EFFECTS OF GARLIC AND BLACK PEPPER EXTRACT ON BROILERS PRODUCTION

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A Thesis

By

N M M HOSSAIN
Registration No. 1305109
Semester: July-December, 2014
Session: 2013-14

MASTER OF SCIENCE (M.S.)
IN
PHARMACOLOGY

DEPARTMENT OF PHYSIOLOGY AND PHARMACOLOGY

HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY UNIVERSITY, DINAJPUR-5200

DECEMBER, 2014

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Submitted to the
Department of Physiology & Pharmacology
Hajee Mohammad Danesh Science and Technology University, Dinajpur,
In Partial fulfillment of the requirements
For the degree of

MASTER OF SCIENCE (M. S.)
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DECEMBER, 2014

DEDICATED
TO
MY BELOVED PARENTS
AND
TEACHERS

ACKNOWLEDGEMENT

*All praises are due to the Almighty **Allah**, who kindly enables the author to complete the present research work successfully and to submit the thesis leading to Master of Science (MS) degree in Pharmacology.*

*The author expresses his profound indebtedness and sincere gratitude to his respected teacher and research supervisor, **Dr. Fahima Binthe Aziz**, Assistant professor, Department of Physiology and Pharmacology, Hajee Mohammad Danesh Science and Technology University, Dinajpur for her scholastic direction, valuable suggestions and constructive criticism, encouragement and kind cooperation in carrying out this research work and writing up of the thesis.*

*The author is also highly obliged and expressing his gratification and sincere appreciation to his respected co-supervisor **Dr. Md. Mahmudul Hasan,** Lecturer, Department of Physiology and Pharmacology, Hajee Mohammad Danesh Science and Technology University, Dinajpur for his valuable suggestions, encouragement and kind cooperation during the entire period of study and preparing the thesis.*

*The author owes arrears of gratitude to **Dr. Md. Bazlar Rashid,** Assistant professor & Chairman, Dept. of Physiology & Pharmacology, Hajee Mohammad Danesh Science and Technology University, Dinajpur and my friends Jahurul, Wasim Akram, Masud and Akter for their kind collaboration, encouragement and valuable suggestions to complete the thesis work.*

The author would also like to thank his co-workers for their encouraging attitude, kind help and all-out support in the entire period of the research work.

The author would like to offer his thanks to all office stuffs of Department of Physiology and Pharmacology, Hajee Mohammad Danesh Science and Technology University, Dinajpur, for their co-operation and encouragement during the study period.

The author is ever indebted to his beloved parent for their endless sacrifices, heartiest blessings and support throughout his entire life. The author is also grateful to his brothers, cousins and other relatives and neighbors for their heartiest blessings, sacrifice and encouragement throughout the entire period of her academic life.

And lastly the author would like to express his thanks and gratitude to all those, whose names could not be mentioned, but have extended their co-operation and help during his research work.

The Author
December, 2014

Abstract

This study was conducted to determine the efficacy of garlic, black pepper and GBP extract as a growth promoter on the performance of broilers. The sixty DOC (Day old chicks)were divided into four groups, A, B, C and D which were supplemented with garlic, black pepper and GBP extract @ 1ml, 1ml and 2ml of broiler ration, respectively. Weekly observations were recorded for live body weight, weekly gain in weight, weekly feed consumption, and feed efficiency and blood parameters of birds for six weeks. All the treatment groups B (1.7±0.062*), C (1.6±58.02*) and D (1.7±63.04**) recorded significantly ($p<0.01$) higher means for live body weight than that of control A (1.640±58.02) group. All the treatment groups showed non-significant increase in weekly gain in weight, feed consumption and feed efficiency as compared to that of control group. In Bangladesh broilers production is mainly performed by non-technical farmers. The broiler production demand is very high because it supports short return of money but major problem is cost maintenance. The initial body weight of group (A), (B), (C) and (D) on 7th of this experiment were 144±7.30gm, 145±7.30gm, 140±7.30gm and 141±7.30gm respectively and after 42nd day of experiment final body weight were 1600±58.02gm, 1700±63.04**gm, 1640±58.02gm and 1730±63.04*gm respectively. The net body weight gain were 1.6±58.02gm, 1.7±63.04**gm, 1.64±58.02gm and 1.73±63.04*gm respectively and economics of production were analyzed and found that net profit per broiler was 38Tk, 45.4Tk, 40.96Tk and 51.16Tk respectively. It is concluded that broiler produced by using herbal extract may be profitable and suitable for human consumption.

