorded in T_1 (448.00) and followed by T_2 (447.50), T_3 (432.00), T_0 (427.75). At fourth weeks of age the highest average feed intake of broilers was recorded in T_3 (856.00) and followed by T_0 (671.25), T_2 (660.00), T_1 (556.25). At fifth weeks of age the highest average feed intake of broilers was recorded in T_0 (469.00) and followed by T_2 (461.25), T_1 (381.25), T_3 (338.00). Irrespective of weekly the mean feed intake per broiler at first, second, third, fourth and fifth week of age was 149.94, 547.97, 438.81, 688.50 and 424.87 g respectively. Irrespective of treatment the mean feed intake per broiler in T_0, T_1, T_2 and T_3 was 449.60, 422.08, 454.19, 455.91 g respectively. The differences in the mean feed intake of broiler, due to treatment were found significant. From the perusal of data on weekly feed intake of broiler contained in Table 3 and Figure 1. It may be noted that mean feed intake of broilers, irrespective of weekly age first, second, third, fourth and fifth week of age was 149.94, 547.97, 438.81, 688.50 and 424.87 g respectively. When treatment wise feed intake of broilers of was observed, it was noted that high weekly mean feed intake of broiler was recorded in T_3 (455.91) followed by T_2 (454.19), T_0 (449.60) and T_1 (422.08). However, the differences in these values of treatment were found to be significant.

Table 3: Average weekly feed intake of broiler chicks (g) of different treatments

Treatments	W1	W2	W3	W4	W5	Overall Weekly Mean
T0	140.08^{a}	539.92^{a}	427.75^{a}	671.25^{a}	469.00^{a}	449.60^{d}
T1	150.50^{a}	564.41^{a}	448.00^{a}	566.25^{a}	381.25^{bc}	422.08^{bc}
T2	157.96^{a}	544.25^{a}	447.50^{a}	660.00^{a}	461.25^{abc}	454.19^{abc}
T3	151.25^{a}	543.30^{a}	390.50^{a}	856.50^{a}	338.00^{d}	455.91^{ab}

Means bearing different superscripts differ significantly ($p<0.05$) under different row

Ginger has been shown to be effective against the growth of both Gram-negative and Gram-positive bacteria including *Escherichiacoli*, *Proteus vulgaris*, *Salmonella typhimurium*, *Staphylococcus aureus* and *Streptococcus viridans* (Cazzola *et al*., 2011).

