

Original Research Article

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Effect of Cardamom and Ginger Powder Supplementation on Body Weight Gain and Feed Efficiency 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 0.25 Cardamom+ 0.25Ginger powder /kg feed. The birds were reared in battery type cages under standard management practices from day-old to five weeks of age. The best results for body weight gain (p<0.05) 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. However, feed efficiency was similar among different groups (p>0.05). Nevertheless, there was significant effect of weeks of cage rearing in the feed efficiency (p<0.05). Hence, from this study it can be concluded that supplementation of Cardamom and Ginger powder in combination form may be done to achieve improved body weight gain at finisher stage.

Keywords

Cardamom, Ginger,
Weight gain, FCR,
Caged Broilers

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Introduction

India has the world's second largest emerging economy. Poultry sector is one of the fastest growing sectors in India. It has an immense scope for obtaining handsome amount of money and hence income generation. India has witnessed, average growth rate of 6 % in

egg production and 12 % for broiler production per annum. Total poultry population in India has increased by 16.81% to 851.81 million from 729.21 million in numbers (BAHS, 2019). India stands on 3rd position in egg production; however, it is still growing in terms of poultry meat production and stands on 6th position in the world in

terms of broiler production. Rise in consumer demand for poultry is responsible for driving the recent growth of the Indian poultry sector. Poultry meat especially chicken meat is covering meat market over the world. According a survey by comptroller general of India, over 75% of Indian youths from 15 to 35 yrs of age are non vegetarians. There is a great variation between the demand and supply of Indian poultry population dynamics. Indian poultry industry is captured more than 90% by corporate sector and very less by unorganized farming. Hence, there is a lot of scope for improvement and catching the flow of poultry market. In this assignment we will be focusing on detailed aspects of poultry production in India. Poultry products have become more common in non- vegetarians (Adbhai *et al.*, 2019).

Supplementation of Cardamom is increasing in many feed items due to its medicinal use and by virtue of its pleasant flavor. Studies on Supplementation of Cardamom suggest that *Teucrium polium* has different active compounds, such as flavonoids, tannins, saponin, glycosides, terpenes and steroids (Cazzola *et al.*, 2011). It has been investigated that Cardamom is enriched with antioxidant, anti-inflammatory, digestive, appetite stimulant, carminative properties and in addition to it, Cardamom has beneficial impact when it is utilized as feed additive in the diet of poultry (Arshad *et al.*, 2010). Cardamom has been known as the "Queen of all spices". Cardamom has antibacterial properties similar to that of probiotics for gram negative bacterium (Martha *et al.*, 2012). Elaichi (cardamom) is a good aromatic, digestive stimulant and carminative. The above mentioned beneficial properties in Cardamom are due to the presence of specific oils in it. Elaichi (cardamom) supplementation in food has shown increase in blood circulation, reduced toxin level in the blood and increases elimination of these

toxins by inducing mild diuresis. It also has anti-allergic effects which may be useful against allergic skin rashes and urticaria.

Ginger (*Zingiber officinale*) is a medicinal herb used on a large scale as a spice, for pickles, candies, and preservatives. This plant belongs to the family Zingiberaceae; which are aromatic herbs having fleshy, tuberous or nontuberous rhizomes and, often have tuber bearing root (Mohamed *et al.*, 2012). The major components of ginger are zingiberene and gingerol which has the ability to stimulate the digestive system thereby influencing the digestive pH and the functioning 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). 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 (*Zingiberiaceae*), commonly known as ginger is one of the essential kitchen spices possessing a list of many health benefits. Ginger is also used as one of the home remedies in treating various gastric problems like constipation, dyspepsia, belching, bloating, gastric, discomfort, ulcerations, and indigestion to both human and animals.

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 and Feed Efficiency 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 3 weeks age (1 to 21 days) and then broiler finisher ration up to 3-5 weeks age (22-35 days) as per following dietary regimes:

Details of dietary treatments

The experimental birds were subjected to the following dietary treatments

Details of dietary treatments:

T₀ (control) Standard ration as per NRC

T₁ Ration supplemented with 0.5g Cardamom powder /kg feed

T₂ Ration supplemented with 0.5g Ginger powder /kg feed

T₃ Ration supplemented with 0.25 Cardamom + 0.25Ginger powder /kg feed

The birds were reared in battery type cages under standard management 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:2900 k.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. 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

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.

