EFFECTS OF GINGER AND BLACK PEPPER SUPPLEMENT ON THE GROWTH PERFORMANCE OF BROILERS

A Thesis

By

MD. MOSTAFIZUR RAHMAN

Registration No. 1405188

Semester: July-December, 2016

Session: 2015-16

MASTER OF SCIENCE (M.S.)

IN

PHYSIOLOGY

DEPARTMENT OF PHYSIOLOGY AND PHARMACOLOGY

HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY UNIVERSITY, DINAJPUR-5200

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Approved as to style and contents by

Dr. Rakibul Islam	**Dr. Fahima Binthe Aziz**
Supervisor	Co-supervisor

(Dr. Rakibul Islam)
Chairman, Examination Committee
And
Chairman
Department of Physiology& Pharmacology

DEPARTMENT OF PHYSIOLOGY AND PHARMACOLOGY

HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY UNIVERSITY, DINAJPUR-5200

DECEMBER, 2016

DEDICATED
TO MY
BELOVED PARENTS

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The Author
December, 2016

ABSTRACT

This study was conducted in the poultry shed at HSTU campus, Dinajpur under the Department of Physiology and Pharmacology from October to December, 2016 to determine the efficacy of ginger, black pepper and ginger-black pepper supplement as a growth promoter on the performance of broilers. Total forty number of cobb 500 day old broiler chicks were purchased from local market and were assigned into four groups named $T_{0,}$ $T_{1,}$ T_2 and T_3 where T_0 is control group and another three groups were supplemented with ginger, black pepper and ginger-black pepper @ 1g, 1g and (0.5+0.5)g =1g per kg feed of broiler ration respectively. At first, the birds were remain in observation for seven days as a quarantine period without treatment. Seven days interval, observations were recorded for live body weight, feed consumption, and feed efficacy of birds for five weeks. The initial body weight of groups $T_{0,}$ $T_{1,}$ T_2 and T_3 on 7^{th} day of this experiment were 175±8.54g, 178±7.95g, 174±7.90g and 177±7.95g and after 35^{th} day of experiment final body weight were 2.21±0.08kg, 2.51±0.04kg, 2.36±0.04kg and 2.52±0.04kg which recorded significantly ($p<0.01$) higher means for live body weight than that of control T_0 (2.21±0.08kg) group. All the treatment groups were show significant increase in body weight compared to that of control group. Carcass body weight and blood performance also determined at 35^{th} day of the experiment but there is no significant difference. It is concluded that broiler produced by using ginger and black pepper supplement can be profitable and suitable for human consumption as natural growth promoter. Further study may be more significant if get a favorable environment and proper facilities.

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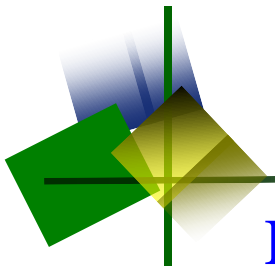
LIST OF ABBREVIATIONS

B.wt.	:	Body weight
BAU	:	Bangladesh Agricultural University
Conc	:	Concentration
cu mm	:	Cubic millimeter
d.w	:	Drinking water
ESR	:	Erythrocytes Sedimentation Rate
et al.	:	Associates
Fig.	:	Figure
GBP	:	Ginger and Black Pepper
Ml	:	Gram
Hb	:	Hemoglobin
i.e.	:	That is
J.	:	Journal
Kg	:	Kilogram
Lit	:	Litre
Ltd	:	Limited
Mg	:	Milligram.
gm	:	Gram
mm3	:	Cubic millimeter
No	:	Number
PBS	:	Phosphate buffer solution
PCV	:	Packed Cell Volume
PM	:	Population Mean
SE	:	Standard Error
SM	:	Sample Mean
TEC	:	Total Erythrocyte Count
Vol.	:	Volume
Pg	:	Picogram
%	:	Percent
&	:	And
@	:	At the rate of
<	:	Less than
>	:	Greater than
$\pm$	:	Plus minus
$0^{o}C$	:	Degree centigrade



CHAPTER I

INTRODUCTION

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INTRODUCTION

Bangladesh is highly populated country and growth of population is increasing very fast in comparison to its land size, as a result huge pressure is created on people's basic need. Our national economy mainly depends on agriculture. Livestock plays an important role as the back-bone of agriculture. Poultry play important role in the national economy. Demand of protein of this vast population is a great threat for us. There are so many sources of protein but it is not possible to fulfill the demand without broiler. Because the duration of broiler rearing is very short and within 30-35 days it is ready for marketing and suitable for human consumption. It also brings very short time return to farmer. The meats of broiler are nutritious, tasty and contain less fat. It has no harmful effect on health and there is no religious restriction to consume. This factor favors producing poultry in Bangladesh (Anwarul *et al.* 2006).

The poultry production systems have led to marked increase in the production of poultry meat and eggs throughout the world (Armstrong, 1986). It has triggered the discovery and widespread use of a number of feed additive. The term 'feed additive' is applied in a broad sense, to all products other than those commonly called feedstuffs, which could be added to the ration with the purpose of obtaining some special effects (Feltwell and Fox, 1979) . The main objective of adding feed additive is to boost animal performance by increasing their growth rate, better-feed conversion efficacy, greater livability and lowered mortality in poultry birds. These feed additives are termed as growth promoters and often called as non-nutrient feed additives (Shigh and Panda, 1992). Many synthetic drugs and growth promoters are supplemented to the broilers to promote the rapid growth, but their use have shown many disadvantages like high cost, adverse side effect on health of broiler and long residual properties etc. Growth promoters are chemical and biological substances, which are added to broiler feed with the aim to improve the growth of broiler in fattening, improve the utilization of feed and in this way realize better production and financial results. Positive effect can be expressed through better appetite, improved feed conversion (Arfeen *et al.* 1995).

According to our socio-economic situation, the knowledge of our farmer is very little because most of them are not properly trained for broilers production but unemployed

young generation is coming in this business for short term return. Pharmaceutical companies take this advantage. They are convincing farmers for using antibiotics as a growth promoter of the broiler. As a result, each and every broiler is a depot of antibiotics. When these broilers are consumed by human this antibiotic residue enters into human body and may cause serious human health hazards with drug residues (Kibria *et al.* 2009).

The efficacy of ginger is purported to be a result of its aromatic, carminative and absorbent properties (Govindarajan, 1982 a, b). Ginger is a widely used spice and functional food. The main constituents of ginger include volatile oil (β-bisabolene, cineol, phellandrene, citral, borned, citronellol, linalool, limonene, zingeberol, zingeberene, camphene), oleoresin (gingerol, shogoal), phenol (gingerol and gingerone), proteolytic enzymes (zingibain), vitamin B6, vitamin C and calcium, magnesium, phosphorus, potassium, linoleic acid (Kikuzaki *et al.* 1993). Also the pungency and aroma of ginger are because of the gingerol and volatile oil respectively (Kikuzaki *et al.* 1994). A recent study (Egwurugwu *et al.* 2007) observed that ginger had both prophylactic and therapeutic properties. Ginger powder 1g daily alleviated clinical nausea of diverse causes including postoperative nausea (Arfeen *et al.* 1995).

