Effect of clove powder on growth performance and carcass characteristics of Broiler

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Effect of clove powder on growth performance and carcass characteristics of Broiler

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List of Abbreviations:

CLP	Clove powder
FCR	Feed conversion ratio
BWG	Body weight gain
FI	Feed intake

Abstract

This study examined how broiler chickens responded to clove extract added to their basal diet (broiler starter feed and broiler grower feed) at various concentrations (0% ,0.04%, 0.08%). Performance in terms of growth and carcass characteristics were examined in the study. About sixty three (63) Cobb 500 strain chicks (one day old) were used. The total 63 day old chicks were randomly distributed into three dietary treatment groups, each dietary treatment had three replications of which each replication received 21 chicks. (T0=control, T1=0.04%-clove, T2=0.08%-clove). To suit the nutritional needs of broiler chicken the experimental feed was designed to follow proper requirement of nutrition. The experiment was lasted 5 weeks. After 5 weeks of feeding the experimental diet 3 birds from each treatment group were slaughtered to measure the carcass characteristics. The amount of feed consumed, total body weight gain, feed conversion ratio (FCR) improved significantly (P 0.01) after clove extract was added to the chicks' ration. When 0.04% of clove extract was added, the performance of the chickens was better than other groups. Thus, based on the result obtained from this study it can be suggested that 0.04% clove powder can be supplemented in broiler diet to obtain better growth and carcass yield.

Keywords: clove powder, weight gain, feed intake, FCR, broiler,

Chapter 1: Introduction

Poultry meat particularly flesh of broiler having high nutritional value, modified fat and polyunsaturated ω-3 fatty acid structure, and abundance in vitamins and minerals, especially calcium and phosphorus become the key food sources used to significantly expand the number of people's choices in consumption of protein. Poultry meat is superior to meat from ruminants in terms of taste, appeal, ease of digestion, softness, low fat content, and high cholesterol, in addition to being better and healthier for human health (Hasan et al., 2020). For several reasons, but mostly because it is a cheap source of animal protein, demand for poultry meat is growing. (2009). (Magdelaine et al. (2008). As a result, Bangladesh is also experiencing a surge in the development of chicken breeds that have excellent genetic potential, are used for meat production, and can satisfy market needs from 28 to 35 days of age (Hasan et al., 2020)

Broiler consumption in Bangladesh made up 40% of all meat consumed in 2018, and the per-person intake is currently 6.3 kg, with a predicted increase to roughly 7 kg in 2020 (WPSA-BB, 2018)

For many years, Antibiotics have been used in chicken feed to increase growth and to deter or get rid of harmful microorganisms (Gadde et al., 2017). However, because of growing worries about antibiotic-resistant bacteria and antibiotic residue in meat and eggs, the chicken industry is currently shifting toward the reduced usage of antibiotics (Mashayekhi et al., 2018). The use of antibiotics in animal feed was outlawed by the European Union (EU) in 2006 (Belal et al., 2018). According to research (Vijayasteltar *et al.,* 2016; Al-Shammari *et al.,* 2017), herbs, medicinal plants, and spices may be more effective than antibiotics at promoting animal health. A set of aromatic plants, including cloves, cardamom, anise, ginger, black pepper, and cumin, are frequently utilized because of their favorable effects on the development and health of poultry, possibly because of their immune stimulatory qualities (Chowdhury et al., 2018; Kunnumakkara et al., 2018). The spice clove (*Syzygium aromaticum*) is regarded as one of the most adaptable. Numerous biologically active substances including eugenol, eugenol acetate, and -caryophyllene, are present in them (Jimoh et al., 2017). According to AlShaikh and Perveen (2017), eugenol, which makes up 70–80% of clove oil, is the component in cloves that is most physiologically active.