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. 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 (Table 3) analyzed using analysis of variance (ANOVA) technique as per Snedecar & Cochran (1994).

Critical differences

The critical difference was calculated with the help of following formula:

$$CD = \frac{\sqrt{2MSS(E)}}{r} \times t \text{ error}$$

Where,

SE – Standard error

CD – Critical differences

r – No. of replication

t error - Treatment error

Results and Discussion

Weekly average gain in weight (g) of broilers

The data regarding average feed intake of broilers randomly distributed into control (T₀) three different treatments (T₁, T₂, T₃) are presented in Table 4.

In general, average gain in weight of broilers at first, second, third, fourth, and fifth weeks of age ranged from 104.66g to 124.33, 261.33 to 333.00, 223.04 to 359.67, 436.31 to 642.68, 89.67-325.67g. At first week of age the average highest gain in weight in body of broilers was recorded in T₃ (123.09) followed by T₁ (1121.59), T₂ (119.92), T₀ (114.00). At second week of age the average gain in weight body of broilers was recorded in T₃ (313.83) followed by T₁ (303.08), T₀ (295.34), T₂ (280.58). At third week of age the average highest gain in weight of broilers was recorded in T₂ (307.69) followed by T₁ (292.13), T₃ (281.51), T₀ (273.94). At fourth week of age the average highest gain in weight in body of broilers was recorded in T₃ (606.91) followed by T₁ (544.54), T₀ (522.07), T₂ (517.48). At fifth week of age the average highest weight gain in body of broilers was recorded in T₀ (223.25) followed

by T₂ (221.92), T₁ (169.00), T₃ (129.25) Irrespective of week, the mean average gain in weight per broilers at first, second, third, fourth and fifth week was 119.65, 298.20, 288.81, 547.75, and 185.85 g, respectively.

Irrespective of treatment, mean average gain in weight per broiler in T₀, T₁, T₂ and T₃ was 119.65, 298.21, 288.81, 547.75, and 185.86 g respectively. From the perusal of data on weekly average gain in weight per broilers

after five week of age contained in Table 4 and Figure 1. It may be noted that mean gain in weight per broilers, irrespective of weekly at one, two, three, four and five week of age was 119.65, 298.20, 288.81, 547.75, and 185.85 g respectively. When treatment wise gain in weight of broilers was recorded the highly weekly gain in weight was observed in T₃ (547.75), T₁ (298.20), T₂ (288.81) However the differences in these values of treatment were found to be significant.

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	50.00	44.00	47.50 ^a
R3	50.00	49.33	44.00	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

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

Ingredients (%)	Broiler Starter (0 – 21 day)	Broiler Finisher (22 – 42 days)
Corn	60.00	63.00
Ground nut cake	23.35	18.00
Fish meal	13.00	15.00
Mineral mixture	3.00	3.00
Common salt	0.50	0.38
Vitamine Premix (vit. A, B ₂ , D ₃)	0.05	0.02
Amprosol	0.05	0.05
Nuvinin	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	6.00
ME (Kcal/kg)	2900	3000

Table.3 Structure of analysis of variance (ANOVA)

Sources of variation	d. f	S.S	M.S.S	F. cal	F. table	Result	CD
Treatment	t-1	SS(t)	MSS(t)	R1		S/NS	
Replication	r-1	SS(t)	MSS(r)	R2			
Error	(r-1) (t-1)	ESS	MESS				
Total	Rt-1						

d. f - degree of freedom
 SS - sum square
 MSS - Mean sum square
 r 1 - MTSS/MESS
 r 2 - MRSS/MESS
 C.D - Critical differences
 S - Significant
 NS - Non-significant
 t - Treatment
 ANOVA - Analysis of variance

Table.4 Average weekly means gain in weight of broiler chicks (g) of different treatments

Treatments	W1	W2	W3	W4	W5	Mean
T0	114.00	295.34	273.94	522.07	223.25	285.72 ^a
T1	121.59	303.08	292.13	544.54	169.00	286.07 ^b
T2	119.92	280.58	307.69	517.48	221.92	289.52 ^c
T3	123.09	313.83	281.51	606.91	129.25	290.92 ^d
Mean	119.65 ^A	298.21 ^D	288.81 ^C	547.75 ^E	185.86 ^B	