The active ingredients found in zinger (Curcuma longa) are curamine, demethoxy curcumin, bisdemethoxy curcumine, (Wuthi-Udomler *et al.* 2000) and tetrahydro curcuminoids (Osawa *et al.* 1995). Curcumine is the main important bioactive ingredient responsible for the biological activity of curcuma. Curcuma has been shown to have several biological effects, exhibiting anti-inflammatory (Holt *et al.* 2005), antioxidant (Iqbal *et al.* 2003) and hypolipidaemic (Ramirez-Tortosa *et al.* 1999) activities. Curcumin has also been studied extensively as a chemopreventive agent in several cancers (Duvoix *et al.* 2005). Additionally it has been suggested that curcumin possess hepatoprotective, antitumor, antiviral and anticancer activity (Polasa *et al.* 1991). It is used in gastrointestinal and respiratory disorders (Anwarul *et al.* 2006). The significant biological properties of ginger powder make it a potential substitute for in feed antibiotics in livestock diets. A number of studies have been conducted to evaluate the effect of ginger on the growth performance of broiler chickens. There is growing interest in developing natural alternatives to antibiotic growth promoters in order to maintain both bird's performance and health. In the last decade, ginger has been extensively used in poultry diets. Wide range medicinal properties of this plant have been advocated. In

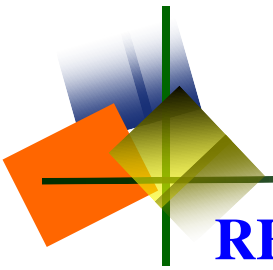
poultry feed, ginger has been extensively used in different concentrations, dosages and durations.

Medicinal plants compete with the synthetic drugs. Majority of medicinal plants do not have the residual effects (Tipu *et al.* 2006). As the world is becoming more advanced, new diseases are emerging in animals and human beings by irrational use of antibiotics and antimicrobial growth promoters. Now it is the need of the time to work more extensively on the medicinal plants in the greater interest of mankind. The significant biological properties of black pepper powder make it a potential substitute for in feed antibiotics in livestock diets. A number of studies have been conducted to evaluate its effects on the performance of broiler chickens, laying hens and rabbits. There is growing interest in developing natural alternatives to antibiotic growth promoters in order to maintain both birds' performance and health. In the last decade, black pepper has been extensively used in poultry diets. Black pepper is a natural herb of the ginger family, *Zingiberaceae*. Wide range medicinal properties of this plant have been advocated. In poultry feed, black pepper has been extensively used in different concentrations, dosages and durations.

Dried ground pepper has been used since antiquity for both its flavor and as a medicine. Black pepper is the world's most traded spice. It is one of the most common spices added to our diets.

The general objective is to see the effect of ginger and black pepper on growth and biood performance of broiler. Considering the present situation of poultry production, the work has been carried out with following objectives:

1) To evaluate the growth performance of broiler by using ginger and black pepper.
2) To determine the blood constituents of the broiler by using ginger and black pepper.
3) To determine a valid and cost effective use of ginger and black pepper for the farmers.



CHAPTER II

REVIEW OF LITERATURE

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REVIEW OF LITERATURE

The purpose of this chapter is to provide a selective review of the research works accomplished in relation to the present study. Literature on growth performance of broilers supplemented ginger and black pepper related to this study has been reviewed under the following headings.

Ginger:

Ginger is a herb but is often known as a spice, with a strong distinct flavor that can increase the production of saliva. It is used in many countries as a medicinal ingredient. Some say it can help cure diabetes, headaches, cold, fatigue and nausea. The health benefit of honey and ginger in treating respiratory problems. The ginger plant is approximately 30 – 60 cm tall and is extremely rare to find in the wild.

Taxonomic classification of ginger:

Zingiber officinale (Roscoe) classification are as given bellow:

Kingdom: *Plantae*

Phylum: *Magnoliophyta*

Class: *Liliopsida*

Order: *Zingiberaceae*

Genus*: Zinger Mill*

Species: *Zingiber officinale*

Chemical constituents of ginger:

Zingiber officinale is a perennial plant, commonly known as ginger. Ginger may act as a pronutrients because of the vast active ingredients it has been reported to contain. Herbs Hands Healing (2011) reported that ginger contains some chemical constituents which are given below-

- Gingerols: Responsible for taste.

- Zingiberene: Responsible for scent.
- Zingibain: Has an antibacterial and anti-inflammatory activity.
- Vitamin E:Acts as an antioxidant which helps to neutralize free radicals.
- Ascorbic acid.
- Caffeic acid.
- Capsaicin.
- Beta-sitosterol.
- Beta-carotene.
- Curcumin.
- Lecithin.
- Limonene.

Chemical and bioactive properties of fresh and dried ginger:

Chairat puengphian *et al.(*2008) conducted the study on 6-gingerol content and bioactive properties of ginger extracts reported the following data.

Chemical and bioactive properties	Materials	
	Fresh ginger	**Dried ginger**
Mosture content (%)	94.17± 0.16[a]	11.54± o.29[b]
[6]- gingerol content (mg/g dry weight basis)	21.15±0.13[a]	18.81± 0.15[b]
Total phenolic content (mg gallic acid/g extract	24.63± 0.43[b]	59.40± 0.14[a]
EC_{50} (µg/ml)	64.60± 18[a]	32.95± 1.32[b]
ABTS assay (µ molTrolox/g extract)	169.06± 3.96[b]	403.71± 7.24[a]

a,b means ± standard deviation in the same row with different letters is significantly different ($P \leq 0.05$) Efficient Concentration; The amount sample (µg) needed for 50% decreasing in the initial DPPH concentration per 1.0 ml of initial solution.

Medicinal properties of ginger:

- antiemetic/antinausea
- anticlotting agent
- antispasmodic
- antifungal
- anti-inflammatory
- antiseptic

- antibacterial
- antiviral
- antitussive
- circulatory stimulant
- carminative
- expectorant
- increases blood flow

Ginger helps in growth performance of broilers:

W.B. Zomraw *et al.* (2012) conducted a study using one hundred and twenty eight unsexed day old broiler chicks (Ross 308) 32 birds/treatment with four replicates was conducted to evaluate the effect of ginger root powder as natural feed additives on growth performance, blood and serum constituents of broiler chickens. Four dietary treatments were formulated to meet the nutrient requirements of broiler chick containing ginger root powder at levels 0%, 0.5%, 1% and 1.5%. Result showed that significant decreased ($P<0.05$) were observed in feed intake and weight gain for birds fed 0.5% ginger root powder. There were no significant differences ($P>0.05$) in feed conversion ratio among all dietary treatments. Treatments had significant decreased ($P<0.05$) in pre-slaughter weight for birds fed 0.5% ginger root powder. No significant differences ($P>0.05$) were observed in dressing percentage. There were no significant effect ($P>0.05$) on serum glucose, total protein and creatinine. Significant differences were observed in serum triglyceride and cholesterol levels. There were no significant differences ($P>0.05$) among all dietary treatments in Hb percentage, PCV percentage, TRBcs, MCV, MCH and MCHC percentage. The results showed that the inclusion of ginger root powder at levels 0.5% and 1% in the diet, had lowering effect on cholesterol levels, and the chick may tolerate up to 1.5% without adverse effect on growth performance and blood parameters.