These phytogenic additives may act in a variety of ways, including enhancing feed intake and flavor, promoting the release of digestive enzymes, boosting gastric and intestinal motility, stimulating the endocrine system, acting as an antimicrobial (MITSCH et al., 2004), an anthelmintic, a coccidiostat (JAMROZ et al., 2005), a stimulant of the immune system, and having anti-inflammatory and antioxidative activity. Numerous studies have demonstrated the antibacterial effects of herbal extracts, which can boost the health of bird's digestive systems by reducing the quantity of disease-causing bacteria and improving intestinal microflora population (JAMROZ et al.,2005; MITSCH et al.,2004). For better performance and a higher feed conversion ratio, intestinal health in chicken is crucial. Increased intestinal villi size and height improves nutrient absorption in the gastrointestinal system. Diet was discovered to have an impact on the shape of the intestinal villi. The morphology of the intestinal villi and feeding preferences were found to be correlated in several domestic birds (ZULKIFLI et al., 2009). However limited research has been done on growth performance of broiler using clove powder as dietary supplements. Therefore, the present research was undertaken to assess the effect of clove powder on growth performance and carcass quality in broiler chicken.

Objectives: The study was conducted for the following reasons:

1. To introduce *Syzigium aromaticum* (Clove) as inexpensive candidates (herb) for replacing antibiotic growth promoter without residual effects.
2. To investigate the optimum proportion of herbs for maximum weight gain and carcass yield

Chapter 2: Review of Literature

As feed additives in the production of poultry, natural medical items derived from herbs, species, and their extract products have been used (Hashemi and Davoodi, 2010; Khan et al., 2012). The performance of broiler chicks up to 5 weeks old was affected by various treatments, and it was discovered that adding clove extract supplements greatly boosts feed intake and weight gain.

In comparison to other groups, the addition of clove extract at a concentration of (0.5%) produces the best results. The outcome of this study showed that clove may be added to broiler feed at a level of 0.5% to improve broiler performance. Based on earlier research and the results of this study, clove can be regarded as a medicinal plant. (Kholoud Osama et al., 2021). There was a control group and clove powder were in concentration like 0%,0.5%,1%,1.5%. Among all the 0.5% concentration of clove in feed has given the best result of body weight gain, FCR, feed intake etc.

Another study found that all dietary interventions had an impact on performance. In comparison to those of 1% clove powder (CLP) and the controls (positive and negative), the inclusion of various levels of CLP from 2% to 6% resulted in a gradual decrease ($P < 0.0001$) in bodyweight gain (BWG) and daily feed intake (FI) with a gradual increase ($P<0.0001$ and $P = 0.015$, respectively) in FCR at two and three weeks old. The inclusion of CLP at 4% to 6%, as well as when 3% to 6% of CLP was added to feed intake, however, produced a drop in daily weight gain when compared to other treatments, without any change in FCR in all dietary regimens at 4 and 5 weeks old. Beyond 2% of the diet, clove consumption had a negative impact on performance, which may have been due to a poor impact on the feed's palatability. The findings, however, are consistent with those of Mohammadi et al. (2014), who discovered that broilers supplemented with clove oil (100 mg/kg, 300 mg/kg, and 500 mg/kg) did not grow linearly and experienced lower growth performance and total feed intake with the addition of 500 mg of cloves/kg of food. Similar results were obtained by Agostini et al. (2012), who utilized clove oil at different concentrations (100, 200, 1000, and 2500 mg/kg), and who observed lower growth performance at the 1000 and 2500 mg/kg levels. Clove oil at doses of 200, 400, and 600 mg/kg added to the feed of birds in another study by Mukhtar (2011) enhanced growth outcomes. In a recent study by Mahrous et al. (2017), broiler chickens were fed clove bud supplements at a rate of 0.5 and

1.0g/kg diet, and no significant differences in growth performance (BWG and FCR) were seen. However, performance declined in groups supplemented with higher levels of cloves (1.5 g/kg diet).