Means bearing different superscripts differ significantly (p<0.05) under different rows for treatment and columns in weekly means

Table.5 Average weekly means (FCR) or feed efficiency per broiler different treatments

Treatments	W1	W2	W3	W4	W5	Mean
T0	1.23	1.83	1.56	1.29	2.34	1.65 ^A
T1	1.24	1.86	1.51	1.03	2.37	1.60 ^A
T2	1.32	1.94	1.46	1.30	2.33	1.67 ^A
T3	1.23	1.74	1.37	1.41	2.70	1.69 ^A
Mean	1.26 ^a	1.84 ^c	1.48 ^b	1.26 ^a	2.43 ^d	

Means bearing different superscripts differ significantly (p<0.05) under different column and rows respectively

Fig.1 Average weekly gain in weight of caged broiler on diet supplemented with different cardamom and ginger powder

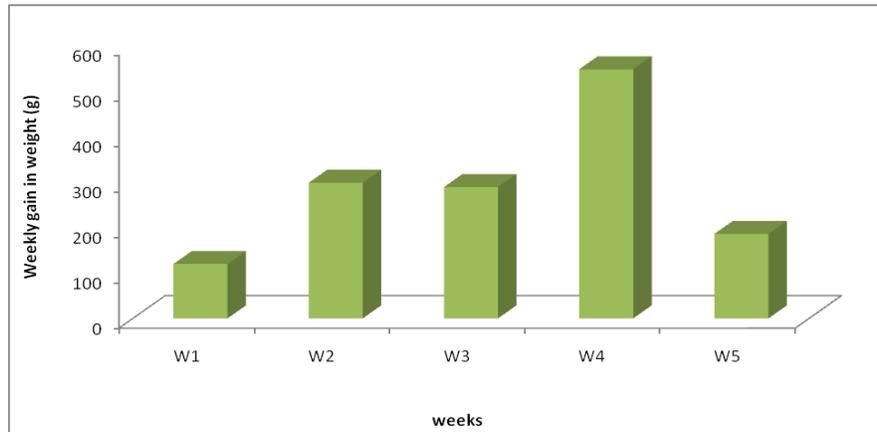
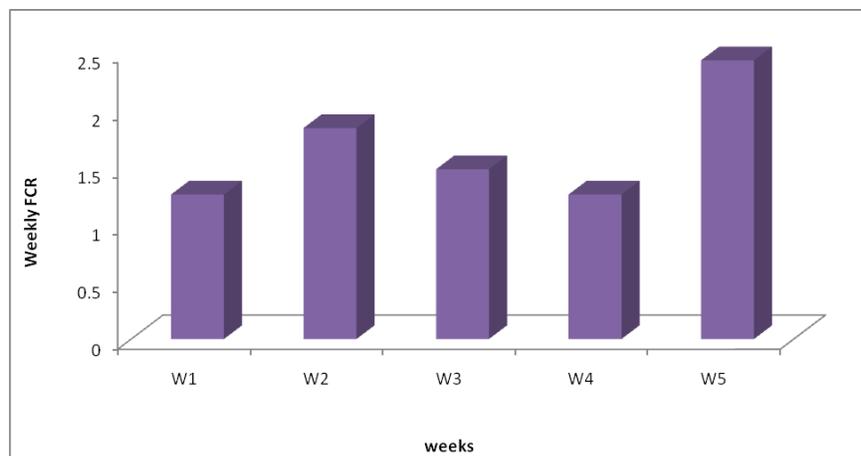


Fig.2 Average weekly feed conversion ratio of caged broilers on diet supplemented with different cardamom and ginger powder



It has been pertinent by Figure 1 that major body weight gain has been seen in 4th week as compared to other weeks. The effect of treatment was seen significant ($p < 0.05$) as shown in Table 4. This can be stated from here that this increased body weight gain may be due to positive effect of supplementation of caged broilers with Cardamom and Ginger. Patel and Srinivasan, (2000) studied that Ginger has been suggested to improve pancreatic lipase activity of intestinal lipase, disaccharides, and sucrose and maltase activities of rats. It has been found to have favorable effects on gut function, which is

suggested as the primary mode of action for growth promoting feed additives. Narahari and Ahmed (2003) investigated that significantly higher body weight and feed intake livability was achieved in treatment group broilers as compared to that of control group chicks. However due to better growth rate, 2.1% better feed efficiency was observed in treatment group chicks than control group in broiler from 0-6 week age. Biswas *et al.*, (2005) found that body weight of eight week old chicks of same age was in range from 185.71+ 3.64g to 191.43+3.84g between different groups. Ao *et al.*, (2011) expressed

that garlic did not show significant affect on glucose level in blood of control group birds compared with the treatment group birds.