Arkan, B. Mohamed *et al.* (2012) carried out a study to explore the usage of different levels of ginger at concentration of 0.1 and 0.2% respectively supplemented to diets on the performance and blood serum traits of the broiler chickens. 180 (ROSS) 3 weeks old broiler chicks raised to 6 weeks of age. The birds were distributed into 3 treatment groups with three replicates per treatment (20 birds per replicate + 10 females). Ginger was supplemented at the rate 0.1 and 0.2% in the diets to treatments T2 and T3

respectively while treatment one served as control. The result of performance parameter showed significant difference between treatments. However body weight, weight gain, FCR and feed intake showed a significant differences ($p<0.05$) between T2 (0.1% ginger) and T3 (0.2% ginger) and control. The total protein didn't differ significantly between the treatment groups. Serum cholesterol, triglyceride and glucose level was a significantly lower in the 0.1 and 0.2% of ginger ($p<0.05$) than control. Findings of the research study indicated that groups receiving ginger at the rate of 0.1 and 0.2% of the diets showed better performance and serum profiles in broiler.

M. Arshad *et al.*(2012) conducted a study to explore the economic and immunological impact of ginger (*Z. officinale*) in commercial broiler chicks. One hundred and sixty (160) day old broiler chicks were divided into four groups A,B,C and D; having 40 chicks in each group. Each group was further replicated four times with 10 chicks per replicate. Ginger extract @ 30, 40 and 50 ml/liter of drinking water was given to groups A, B and C respectively. Group D was kept as control. Data on body weight gain, feed intake and economics were recorded for each replicate of the respective groups. It was observed out that treatment groups gained significantly ($P<0.05$) higher body weight than control group. Significant ($P<0.05$) difference was noticed in mean feed intake in group B and C. Mean antibody titer against IBD was higher for group B and C. Whereas Mean anti body titer against ND was higher for group C. Mean feed cost per chick was not affected by any group. Gross return was significantly ($P<0.05$) better in all the treatment groups as compared to control group D. It was concluded that use of ginger extract had significantly improved the immunity and over all improves body weight.

F. E. Dieumou *et al.* (2009) conducted an experiment to evaluate the effect of ginger and garlic essential oils on some blood parameters, growth performance and gut microbial population of broiler chickens. Forty two male and female day old chicks of A*rbour acres* line were arranged in a fractional factorial experiment of an unbalanced completely randomised design and allotted to three treatments given by stomach tube except for the control in three doses 0 (Control),10mg/kg/day, 20mg/kg/day, and 40mg/kg/day. The trial lasted for seven weeks and there were no differences in feed intake, body weight gain and the feed conversion ratio among the birds. All organ weights and carcass characteristics were not affected by the treatments, except for a decrease ($P< 0.05$) in relative liver weight of birds on garlic oil treatment compared with those given ginger oil and control. Similarly, a lower ($P< 0.001$) proportion of the head

weight of birds given essential oils was observed compared to the control. Dosages effects showed a decrease in relative weight of organs only for the head ($P<0.001$) and the gizzard ($P<0.05$) compared to the control. Male broilers deposited less ($P<0.001$) than the females. There were no significant differences observed in the activities of the serum transaminases (AST & ALT) and blood creatinine level, indicating that none of the three dosages of essential oils given to birds was toxic. However, *Escherichia coli*, and other Enterobacteria counts in the ileo-cæcaldigesta numerically decreased ($P<0.05$) compared to the control as the doses of essential oils given increased.

Beneficial effects of ginger on nausea and vomiting of pregnant women:

Ozgoli *et al.* (2009) reported that ginger has antiemetic and anxiolytic activities. Shogoal and gingerol from ginger may stimulate the flow of saliva, bile, and gastric secretions. Ginger was also found to suppress gastric contractions and improve intestinal muscle tone and peristalsis. Constituents in ginger may interact with 5HT-3 receptors and may be partially responsible for its antiemetic (antinausea) benefits. A recent single blind clinical trial study of 67 pregnant women showed that twice administration of 250 mg of ginger daily for four days could subside the incidents of vomiting.

Willetts *et al.* (2003) reported that its effects on nausea and vomiting during pregnancy are as good as vitamin B6. However, a study in Thailand of 138 women shows that there is no significant difference between ginger and vitamin B6 for the treatment of nausea and vomiting during pregnancy.

Ginger may benefit people at risk of cardiovascular diseases:

Verma *et al.* (2004) reported that ginger was found to inhibit 50% of a distinct development of atheroma in the aorta and coronary arteries of rabbits in a study. There was also distinct decrease in lipid peroxidation and enhancement of fibrinolytic activity in ginger treated animals. Authors suggested the protection was probably because of its free radical scavenging, prostaglandin inhibitory properties.

Akhani *et al.* (2004) reported that treatment with *Z. officinale* also caused a decrease in serum cholesterol, serum triglyceride and blood pressure in diabetic rats. The data suggest a potential antidiabetic activity of the juice of *Z. officinale* in type I diabetic rats, possibly involving 5-HT receptors stated by Akhani, S.P. *et al.* (2004).

Ginger has more than 50 antioxidants:

Jagetia *et al.* (2004) reported that ginger root extract was shown to have antioxidant activities in a cell study. It may contain more 50 antioxidants. In one study, ginger rhizome (*Zingiber officinale*) was found to protect mice against radiation-induced lethality. The irradiation of animals resulted in a dose-dependent elevation in the lipid peroxidation. However, treatment of mice with ginger rhizome before irradiation caused a significant depletion in lipid peroxidation.

Anti-bacterial properties of ginger:

Jagetia *et al.* (2003) reported that ginger root extract was demonstrated to have a dose-dependent antimicrobial activity against *Pseudomonas aeruginosa, Salmonella typhimurium, Escherichia coli* and *Candida albican*s.

Mahady *et al.* (2003) reported that a methanol ginger root extract containing gingerols inhibited the growth of all helicobacter pylori strains. In another in vitro study, ginger root extracts containing the gingerols inhibited the growth of H. *pylori* Cag A+ strains.