According to research by (Al-Mufarrej et al., 2019), broiler chicken performance was negatively impacted by a higher clove content (greater than 2%), which may be attributed to a negative impact on feed palatability.

However, the feed intake of birds supplemented with 500 mg/kg clove essential oil and antibiotic was not significantly lower than that of birds fed on the diet supplemented with 300 mg/kg clove essential oil. (Mohammadi et al.,2013)

Chapter 3: Materials and Methods

3.1 Study area:

The entire study was conducted at the Chattogram Veterinary and Animal Sciences University (CVASU), located in Khulshi, Chattogram, Bangladesh. The poultry research shed was used for the animal trials, and the department's post-graduate (PG) and undergraduate animal nutrition laboratories were used for all lab work.

3.2 Preparation of clove powder:

Clove seeds were purchased from a herbal shop in Jhautola bazar, Chattogram city before being washed and ground (Image 1.2). Then dried clove seed was ground into powder using an electric grinder (Panasonic MX-AC555) and stored in an airtight plastic zipper bag at 4°C until mixed into the feed.

Image 1.1 dried clove

Image 1.2 grinded clove

3.3 Design of the experiment:

Total 63 day-one chick was collected from Kazi farms limited, Chattogram. Immediately after unloading, all the chicks were examined for any types of abnormalities and measured weight for maintaining uniform size in all treatment groups. They were divided in three groups (T0= control, T1=0.04%clove, T2= 0.08%clove) each group having 3 replicates and 7 birds in every replicates.

Table 1: Layout of the experiment:

Treatment group	Replications	No. of birds per replication	No. of birds per treatment group
T0= Control	R1 R2 R3	7 7 7	21
T1=basal diet +0.04% clove	R1 R2 R3	7 7 7	21
T2= basal diet +0.08% clove	R1 R2 R3	7 7 7	21
Total			63

3.4 Preparation of shed:

3.4.1 Housing and cleaning:

The poultry research shed's floor and all its broiler rearing cages were initially scrubbed down with bleaching powder and running tap water. The house was given a thorough cleaning and washing and allowed to dry for 4-5 days. All windows were left open while the clothes were drying to provide proper airflow. The chicken shed was disinfected using a 1:2 mixture of formaldehyde (CH2O) and potassium permanganate (KMNO4). All the cages were set up based on treatments without any bias to distribute the chicks uniformly. All the birds were housed in wire cages with paper bedding throughout their first two weeks of life. Cage dimensions were (3.5 ft. x 1.63 ft.) for every 7 birds. During the starter period, a separate drinker

Image 1.3 Housing of birds

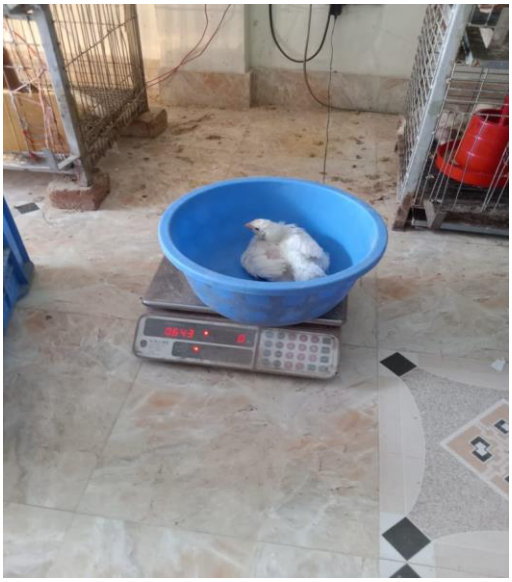

Image1.4 weighing of birds.

Was placed for the birds' water supply, along with a round feeder. After that, a feeding tray was provided in front of each cage for feed supply.