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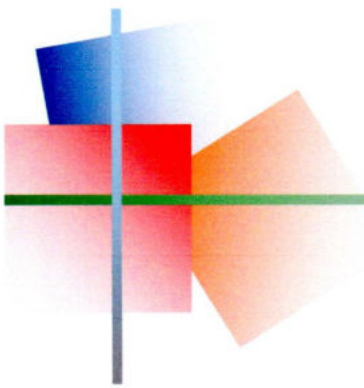
LIST OF ABBREVIATIONS

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	:	Garlic and Black Pepper
ml	:	Gram
Hb	:	Hemoglobin
i.e.	:	That is
J.	:	Journal
kg	:	Kilogram
lit	:	Litre
Ltd	:	Limited
mg	:	Milligram.
ml	:	Milliliter
mm3	:	Cubic millimeter
No	:	Number
PBS	:	Phosphate buffer solution
PCV	:	Packed Cell Volume
PM	:	Population Mean
SE	:	Standard Error

LIST OF ABBREVIATIONS (CONTD.)

SM	:	Sample Mean
TEC	:	Total Erythrocyte Count
Vol.	:	Volume
pg	:	Microgram
%	:	Per cent
&	:	And
@	:	At the rate of
<	:	Less than
>	:	Greater than
±	:	Plus minus
$0^{o}C$	:	Degree centigrade



CHAPTER 1

INTRODUCTION

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INTRODUCTION

The population growth rate gradually increasing in the world, but do not increasing landing capacity and proper sources of food. The protein is playing an important role for human health. To fill up the protein deficiency for big population in the world the contribution of poultry is mark able. 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 "growth promoters". 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 herbal plants is to boost animal performance by increasing their growth rate, better-feed conversion efficiency, greater livability and lowered mortality in poultry birds. These herbal plants are termed as "growth promoters" and often called as non-nutrient feed additives (Singh and Panda, 1992). Many synthetic drugs and growth promoters are supplemented to the broilers to effect rapid growth, but their use have shown many disadvantages like high cost, adverse side effect on health of birds and long residual properties etc. Growth promoters are chemical and biological substances, which are added to livestock food with the aim to improve the growth of chickens in fattening, improve the utilization of food and in this way realize better production and financial results. Their mechanism of action varies. Positive effect can be expressed through better appetite, improved feed conversion, stimulation of the immune system and increased vitality, regulation of the intestinal micro-flora, etc. In any case, expected results of the use of these additives are increased financial effects of production. Because of the fact that growth promoters have different mechanisms of action, it is necessary to present every group individually and present the effect, which can be expected with their utilization. With the development and wide use of synthetic and semi-synthetic antibiotics, pros and cons have been experienced throughout the last 50 years, which have been directed research back to natural antimicrobial products as indispensable resources. Consequently there is considerable research interest in the possible use of natural products, such as essential oils and extracts of edible and medicinal plants, herbs and spices, for the development of new additives in animal feeding.

The Garlic (*Allium sativum*) from the family Meliaceae (Von Maydell, 1986) contains azadirachtin- a biologically active compound found in its seeds, bark and leaves (Wikipedia, 2007; Makeri *et al.*, 2007) which is responsible for its varied medicinal uses (Schmutterer, (1990. But it is known to induce some toxic effects (Wikipedia, 2007). Garlic preparations fed to laying hens have been reported by Sadre *et al.,* (1984) and Gowda *et al.*, (1998) to significantly reduce the content of hemoglobin, erythrocyte count and packed cell volume. Despite these findings, there is a dearth of information on the possible hematological effects of Garlic (Allium sativum) aqueous extract in chickens of Northeastern, Nigeria. This investigation was therefore, designed to study the hematological effects of Garlic (*Allium sativum*) aqueous extract in chicken, with a view to establishing its safety. Plants are the oldest friends of mankind. They not only provide food and shelter but also serve humanity by preventing and curing different ailments. Herbs and spices have always been helpful to cure diseases. In modern animal feeding, they are forgotten because of use of antimicrobial growth promoters (AGP). But due to the prohibition of most of AGP, plant extracts have gained interest in animal feed strategies (Charis, 2000). The risk of the presence of antibiotic residues in milk and meat and their harmful effects on human health has led to their prohibition for use in animal feed in the European Union. Many plants also produce secondary metabolites such as phenolic compounds, essential oils and sarasaponins (Chesson *et al.*, 1982; Wallace *et al.*, 1994; Kamel, 2001). Herbs normally used are picorhiza, garlic, cloves, slippery elm, Garlic fruit and leaves, sophora flavescens, Nutmeg, cinnamon, ginger, peppermint, sage, thyme, mustard and fenugreek. These plants are used as digestive stimulants, antidiarrhoic, antiseptic, antiinflammatory, antiparasitic and appetite stimulants inhuman beings as well as animals. It is conceivable that herbal agents could serve as safer alternatives as growth promoters due to their suitability and preference, lower cost of production, reduced risks toxicity and minimum health hazards. Interestingly recent biological Trials of certain herbal formulations in India as growth have shown encouraging results and some of the reports have demonstrated improvement with respect to weight gain, feed efficiency, lowered mortality, increased immunity and increased livability in poultry birds (Kumar, 1991). Also these herbal growth promoters have shown to exert therapeutic effects against liver damage due to feed contaminants like aflatoxin (Ghosh, 1992). Garlic (*Allium sativum*) dry leaves extract as medical herbs could be beneficial in immunosuppressant diseases of poultry.