Ginger may promote gastric intestinal motility:

Yamahara *et al.* (1990) reported that intake of ginger root (Zingiberis Rhizome) was found to enhance the transport of a charcoal meal in a study of mice.

Black Pepper:

Black pepper (*Piper nigrum*) is a flowering vine in the family Piperaceae, cultivated for its fruit, which is usually dried and used as a spice and seasoning. The fruit, known as a peppercorn when dried, is approximately 5 millimetres (0.20 in) in diameter, dark red when fully mature, and, like all drupes, contains a single seed. Peppercorns, and the powdered pepper derived from grinding them, may be described simply as pepper, or more precisely as Black pepper (cooked and dried unripe fruit), green pepper (dried unripe fruit) and white pepper (dried ripe seeds).

Taxonomic classification of black pepper:

Kingdom: *Planta*

Division: *Manoliophyta*

Class: *Magnoliopsida*

Order: *Piperales*

Family: *Piperaceae*

Genus*: Piper*

Species: *P.nigrum*

Nutritious Value of Black Pepper

See the table below for in depth analysis of nutrients: Black peppers (*Piper nigrum*), Nutritional value per 100 g. (Source: USDA National Nutrient data base)		
Principle	**Nutrient Value**	**Percentage of RDA**
Energy	255 Kcal	13%
Carbohydrates	64.81 g	49%
Protein	10.95 g	19.5%
Total Fat	3.26 g	11%
Cholesterol	0 mg	0%
Dietary Fiber	26.5 g	69%
Vitamins		
Choline	11.3 mg	2%
Folic acid	10 mcg	2.5%
Niacin	1.142 mg	7%
Pyridoxine	0.340 mg	26%
Riboflavin	0.240 mg	18%
Thiamin	0.109 mg	9%
Vitamin A	299 IU	10%
Vitamin C	21 mg	35%
Vitamin E-γ	4.56 mg	30%
Vitamin K	163.7 mcg	136%
Electrolytes		
Sodium	44 mg	3%
Potassium	1259 mg	27%
Minerals		
Calcium	437 mg	44%
Copper	1.127 mg	122%
Iron	28.86 mg	360%
Magnesium	194 mg	48.5%
Manganese	5.625 mg	244.5%
Phosphorus	173 mg	25%
Zinc	1.42 mg	13%
Phyto-nutrients		
Carotene-β	156 mcg	--
Carotene-α	0 mcg	--
Crypto-xanthin-β	48 mcg	--
Lutein-zeaxanthin	205 mcg	--
Lycopene	6 mcg	--

Herbal properties of black pepper

Alzoreky and Nakahara, (2003) reported that Buffered methanol (80% methanol and 20% PBS) and acetone extracts of edible plants of 26 species including black pepper screened for their antibacterial activity against *Bacillus cereus*, *Staphylococcus aureus*, *Listeria monocytogenes*, *Escherichia coli* and *Salmonella infantis* by the disc assay showed that the MIC of extracts determined by the agar dilution method ranged from 165 to 2640 mg/ml. *B. cereus* was the most sensitive microorganism to extract from *Cinnamomum cassia*, *Azadirachta indica*, *Rutagraveolens*, *Rumexnervosus*, *Thymus serpyllum* and *Zingiber officinale* with MIC of 165 to 660 mg/ml. The inhibitory activity against *E. coli* and *S. infantis* was produced only by *Cinnamomum cassia* extract at the highest MIC of 2640 mg/ml.

Kalemba *et al*. (2003) found that alcoholic extracts of black pepper were most effective against *Helicobacter pylori*, in reducing its growth.

Lee and Ahn, (1998) reported that the C. cassia bark-derived cinnamaldehyde, when tested using 1 or 0.5 mg/disks, revealed potent inhibition against *Clostridium perfringens* and *Bacteroidesfrgilis*. The growth of *Bifidobacterium bifidum* was significantly inhibited at the dose of 1 and 0.5 mg/disk, whereas weak or no inhibitory activity was obtained against *Bifidobacteriumlongum* or *Lactobacillus acidophilus*. In contrast, tetracycline and chloramphenicol showed an inhibitory effect against all test bacteria at doses as low as mg/disk.

Mau *et al.* (2001) conducted a study on the antibacterial activity of extracts of chive (*Allium tuberosum*), black pepper and cornifructus (*Cornus officinalis*) against common food borne microorganisms, alone and in combination, showed that the mixed extract, consisting of three extracts in equal volumes possessed an antimicrobial spectrum and had excellent stability to heat, pH and storage on growth of *E. coli* at 2-5 mg/ml. The mixed extract also inhibited the growth of *Pichiamembranae faciens* at 2 mg/ml. When the mixed extract was used in foods, an expected antimicrobial effect in organic juice, pork and milk was observed. Overall, the mixed extracts have promising potential for incorporation into various food products for which a natural antimicrobial additive is desired. *H. pylori* are associated with the pathogenesis of gastritis, duodenal ulcer and gastric lymphoma. The black pepper extract, at a concentration of 80 mg/day as a single

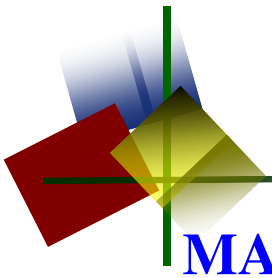
agent, was found ineffective in eradicating *H. pylori* infections in an experiment carried out in human subjects (*in-vivo*).

Nir *et al.,* (2000) reported a combination of black pepper with other antimicrobials, or Black pepper extract at a higher concentration, may prove useful. The black pepper extract was well tolerated and side effects were minimal.

Shah *et al.* (1998) reported acute (24 hour) and a chronic (90 days) oral toxicity studies on an ethanol extract of black pepper in mice at the dose rate of 0.5, 1.0 or 3 g/kg for acute and 100 mg/kg/day for chronic studies showed that the extracts caused no significant acute or chronic mortality compared to the control during the study.

Antioxidant properties of black pepper

Middleton and Kandaswami, (**1993**) Studied oxygen is one of the most important element for life, growth and metabolism of living organisms. Auto oxidation process results in the destruction of important molecules in diet formulations and also damages cellular tissues in living organisms. Therefore, auto oxidation results in the formation of reactive oxygen species and causes different kinds of diseases. Black pepper has antioxidant characteristics. Black pepper extracts show antioxidant activity which is comparable to synthetic antioxidants.



CHAPTER III

MATERIALS AND METHODS

CHAPTER III

MATERIALS AND METHODS

The experiments were conducted for a period from 31 October 2016 to 04 December in the poultry shed at HSTU campus, under the Physiology and Pharmacology Department, Basherhat, Dinajpur. To complete the research work following steps were followed.