3.4.2 Sanitation:

During the period when the bird was being raised in the poultry research shed, every biosecurity protocol was rigorously followed. There was a footbath with potassium permanganate (KMNO4) at the shed's entrance. Regularly using soap and clean water, all drinkers and feeders were thoroughly cleaned before being used to provide water or food, respectively. The wastes were removed every day, and the exhaust fan was turned up for proper ventilation, as the bird's fecal contents produce more ammonia gas and smell.

3.5 Bird's management:

During the experimentation period, general rules for managing the rearing of birds were followed. The management is described in the following:

3.5.1 Brooding:

Newspaper that was clean, dry, and placed on the floor of the brooder cages functioned as safe bedding materials for proper brooding. On a daily basis, the paper sheet was constantly changed. The surrounding wall of the cages was covered with hardboard throughout that time of brooding. Every cage had a 60-watt bulb for appropriate lighting, and the chicks were brooded at temperatures of 95°F, 90°F, and 85°F for the first, second, and third weeks, respectively. The temperature of the room was measured using a room thermometer. After the brooding period the entire paper sheet and hardboard were removed.

3.5.2 Feeding:

As per layout of the experiment, only basal diet was given to the control group (T0). Clove powder was added at 0.04% and 0.08% ratio with the basal diet in treatment group T1 and T2 respectively. All the feed ration was made on DM basis. At the first two weeks, broiler starter ration and last three weeks, broiler finisher ration was provided to the birds sequentially. Birds were given ad libitum drinking water.

3.5.3 Vaccination:

Vaccines against infectious bursal disease and the Newcastle disease were administered to the birds during the trial. On the 5^{th} day of each bird, a single eye drop of the Newcastle disease vaccine (BCRDV) was administered, and a booster dose was given on the 20^{th} day. The infectious bursal disease vaccine (Gumboro) was then given on the 11^{th} day, and a booster shot was given in 16^{th} day.

Image 1.5 vaccination of bird

3.5.4 Diet of the experiment:

Starter and Grower, two separate rations were formulated carefully, and all the feed ingredients were purchased from the local market. After that, the feed ingredients were mixed and prepared for the ration in the laboratory. Previously grinded clove powder was added to the rations of the respective treatment groups. Basal diet's (Starter and Grower) proximate analysis was determined by the method described by the Association of Official Analytical Chemists (AOAC,2005). The ingredients and estimated chemical compositions of the basal diets are shown in Table.

Table 2. The ingredients compositions of the starter diets

	Starter Diet		
Ingredients	T0	T1	T2
Maize	53.3	53.3	53.3
Rice polish	3.5	3.5	3.45
Palm oil	4	4	4
Soybean meal	32.9	32.7	32.8
Fishmeal	3.25	3.45	3.35
Limestone	1.4	1.36	1.37
Dicalcium phosphate	0.45	0.45	0.45
Common salt	0.25	0.25	0.25
Vitamin-mineral premix	0.25	0.25	0.25
Toxin binder	0.1	0.1	0.1
Coccidiostat	0.1	0.1	0.1
Methionine	0.2	0.2	0.2
Lysine	0.2	0.2	0.2
Clove	**0**	**0.04**	**0.08**
Antioxidant	0.1	0.1	0.1
Total	100	100	100

Table 3. The ingredients compositions of the finisher diets

	Finisher diet		
Ingredients	T0	T1	T2
Maize	60	60.02	60.03
Rice polish	5.5	5.48	5.46
Palm oil	4	4	4
Neem leaf meal	0	0	
Soybean meal	22.7	22.65	22.6
Fishmeal	5.4	5.44	5.48
Limestone	1.02	1	0.97
Dicalcium phosphate	0.38	0.37	0.38
Common salt	0.25	0.25	0.25
Vitamin-mineral premix	0.25	0.25	0.25
Toxin binder	0.1	0.1	0.1
Coccidiostat	0.1	0.1	0.1
Methionine	0.1	0.1	0.1
Lysine	0.1	0.1	0.1
Antioxidant	0.1	0.1	0.1
Clove	**0**	**0.04**	**0.08**
Total	100	100	100

3.6 Data collection:

Throughout the entire experimental period, bird's feed intake and weight gain as well as FCR was noted every week. Weight gain was calculated by differentiation between the final body weight and initial body weight of the birds. As well as feed intake was calculated by deducting leftover feed from the total amounts of feed provided to the birds. FCR (Feed Conversation Ratio) was estimated through dividing feed intake by the weight gain of the birds.