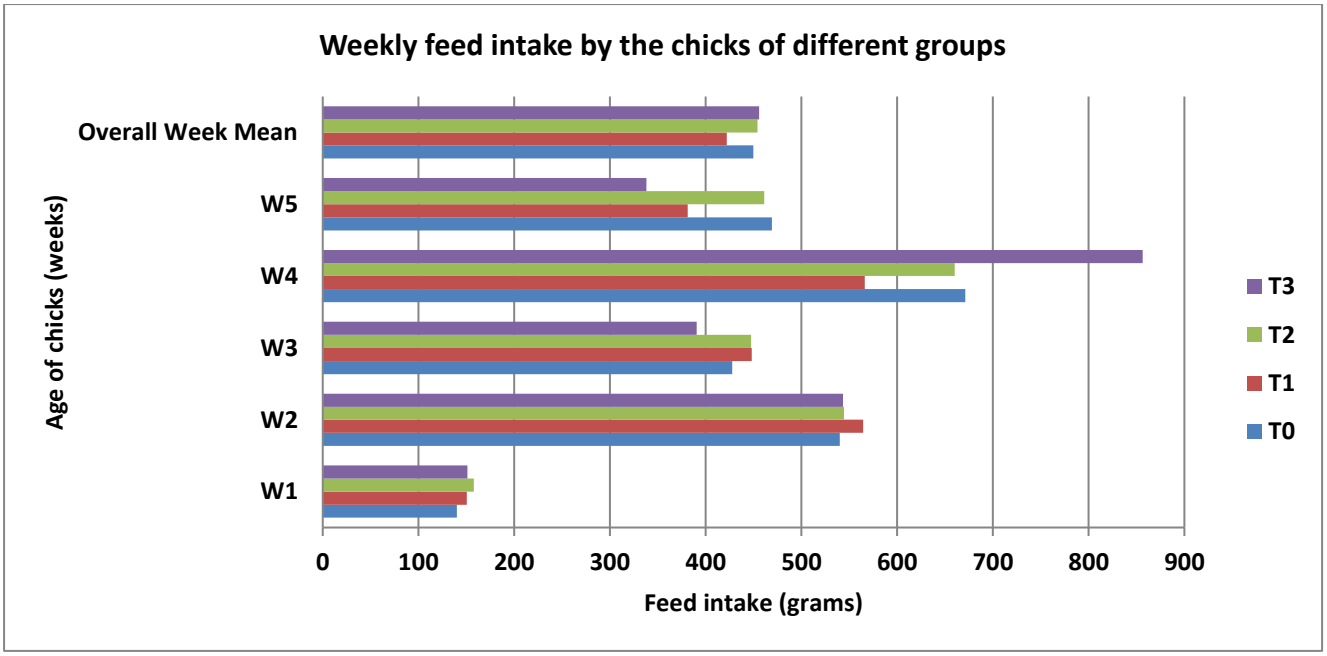

Figure 1: Average weekly feed intake of caged broiler on diet supplemented with different cardamom and ginger powder

The ingredients of Zigbir optimize liver functions and resulting to better utilization of fat, fat soluble vitamin and other nutrient that ultimately improved body weight and feed conversion. El-Deek *et al*. (2002) in an experiment found that that diet containing 1g/kg of ginger did not significantly affected the growth performance in broilers. No significant differences were observed in body weights of male Japanese quails fed on different levels of vitamins E and Selenium. AL-Moramadhi (2010) studied the effect of ginger root infusion on some physiological parameters

in broiler at dose 100mg/kg body weight for 6weeks.The results showed no significant effect of ginger roots infusion on body weight and food intake. Elamin *et al*. (2011) studied the response of broiler chicks to dietary cardamom (*Elettaria cardamomum*) as a natural feed additive on broiler performance and blood parameter. They were supplemented with four levels of cardamom (0.0%, 0.15%, 0.30% and 0.45%). The treatment had significantly ($p>0.05$) decreased blood total lipid and glucose. However, there was no significant ($p>0.05$) effect on blood total protein. Amar *et al*. (2013) stated that, the addition of ginger essential oil to the diet at the levels 10, 20 and 40mg /kg /day caused no significant effect on the feed intake, weight gain and feed conversion ratio of broiler. Arshad *et al*. (2010) reported that, the feed intake, weight gain and feed conversion ratio were improved in broiler chicks fed on dietary ginger powder at levels 0.1 and 0.2%.

Body Weight of Chicks

The data regarding average body weight of the broilers randomly distributed into control (T_0) three different treatments (T_1, T_2, T_3) are presented in the Table 4. At first week of age the highest body weight of broilers was recorded in T_3 (171.17g) followed by T_1 (170.42g), T_2 (166.92g), T_0 (162.00g). At second week of age the highest body weight of broilers was recorded in T_3 (485.00g) followed by T_1 (473.50g), T_0 (457.33g), T_2 (447.50g). At third week of age the highest body weight of broilers was recorded in T_3 (766.51g) followed by T_1 (765.62g), T_2 (755.18g), T_0 (731.27g). At fourth week of age the highest body weight of broilers was recorded in T_3 (1373.41g) followed by T_1 (1310.17g), T_2 (1272.66g), T_0 (1253.33g). At fifth week of the highest body weight of broilers was recorded in T_3 (1502.67 g) followed by T_2 (1494.58g), T_1 (1479.16g), T_0 (1476.58g). Irrespective of weekly the mean body weight of broilers in first, second, third, fourth and fifth week was. 167.62, 465.83, 754.64, 1302.39 and 1488.24 respectively. Irrespective of treatment, mean average gain in weight per broiler in T_0, T_1, T_2 and T_3 was 816.10, 839.77, 827.37, 859.75 g respectively. The differences in the average gain in body weight of broilers, both due to treatments and weeks were found significant. From the perusal of data on weekly body weight of broilers, contained in Table 4 and Figure 2. It may be noted that mean body weight of broilers irrespective of weekly at one, two, three, four, and five week was 167.62, 465.83, 754.64, 1302.39, and 1488.24g, respectively. When treatment wise body weight of broilers was observed, it was noted that highest weekly treatment mean body weight of broiler was recorded in T_3 (859.75), T_1 (839.77), T_2 (827.37), T_0 (816.10). The differences in these values of treatments were also found significant, indicating a significant effect of treatment on body weight of broilers.