Average weekly FCR of broilers of different treatment (kg. feed per kg. of weight)

The data regarding average feed conversion ratio (FCR) per broiler during first week of age randomly distributed into control (T₀) three different treatments (T₁, T₂, T₃) are presented in Table 5.

At first week of age the best FCR per broilers was recorded in T₂ (1.32) and followed by T₁ (1.24), T₃ (1.23), T₀ (1.23) kg. At second weeks of age the best FCR per broilers was recorded in T₂ (1.94) and followed by T₁ 1.86), T₀ (1.83), T₃ (1.74) g. At third weeks of age the best FCR per broilers was recorded in T₀ (1.56) and followed by T₁ (1.51), T₂ (1.46), T₃ (1.37) g. At fourth weeks of age the best FCR per broilers was recorded in T₃ (1.41) and followed by T₂ (1.30), T₀ (1.29), T₁ (1.03) g. At fifth weeks of age the best FCR per broilers was recorded in T₃ (2.70) and followed by T₁ (2.37), T₀ (2.34), T₃ (2.33). Irrespective of weekly the mean average FCR per broiler in first, second, third, fourth and fifth week of age was 1.26, 1.84, 1.48, 1.26, and 2.43 g respectively. Irrespective of treatment the mean FCR per broiler in T₀, T₁, T₂ and T₃ was 1.65, 1.60, 1.67 and 1.69 g respectively. From the perusal of data on weekly average feed conversion ratio per broiler contained in Table 5 and Figure 2. It may be observed that the mean average FCR per broilers, irrespective of weekly at one, two, three, four and five week of age was 1.26, 1.84, 1.48, 1.26, and 2.43 kg respectively. These results were expected. Regarding the influence of treatment on weekly FCR per broiler was observed that mean FCR of different treatments were 1.65, 1.60, 1.67 and 1.69 However the differences

in these values of treatment were found non – significant.

Srivastava and Mustafa (1989) found that Ginger supplementation shown to be effective towards controlling the growth of both Gram-negative and Gram-positive bacteria including *Escherichia coli*, *proteus vulgaris*, *Salmonella typhimurium*, *staphylococcus aureus* and *streptococcus viridans*. The ingredients of Ginger improve liver functions thereby resulting in better utilization of several nutrients that ultimately adds up to the improved body weight and feed conversion. El-Deek *et al.*, (2002) in an experiment observed that that diet containing 1g/kg of Ginger had a non- significantly affect on the growth performance in broilers under different groups. Al-Moramadhi (2010) investigated the effect of ginger root infusion on some physiological parameters in broiler. The results showed that there was no significant effect of Ginger root supplementation on body weight and food intake of broiler chicks among different groups. 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. Broiler diets were supplemented with four levels of cardamom (0.0%, 0.15%, 0.30% and 0.45%). The treatment group had significantly ($p>0.05$) lower blood total lipid and glucose values. However, a non- significant ($p>0.05$) effect on blood total protein was observed. Amar *et al.*, (2013) shown that the addition of Ginger essential oil to the diet led to non- significant effect on the feed intake, weight gain and feed conversion ratio in different broiler groups. Arshad *et al.*, (2010) studied that the dietary addition of Ginger powder at different levels showed improved feed intake, weight gain and feed conversion in broiler chicks which were supplemented as compared to non-supplemented group.

In conclusions, this study supplementation of Cardamom and Ginger powder and their combination was provided to the caged chicks with an objective to study the effect of supplementation on weekly body weight gain and feed efficiency of caged broilers. The best results for body weight gain 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. However, feed efficiency was similar among different groups. Nevertheless, there was significant effect of weeks of cage rearing in the feed efficiency. Hence, from this study it can be concluded that supplementation of Cardamom and Ginger powder in combination form may be done to achieve improved body weight gain 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 Interest

Authors declare that they do not have any conflict of interests.

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