Image 1.6 weighing of leftover feed

Image 1.7 Record keeping.

3.7 Carcass characteristics:

On the 35th day, two birds from each replication were taken and slaughtered according to protocol by severing the carotid artery and jugular vein. Every bird was scalded and had its feathers removed right away when it had sufficiently bled. After removing feather birds were eviscerated. The birds' heads and feet were then removed using the procedure outlined by Jones (1984). The dressed bird's weight was recorded. Additionally, the individual weights of the head, shank, breast, thigh, drumstick, heart, belly fat, liver, spleen, gizzard, and bursa were noted.

Image 1.8 slaughtering of birds

Image 1.9 proper bleeding

Image 1.10 cutting body parts

Image 1.11 weighing of body parts

3.8 Statistical analysis

The experiment was conducted using a completely randomized design (CRD) and the data were analyzed by one-way ANOVA using PROC GLM of SAS (SAS, 2014). The mean differences were compared using Duncan's Multiple Rang Test at 5% level of significance.

Chapter 4: Results

The findings of the dietary effect of clove powder on broiler growth (Body weight gain, FCR) performance, carcass characteristics are described in this chapter.

4.1 Body weight: The impact of feeding clove powder of broiler has great effect on growth performance. The body weight on different week among the three groups are shown in Table 4. The table shows that there is non-significant on initial weight ,1st week and 2nd week which means no effect on clove in body weight. At 3rd week it is significant means intake of clove increase body weight highest value in T1, lowest in T0, similarly at 4th week it is also significant, at 5th week also highest value in T1, lowest in T0 no difference in T1, T2.

Table 4. Effect of clove on body weight of broiler in different week

Parameter	Treatment			P value	Level of significance
	T0	T1	T2		
Initial body weight	44.1867	43.9167	44.2333	0.3680	NS
Body weight at 1st week	133.29	124.57	118.71	0.4850	NS
Body weight at 2nd week	289.01	306.67	306.12	0.6018	NS
Body weight at 3rd week	464.92^{b}	601.86^{a}	597.17^{a}	0.0327	*
Body weight at 4th week	800.92^{b}	1030.89^{a}	989.33^{a}	0.0248	*
Body weight at 5th week	1219.42^{b}	1483.83^{a}	1467.17^{a}	0.0041	**

[a,b,c] in a row with no shared superscripts deviate significantly ($p<0.05$). The data is presented as an average of three replicate groups of seven birds each. (n=21). * TO =Basal diet, T1 = Basal diet+0.04% clove powder, T2=Basal diet+0.08%** = Significant, NS = Not Significant.

4.2 Body weight gain:

Highly significant differences ($p<0.05$) in the weight gain of broilers in different treatment groups were observed in the entire trial period and presented in Table 5. It shows non-significant in first 2 weeks then at 3rd week it shows significant, the highest weight gain in T1 and lowest in control group though T1 and T2 show no difference. At 4th week the highest weight gain in T1 lowest in control group T0. At 5th week highest in T2 but T1 is less different and T0 is lowest as well.