3.1 Collection and management of chickens

Day old chicks (Cobb-500) marketed by CP Bangladesh Ltd. were purchased from local market for this experiment. The experiment was carried in the poultry shed at HSTU campus, Basherhat, Dinajpur. Day old broiler chicks were (forty in number) brought in the experimental shed. The body weight of all selected chicken ranged from 28 gm to 30 gm. Then the broiler chicks were managed carefully. Immediately after unloading from the chicks boxes the chicks were given Vitamin-C and glucose to prevent the stress occurring during transport. The chickens were allowed to take rest for seven days for the adaptation. The broiler chicks were kept in the same compartment for seven days and brooding temperature were correctly maintained. The litter management was also done very carefully. The starter and finisher rations were supplied to the broiler chicken ginger and black pepper were selected for effectiveness as growth promoter of broilers. Mature and disease free black pepper were collected from Baserhat. Ginger was purchased from Basherhat, Dinajpur. It was identified with the help of Botanists. All management of the bird such as feeding, drinking, housing, biosecurity were provided during experimental period.

Figure 1: Day old Chicks

3.2 Dietary treatment

After seven days of acclimatization all the forty chicks were randomly divided into four equal groups (T_0, T_1, T_2 and T_3) for assessing the efficacy of ginger and black pepper as growth promoter on broilers.

Chicks of group 'T_0': were kept as control and were not treated.

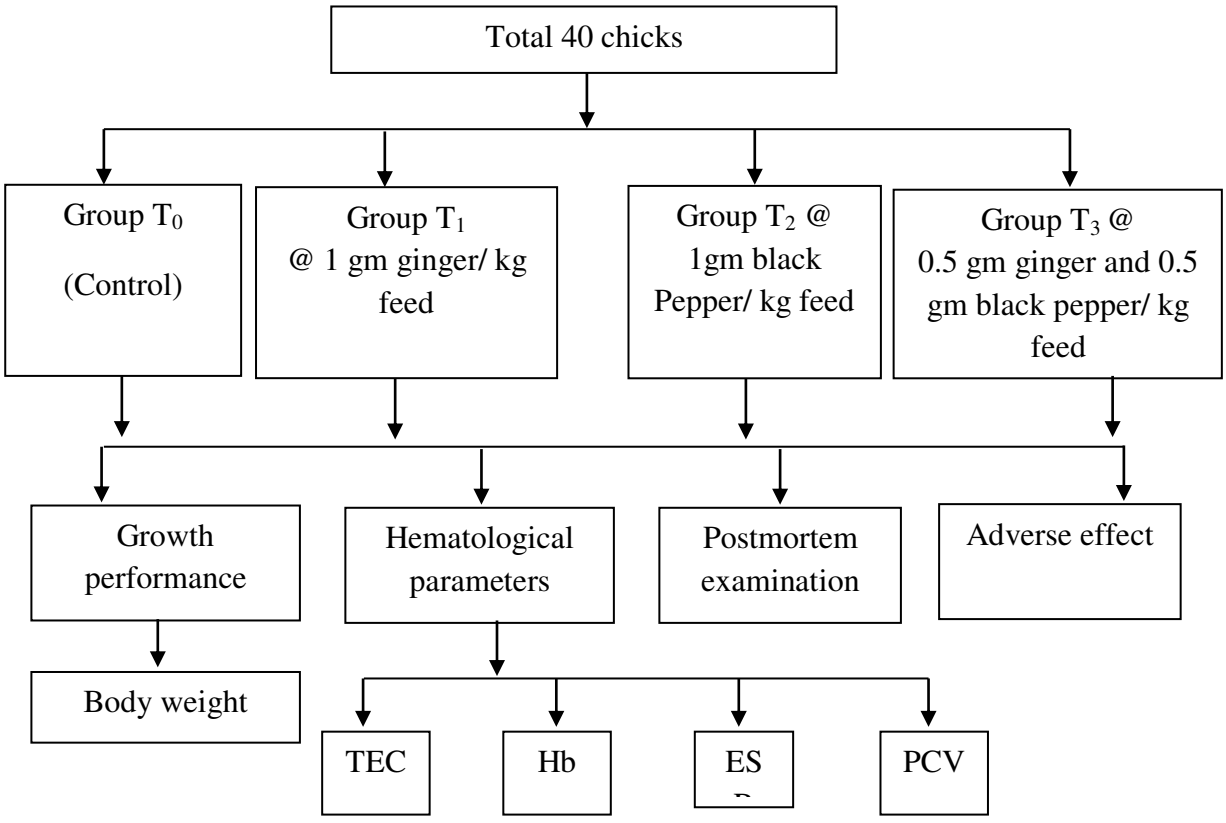
Chicks of group 'T_1': were treated with black pepper supplement @ 1gm/kg added in feed.

Chicks of group 'T_2': were treated with ginger supplement @ 1 gm/kg added in supplied feed.

Chicks of group'T_3': were treated with ginger and black pepper combinely @ 1 gm per kg feed.

All the chicks of treated and control groups were closely observed for thirty five days after treatment and following parameters were studied.

Experimental Layout



Layout of the experiment

3.3 Preparation of experimental supplement

Ginger and black pepper were collected to produce the experimental supplement that were used in broiler ration to promote the growth of broiler. The preparation of ginger and black pepper are as given below:

3.3.1 Preparation of ginger supplement

At first ginger were weighted from electric balance and then thoroughly washed in tap water. The ginger were cut into small pieces with the help of knife, thereafter the fleshy parts were grinded with the help of pestle and mortar. Then grinded portion was dried in sun for two days to loss moisture. After that all the grinded portion of ginger was stored in the air tight container to use it as a feed supplement.

Figure 2: Picture of ginger.

Figure 3: Grinding of ginger.

3.3.2 Preparation of black pepper supplement

For the preparation of dust, the black pepper were dried in sun for 10 days and followed by oven at 55-60°C for 2 days. The dried Black pepper was pulverized with a blender to obtain the fine dust, after then dust was preserved in airtight plastic container until they were directly used for feed supplement.