Table 4: Average weekly body weight of broiler chicks (g) in different treatments

Treatments	W1	W2	W3	W4	W5	Overall mean body weight
T0	162.00^{d}	457.33^{a}	731.27^{a}	1253.33^{ab}	1476.58^{a}	816.10^{cd}
T1	170.42^{abc}	473.50^{bc}	765.62^{a}	1310.17^{c}	1479.16^{a}	839.77^{abc}
T2	166.92^{bc}	447.50^{d}	755.18^{a}	1272.66^{ab}	1494.58^{a}	827.37^{bcd}
T3	171.17^{ab}	485.00^{bc}	766.51^{a}	1373.41^{d}	1502.67^{a}	859.75^{ab}

Means bearing different superscripts differ significantly ($p<0.05$) under different rows

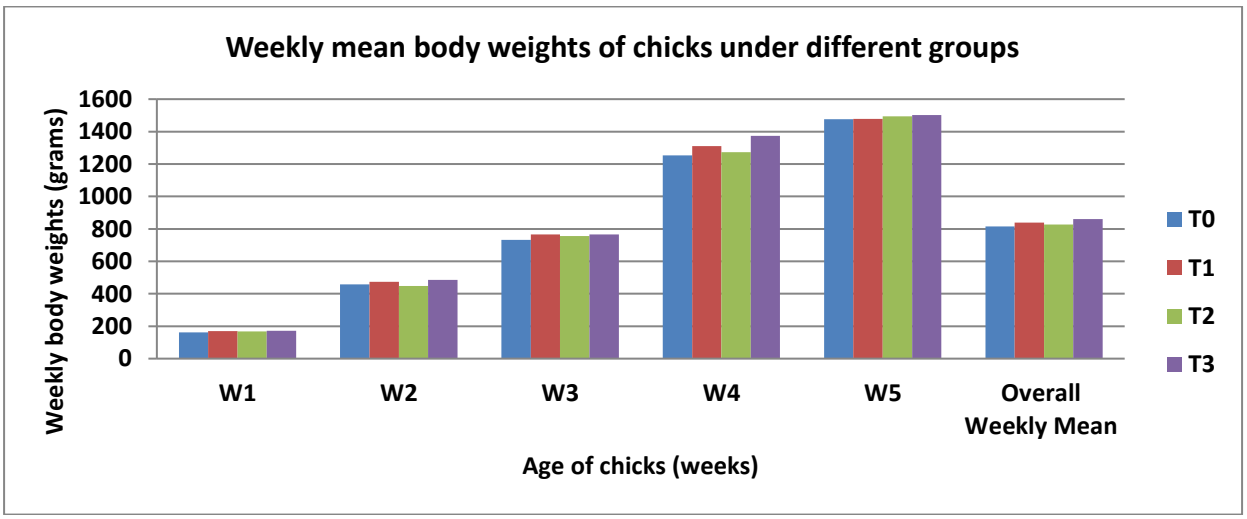

Figure 2: Average weekly body weight (g) per broiler in four different treatments with different level of cardamom and ginger powder

Patel and Srinivasan, (2000), reported that Ginger has been found to enhance pancreatic lipase activity intestinal lipase, disaccharides, and sucrose and maltase activities of rats. Ginger has favorable effects on gut function, which is the primary mode of action for growth promoting feed additives. Narahari and Ahmed (2003) revealed significantly higher body weight and feed intake livability was comparable between treatments. However due to better growth rate 2.1% better feed efficiency was recorded than control group in broiler from 0-6-week age. Biswas *et al*. (2005) observed body weight of eight week of age ranging from 185.71+ 3.64g to 191.43+3.84g between different groups.

Conclusion

In this study supplementation of cardamom and ginger powder and their combination was provided to the caged chicks to study the effect of supplementation on weekly feed intake and body weight achieved respectively. The best results for feed intake and body weight was seen for the group of caged chicks supplemented with combination of Cardamom and Ginger powder each @ 0.25 g/kg feed followed by individually supplementing chicks with Cardamom and Ginger powder than without supplemented group i.e. control group. Hence, from this study it can be concluded that supplementation of Cardamom and Ginger powder in combination form may be done to achieve improved feed intake and body weight obtained at finisher stage.

Recommendation

This study brings out the insights of using Cardamom and Ginger powder individually and in combination for caged broilers. However, it is recommended to carry similar study on supplementation of Cardamom and Ginger powder in combination on large number of chicks for further detailed study including hematological, internal organs, muscle quality for more knowledge on this type of study. Nevertheless, this study will be a basis of further study on supplementation of Cardamom and Ginger powder in combination.

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Conflict of Interests

There is no conflict of interest.

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