Table 5. effect of clove on body weight gain of broiler

Parameter	Treatment			P value	Level of significance
	T0	T1	T2		
Body weight gain 1st week	12.729	11.521	10.640	0.4828	NS
Body weight gain at 2nd week	22.245	26.015	26.772	0.2415	NS
Body weight gain at 3rd week	25.130[b]	42.169[a]	41.578[a]	0.0085	**
Body weight gain at 4th week	48.000[b]	61.291[a]	56.024[ab]	0.0544	*
Body weight gain at 5th week	59.786[b]	64.706[ab]	69.929[a]	0.0385	*

[a,b,c] in a row with no shared superscripts deviate significantly ($p<0.05$). The data is presented as an average of three replicate groups of seven birds each. (n=21). * TO =Basal diet, T1 = Basal diet+0.04% clove powder, T2=Basal diet+0.08%** = Significant, NS = Not Significant.

4.3 Feed intake:

Significantly higher ($p<0.05$) weekly feed intake was found in broilers' entire experimental period. Though more feed intake was done by control group T0 whereas T1 group intake more than T2 except 1st and 5th week which is very low. So, we can say T1 intakes more feed than T2.

Table 6. Weekly feed intake of broiler chicken in different week of feeding experimental diet

Parameter	Treatment			P value	Level of significance
	T0	T1	T2		
Feed intake at 1st week	18.7075	17.1395	17.4218	0.2081	NS
Feed intake at 2nd week	46.102	45.854	40.112	0.3975	NS
Feed intake at 3rd week	71.207	67.629	64.251	0.7314	NS
Feed intake at 4th week	94.181	90.127	84.341	0.4942	NS
Feed intake at 5th week	112.274	100.697	103.495	0.0773	NS

[a,b,c] in a row with no shared superscripts deviate significantly ($p<0.05$). The data is presented as an average of three replicate groups of seven birds each. (n=21). * TO =Basal diet, T1 = Basal diet+0.04% clove powder, T2=Basal diet+0.08%** = Significant, NS = Not Significant.

4.4 FCR:

Feed conversion of broilers among different treatment groups differed significantly ($p<0.05$), represents in Table 7. In the 1st week, feed conversion ratio (FCR) was non-significant. From the 2nd week it shows significant, almost similar FCR in T1 and T2 group and T0 was higher than them.

Table 7. Weekly FCR (Feed conversion ratio) of broiler chicken in different week of feeding experimental diet.

Parameter	Treatment			P value	Level of significance
	T0	T1	T2		
FCR at 1st week	1.5154	1.4885	1.6713	0.6371	NS
FCR at 2nd week	2.0736[a]	1.7638[b]	1.5008[b]	0.0063	**
FCR at 3rd week	2.8371[a]	1.5996[b]	1.5771[b]	0.0012	***
FCR at 4th week	1.9643[a]	1.4722[b]	1.5039[b]	0.0061	**
FCR at 5th week	1.87819[a]	1.55635[b]	1.52295[b]	0.0042	**

[a,b,c] in a row with no shared superscripts deviate significantly ($p<0.05$). The data is presented as an average of three replicate groups of seven birds each. (n=21). * TO =Basal diet, T1 = Basal diet+0.04% clove powder, T2=Basal diet+0.08%** = Significant, NS = Not Significant.

4.5 Overall performance:

Table 8. shows the effect of clove powder on the overall growth performance of the broiler from day 1 to day 35 of the trial. The results revealed that the diets group had no significant differences in initial weight but significantly differed ($p<0.05$) in the final weight, weight gain, and feed conversion ratio among diet groups.

Table 8. overall growth performance of broiler chicken of feeding experimental diet.

Parameter	Treatment			P value	Level of significance
	T0	T1	T2		
Initial weight (g)	44.1867	43.9167	44.2800	0.2705	NS
Final weight (g)	1257.72^{b}	1483.83^{a}	1498.83^{a}	0.0130	*
Weight gain (g)	1213.54^{b}	1439.92^{a}	1454.55^{a}	0.0128	*
Feed intake (g)	2397.3	2250.1	2167.3	0.2357	NS
FCR	1.98017^{a}	1.56097^{b}	1.49338^{b}	0.0047	**

^{a,b,c} in a row with no shared superscripts deviate significantly ($p<0.05$). The data is presented as an average of three replicate groups of seven birds each. (n=21). * TO =Basal diet, T1 = Basal diet+0.04% clove powder, T2=Basal diet+0.08%** = Significant, NS = Not Significant.