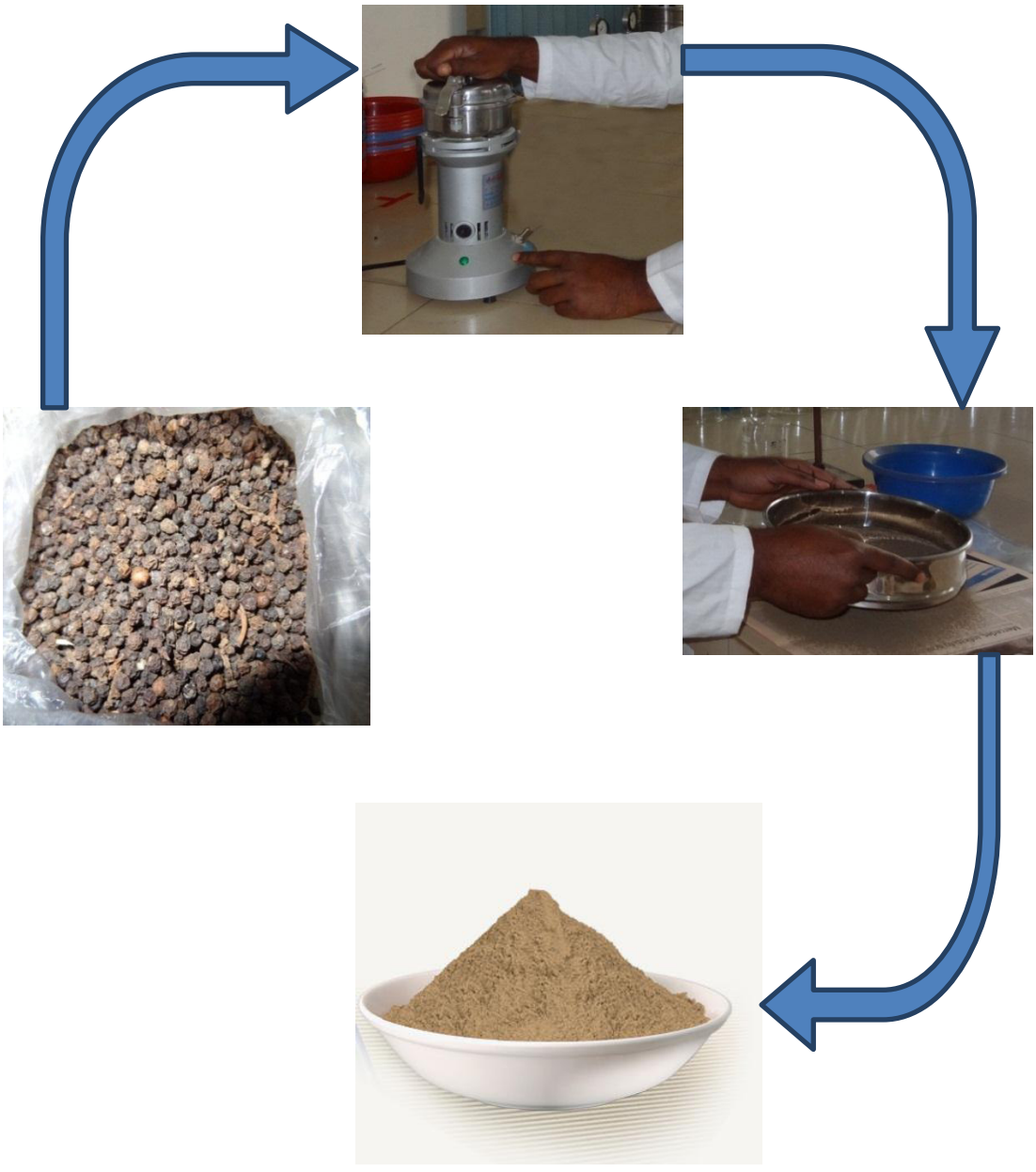


Figure 4: Preparation of black pepper supplement

3.3.3 Preparation of ginger and black pepper supplement

For the preparation of ginger and black pepper supplement, firstly the black pepper were dried in sun for 10 days and followed by oven at 55-60°C for 2 days. The dried black pepper was pulverized with a blender to obtain the fine dust then the ginger's were dried in sun for 10 days and followed by oven at 55-60°C for 2 days. The dried gingers were pulverized with a blender to obtain the fine dust. Finally mixed them to get a combine mixture.

3.4 Preparation of the experimental house and equipments:

An open sided house was partitioned into twelve pens of equal size by using expanded wire net, wood, rod and bamboo materials. A service area was running along the middle of the pens. It was brushed, swiped properly and cleaned with tap water. After washing with clean water, the pens were disinfected by using chlorine solution (500ppm). The room was left vacant for 14 days. Later, it was again disinfected with finis solution (1gm/liter) left to dry up properly. During this time all the feeders, waters and other necessary equipment were properly cleaned, washed and disinfected with finis solution and dried before use.

3.5 Experimental diets:

The commercial broiler starter and prestarter diets manufactured by power poultry feed Ltd. was purchased from the local agent in Dinajpur.

Composition of the diets/100 kg:

Ingredient	**Amount**
Maize	57 kg
Soybean Meal	20 kg
Rice Polish	17 kg
Soybean oil	1 kg
Di Calcium Phosphate (DCP)	800 gm
Limestone	800 gm
Lysine	100 gm
Methionine	70 gm
Toxin Binder	200 gm
Autozyme	100 gm
Vitamin Mineral Premix	1.53 kg
Meat and Bone Meal	1 kg
Salt	300 gm

3.6 Growth performance:

i) The effect of the ginger supplement on body weight gain, feed consumption and feed efficiency of broiler was recorded before and during administration of treatment.
ii) Chickens under treatment and control groups were weighed with electric weighing machine. The weight of each chicken was taken weekly. The average of these weights was calculated and recorded.

Mean live weight gain of each group of chickens on 7^{th}, 14^{th}, 21^{th}, 28^{th} and 35^{th} days were recorded respectively.

3.7 Hematological parameters:

Blood samples were collected from wing vein of chicken of both control and treated groups at 35^{th} days to study the effect of the ginger and black pepper extract and the following parameters were observed:

(a) Total Erythrocyte Count (TEC)
(b) Hemoglobin Estimation (Hb)
(c) Packed Cell Volume (PCV)
(d) Erythrocyte Sedimentation Rate (ESR)

Determination of Total Erythrocyte Count (TEC):

Total erythrocyte count was done following the method described by Lamberg and Rothstein (1977). Well-mixed blood sample was drawn with red blood cell diluting pipette exactly up to 0.5 marks of the pipette. Outside of the tip of the pipette was wiped with cotton. Then the pipette was immediately filled with the red cell diluting fluid (Hayem's solution) up to 101 marks. The free end of the pipette was wrapped around with the rubber tube stretching to both the ends and held with thumb and middle finger. The content of the pipette was mixed thoroughly by shaking with 8-knot motion for 3-5 minutes. Then the counting chamber was placed with special cover glass under microscope using low power (10 x) objectives. After discarding 2 or 3 drops of fluid from the pipette, a small drop was placed to the edge of the cover glass on the counting chamber as the entire area under the cover glass was filled by the fluid. One-minute time was spared to allow the cells to settle on the chamber under the cover glass. Taking 5

larger squares (4 in the 4 corners and the central one) of the central large square, the cells were counted from all the 80 small squares (16 x 5) under high power objectives (45 x). After completion of counting, the total number of RBC was calculated as number of cells counted x 10, 000 and the result was expressed in million/µl of blood.