4.6 Carcass characteristics of broiler:

In Table 9. Summarizes the differences in carcass characteristics across the experimental birds. The carcass parameters significantly differed ($p<0.05$) in terms of wing weight, liver weight and abdominal fat weight. Carcass weight, dress weight, bursa weight, thigh weight, liver weight are decreased in T2 from T1, whereas the other blood weight, wing weight, drumstick weight, shank weight, heart weight are little increase in T2.

Table 9. Carcass characteristics of broiler chicken of feeding experimental diet

Parameter	Treatment			P value	Level of significance
	T0	T1	T2		
Carcass wt	94.9178	95.0352	94.0600	0.3609	NS
Blood wt	5.0822	4.9648	5.9400	0.3609	NS
Dress wt	56.676	58.936	56.964	0.2363	NS
Wing wt	4.7096[b]	5.8424[a]	6.1446[a]	0.0146	*
Bursa wt	15.986	17.543	17.752	0.2983	NS
Thigh wt	0.23276	0.24456	0.16809	0.1083	NS
Drumstick wt	8.6281	9.3992	9.8858	0.2836	NS
Shank wt	8.1768	7.9088	8.4270	0.6268	NS
Liver wt	4.4691[b]	9.4927[a]	8.8047[a]	0.0002	***
Spleen wt	2.9843	2.7133	2.8330	0.7136	NS
Heart wt	3.2392	2.8164	3.0349	0.5116	NS
Head wt	0.14171	0.16477	0.14822	0.7455	NS
Neck wt	0.64908	0.58446	0.69948	0.4091	NS

Abdominal fat wt	3.0179[a]	2.2260[c]	2.6036[b]	0.0033	**

[a,b,c] in a row with no shared superscripts deviate significantly ($p<0.05$). The data is presented as an average of three replicate groups of seven birds each. (n=21). * TO =Basal diet, T1 = Basal diet+0.04% clove powder, T2=Basal diet+0.08%** = Significant, NS = Not Significant.

Chapter 5: Discussion

The inclusion of clove powder in broiler feeds had no negative impacts on body weight during the trial since no unexpected changes in behavior, motor activity or signs of intoxication were noticed during and post-treatment. As feed for chicken, natural therapeutic items made from plants, species, and their extracts have been employed (Hashemi and Davoodi, 2010; Khan et al., 2012). The findings demonstrated that broiler chicks fed clove extract levels quantitatively consumed more feed than the control group. Clove extract ($p<0.05$) enhanced feed intake and weight gain when compared to clove extract and the control treatment, respectively, in an experiment on the performance of broiler chicks up to 5 weeks old. Heba (2017) and Weerasing (2013) concur with this outcome. Clove extract usage did not significantly alter broilers' feed conversion (FCR) when compared to control groups; this finding was consistent with Heba's (2017) findings. The clove extract may have antibacterial properties Bestami (2009). This may increase feed intake, which in turn may increase weight gain and improve feed efficiency. Clove extract's ability to increase broiler performance is likely related to its antibacterial and antifungal properties. The beneficial effects of spices and herbs on food digestion may be due to this. By increasing nutrition absorption, body weight and the weight of other organs can both rise. Additionally, as was already indicated, utilizing clove extract increased feed intake. Broilers with clove extract had higher BW, FCR, and feed intake than broilers without any cloves Bestami(2009).

Chapter 6: Conclusion

The body weight gain and feed intake were increased when broiler chicken fed diet supplemented with clove powder. When compared to other groups, broiler fed diet supplemented with 0.04% clove powder had the superior FCR, overall body weight gain and carcass yield. Based on the results of this research, it can be concluded that clove powder can be added to broiler feed at a level of 0.04% to improve broiler performance.

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