Determination of Hemoglobin Concentrations (Hb):

The N/10 hydrochloric acid (HCl) was taken in a graduated tube up to 2 marks with the help of a dropper. Well-homogenized blood sample was then drawn into the Sahli pipette up to 20 cm. mark. The tip of the pipette was wiped with sterile cotton and the blood of the pipette was immediately transferred into the graduated tube containing hydrochloric acid. This blood and acid were thoroughly mixed by stirring with a glass stirrer. There was a formation of acid hematin mixture in the tube by hemolysing red blood cells by the action of HCl. The tube containing acid hematin mixture was kept standing in the comparator for 5 minutes. After that distilled water was added drop by drop. The solution was mixed well with a glass stirrer until the color of the mixture resembled to the standard color of the comparator. The result was read in daylight by observing the height of the liquid in the tube considering the lower meniscus of the liquid column. The result was then expressed in g %. The above procedure was matched by the Helligehemometer method as described by Lamberg and Rothstein (1977).

Determination of Packed Cell Volume (PCV):

The citrated well mixed blood sample was drawn into special loading pipette (Wintrobe pipette). The tip of the pipette was inserted up to the bottom of a clean, dry Wintrobe hematocrit tube. Then the Wintrobe tube was filled from the bottom by pressing the rubber bulb of the pipette. As blood came out, the pipette was slowly withdrawn but pressure was continued on the rubber bulb of the pipette so as to exclude air bubbles. The tip of the pipette was tried to keep under the rising column of blood to avoid foaming and the tube was filled exactly to the 10 cm mark. Then the Wintrobe hematocrit tube was placed in the centrifuge machine and was centrifuged for 30 minutes at 3000 rpm. Then the hematocrit or PCV was recorded by reading the graduation mark; the percent volume occupied by the hematocrit was calculated by using the following formula as described by Lamberg and Rothstein (1977).

$$PCV\% = \frac{\text{Height of the red cell volume in cm}}{\text{Height of total blood in cm}} \times 100$$

Determination of Erythrocyte Sedimentation Rate (ESR):

The fresh anticoagulant blood was taken into the wintrobe hematocrit tube by using special loading pipette exactly up to 0 marks. Excess blood above the mark was wiped away by sterile cotton. The filled tube was placed vertically undisturbed on the wooden rack for one hour. After one hour the ESR was recorded from the top of the pipette. The result was expressed in mm/in 1st hour.

3.8 Postmortem examinations:

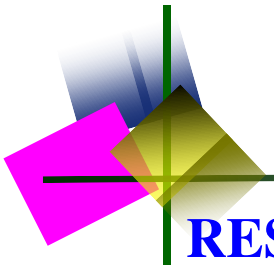
However, at the end of the experiment (i.e. after 35^{th} day) postmortem examinations were carried out but there was no significant change in any organ of the broiler..

3.9 Adverse effect:

There was no mortality in experimental birds during the experimental period and there is not found any side effect on the broiler health.

3.10 Statistical analysis:

The birds were assigned to different experimental groups under Completely Randomized Design (CRD). The data were analyzed by the Statistical Package for Social Science (SPSS) program. The data were considered as significant at 1% level of significance and expressed as the mean ± SEM with factorial arrangement of time and treatments (Steel and Torrie, 1986).



CHAPTER IV

RESULTS AND DISCUSSION

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RESULTS AND DISCUSSSION

This experiment was conducted to study the efficacy of ginger and black pepper as a growth promoter in broiler chicken. This experiment was held in poultry shed at HSTU campus at Basherhat, Dinajpur, under the department of physiology and pharmacology. The results are described based on the following headings:

4.1 Growth performance of broiler by using ginger and black pepper

Seven days interval, observations were recorded for live body weight, feed consumption, and feed efficacy of birds for five weeks. The initial body weight of groups T_0, T_1, T_2 and T_3 on 7th day of this experiment were 175±8.54g, 178±7.95g, 174±7.90g and 177±7.95g and after 35th day of experiment final body weight were 2217±0.08g, 2511±0.04g, 2364±0.04g and 2519±0.04g which recorded significantly ($p<0.01$) higher means for live body weight than that of control T_0 (2.217±0.08) group. All the treatment groups showed significant increase in body weight compared to that of control group. The net body weight gain were 2.217±0.08 kg, 2.511±0.03 kg, 2.364±0.04 kg and 2.519±0.04 kg in T_0, T_1, T_2 and T_3 group (Table 1). So, broilers of group T_1 supplemented with ginger and Group T_3 supplemented with ginger and black pepper combine got the maximum weight ($p<0.01$) followed by group T_2 (supplemented with black pepper), among all of the experimental groups, the control group (group T_0) got the lowest body weight. These findings regarding on body weight has very close agreements with the study of Manwar *et al.* (2005) who performed a research on supplementation of ginger and black pepper powder @ 1 gm per kg feed and reported significant increase in the live body weight of broilers in the treated groups when compared to control group respectively. Carcass body weight also determined at 35th day of the experiment but there is no significant difference in dressing percentage (Table 2) which was similar to the study of W. B. Zomraw *et al.* (2012) who performed a research on the effect of ginger root powder supplementation on broiler chicks performance.

Feed efficiency in group T_0, T_1, T_2, and T_3 were 1.66, 1.55, 1.60 and 1.55 that means for producing 100g body weight, 166g , 155g, 160g and 155g of feed consumed by birds of group T_0, T_1, T_2, and T_3, where T_1, ginger treated group were more significant than other groups. Supplementation of ginger in the treatment caused improvement in the feed

efficiency as compared to that of black pepper treated group. Similarly, Nagalakshmi *et al.* (1996) reported increase in feed efficiency in ginger fed groups, which is in agreement with the findings of the present study.

4.2 Blood performance of broilers by using ginger and black pepper

Observation of hematological parameters (RBC, Hb, PCV and ESR) on 35^{th} day did not show any significant difference ($P<0.05$) among the control (T_0), ginger treated group (T_1) and black pepper treated group (T_2) which is similar with W. B. Zomraw *et. al.* (2012) who performed a research on the effect of ginger root powder supplementation on broiler chicks performance, blood and serum constituents. (Table 3).

4.3 Economics of production

The average rearing cost of broiler kept under different treatment groups as (T_0), (T_1), (T_2) and (T_3) were 231.4 Tk. 238.50 Tk. 243.60 Tk. and 232.24 Tk. respectively (Table 4). Miscellaneous cost summed up Tk. 20 per broiler, which included the estimated cost of electricity and litter disinfectant. The average live weight of broilers in group (T_0), (T_1), (T_2) and (T_3) were 2.21 kg, 2.51 kg, 2.36 kg and 2.52 kg respectively. The broiler was sold in live weight basis at the rate of Tk. 120/kg. The net profit/Kg live weight in the respective group was found taka 15.29, taka 24.98, taka 16.77 and 27.84 taka respectively.

Table 01. Initial and final live weight, weight gain, feed consumption and feed efficiency of broilers @ 1 g black pepper and l g ginger supplement from 1st to 35th day of age.

Variables	Control	Treatment Groups		
	T_0 (n=10) Mean±SE	T_1 (n=10) Mean±SE	T_2 (n=10) Mean±SE	T_3 (n=10) Mean±SE
Initial live weight (g) on 7th day	175±8.54	178±7.95^{NS}	174±7.90^{NS}	177±7.95
Final live weight (g) on 35th day	2217±0.08	2511±0.04*	2364±0.04**	2519 ±0.04*
Weight gain (g)	2042±8.46	2333±7.91*	2190±86**	2342±7.91*
Feed consumption (g)	3700	3910	3800	3920
Feed efficiency	1.67	1.56	1.61	1.56

The above values represent the mean ± standard error (SE) of the initial and final live weight, weight gain, feed consumption and feed efficiency of broiler chickens of different groups (n = 10).

**=Significant at 1% level ($p<0.01$)

*=Significant at 5% level ($p<0.05$)

NS= Non significant

Table 02. Dressing percentages, relative weights of heart, gizzard, liver, spleen and pancreas of broilers on 35th day in control and treatment groups.

Variables	Control	Treatment Groups		
	T_0 (n=10) Mean±SE	T_1 (n=10) Mean±SE	T_2 (n=10) Mean±SE	T_3 (n=10) Mean±SE
Carcass Weight	1.4±0.02	1.615±0.04 ^{NS}	1.50±0.02 ^{NS}	1.625±0.04^{NS}
Relative heart weight	17.00±1.08	19.50±1.04 *	19.50±1.04 ^{NS}	20.10±1.04^{NS}
Relative gizzard weight	45.00±1.87	46.50±1.47**	46.25±0.8 ^{NS}	47.25±0.8^{NS}
Relative liver weight	65.25±1.70	67.50±3.24*	66.50±2.19 ^{NS}	68.50±2.19^{NS}
Relative spleen weight	0.12±0.01	0.12±0.01 ^{NS}	0.12±0.04 ^{NS}	0.15±0.04^{NS}
Relative pancreas weight	0.28±0.02	0.29±0.02*	0.29±0.03 ^{NS}	0.31±0.03^{NS}

The above values represent the mean ± standard error (SE) of dressing percentages, relative weights of heart, gizzard, liver spleen and pancreas of broiler chickens of different groups (n = 10).

**=Significant at 1% level ($p<0.01$)

*=Significant at 5% level ($p<0.05$)

NS= Non significant

Relative weight (%) = $\frac{\text{Weight of organ}}{\text{Live body weight of bird}}$ X 100

Table 03. Hematological parameters of broiler.

Days of post treatment	Treatment		Mean ± SE	Significance value
35th day	RBC million/ mm^3	Control	288.70±13.87	NS
		Black pepper	345.66±12.11	
		Ginger	346.67±12.12	
		Ginger and Black pepper	346.99±0.08	
	Hb (gm%)	Control	7.50±0.27	NS
		Black pepper	7.82±0.19	
		Ginger	7.85±0.2	
		Ginger and Black pepper	7.89±0.2	
	PCV (%)	Control	17.50±0.61	NS
		Black pepper	21.30±0.33	
		Ginger	21.38±0.34	
		Ginger and Black pepper	21.42±0.2	
	ESR (mm in 1st hour)	Control	4.00±0.60	NS
		Black pepper	3.95±1.00	
		Ginger	3.90±1.01	
		Ginger and Black pepper	3.85±0.2	

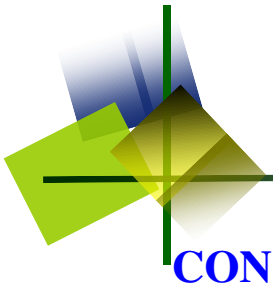
The above values represent the mean ± standard error (SE) of hematological parameters of broiler chickens of different groups (n = 10).

NS= Non significant

Table 04. Data showing economics of broiler production among control group (T_0), treatment groups (T_1) , (T_2) and (T_3) from 1 day-old to 35 days-old of age.

Description	Group T_0 (Control)	Group T_1 Ginger	Group T_2 (Black pepper)	Group T_3 (Ginger + Black pepper)
Cost/DOC (Taka	56	56	56	56
Average feed consumed (Kg)/broiler	3.70	3.75	3.80	3.72
Feed price/Kg (Taka)	42	42	42	42
Cost of zinger and black pepper as growth promoters (Taka)	0.00	5	8	12
Feed cost (Taka.)	155.4	157.5	159.6	156.24
Miscellaneous (Taka)	20	20	20	20
Total cost/broiler (Taka)	231.4	238.5	243.6	232.24
Average live weight (Kg)	2.21	2.51	2.36	2.52
Sale price/Kg live wt. (Taka.)	120	120	120	120
Sale price/broiler (Taka)	265.20	301.20	283.20	302.40
Net profit/broiler (Taka.)	33.80	62.70	39.60	70.16
Profit/Kg live weight (Taka)	15.29	24.98	16.77	27.84

Supplementation with ginger was found to be more profitable than the control (T_0) and treatment group (T_2) of broiler rearing. The results of the present study are in live with the findings of Hernandez *et al.* (2004), who reported that dietary inclusion of tulsi and ginger @ 0.5% in the rations were more beneficial in broilers production.



CHAPTER V

CONCLUSION AND RECOMMENDATION

CHAPTER V

CONCLUSION AND RECOMMENDATION

In this experiment, black pepper and ginger were studied in terms of growth promoter on broilers. The experiment was conducted in the poultry shed at HSTU, Basherhat, Dinajpur, under the physiology and pharmacology department. Forty number of day old chicks were equally divided into four groups (n=10) to carry out this research work.

Keeping one group as normal control group (T_0) and other three groups (T_1), (T_2) and (T_3) was subjected to treatment with ginger and black pepper respectively. The group of (T_1) and (T_2) was supplemented with ginger and black pepper @ 1 gm/kg feed and group (T_3) was supplemented with 0.5 gm ginger and 0.5 gm black pepper combine and the group of (T_0) was provided with the fresh water and feed. Seven days interval observations were recorded in live body weight for 35 days and blood parameters of birds at 35^{th} day. The treatment group (T_1) and (T_3) recorded statistically significant ($p<0.01$) increase for live body weight than that of treatment group (T_2) and control group (T_0). Net live weight gain was increased in ginger treated group (2.51±0.04kg) than black pepper treated group (2.36±0.04kg) and control group (2.21±0.08kg) and profit/ Kg live broiler was Tk. 24.98 in ginger treated group, in black pepper treated group was Tk. 16.77 and control group was Tk. 15.29, ginger and black pepper combine treated group was Tk. 27.84.

This research work shows that continuous treatment with ginger produced a significant ($p<0.01$) increase in live body weight but there is no significant ($p<0.05$) change on blood parameters. It can be concluded that ginger and black pepper may be used as growth promoter but ginger is more effective and economic in broiler production. Further study is necessary to evaluate the biochemical test to investigate any adverse effect in future.

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