Garlic (Allium sativum) extract has immunostimulant effect that activates the cell mediated immune response and therefore, creates an enhanced response to any future challenges occurred by disease organisms. So, the feeding Garlic (Allium sativum) to immunosuppressed birds increase their humoral and cell mediate immune responses (Sadekar *et al.,* 1998). Garlic (Allium sativum) contain a vast array of hemically diverse and iologically active ingredients (Devakumar and Suktt, 1993). Low dose of Garlic (Allium sativum) extract have an inhibitory action on wide spectrum of microorganisms Talwar *et al.,* 1997) and immuomodulator actions that induce cellular immune reaction (Devakumar and Suktt, 1993). Also, Craig (1999) stated that several herbs could help providing some protection against bacteria and stimulate the immune system.

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.

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). Black pepper is native to South East Asia and China, and is extensively cultivated there and elsewhere in tropical regions. Currently Vietnam is the world's largest producer and exporter of pepper, producing 34% of the world's *Piper nigrum* crop as of 2008.

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 European cuisine and its descendants. The spiciness of Black pepper is due to the

chemical piperine. It is ubiquitous in the industrialized world, often paired with table salt.

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.

Objectives:

Considering the present situation, the work has been carried out with the following objective:

(i) To evaluate performance of broilers with garlic and Black Pepper extract.

(ii) To evaluate the effects of garlic and Black Pepper extract on growth performance and on the blood parameters of the broilers.

(iii) To develop a cost effective herbal tonic on the growth performance of broiler.

CHAPTER 2

REVIEW OF LITERATURE

CHAPTER 2

REVIEW OF LITERATURE

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*, *Ruta graveolens*, *Rumex nervosus*, *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 *Bacteroides frgilis*. 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 *Bifidobacterium longum* 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 corni fructus (*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 *Pichia membranaefaciens* 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.

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	--

Garlic, Broilers and Growth promoters:

1. Ansari, 2008 was conducted to determine the comparative efficacy of six medicinal plants including *Nigella sativa, Boerhavia diffusa, Withania somnifera, Ipomea digitata, Allium sativum and Corylus avellena* @ 4 g/kg of feed as growth promoter and their subsequent influence on the performance of broilers. 210-day-old chicks were randomly divided into 21 experimental units of 10 chicks each. These experimental units were randomly allotted to 7 treatments comprising of 3 replicates each. Commercially formulated broiler starter and finisher rations were offered *ad libitum* from 0-4 and 4-6 weeks of age. Authenticated samples of the plant materials were dried in shade, pulverized and mixed each @ 4g kg-1 of feed and offered to the chicks of the respective treatment groups. Maximum gain in weight was observed with the *Withania somnifera* (1.819 kg) followed by *Nigella sativa* (1.805 kg) and Allium sativum (1.800 kg). The best cumulative FCR at the end of 6th week of age was for that of *Withania somnifera* (2.038) followed by *Nigella sativa* (2.054) and Allium sativum (2.083). The lowest results as regards FCR were recorded for *Ipomea digitata* (2.394) and *Boerhavia diffusa* (2.396). The results of the *Corylus avellena* (2.209) and control (2.235) were statistically similar. The maximum profit per bird was obtained from Allium sativum treated birds followed by *Nigella sativa* and *Withania somnifera* treated chickens as compared to control. It was concluded from this study that medicinal plants especially *Withania somnifera, Nigella sativa* and Allium sativum can be used as growth promoters in the poultry diets with better production performance.

2. Biu, 2009 showed that The haematological effect of aqueous extract ofAllium sativum administration intraperitoneally to chickens for 18 days with graded doses of 500, 1000 and 2000 mg/kg body weight was evaluated. Twenty (20) chickens weighing between 400 and 725 grams divided into four groups of five birds each were used. There was a significant decrease ($p<0.05$) in the mean packed cell volume (PCV%) and hemoglobin concentration (Hb) which were dose dependent, while the mean white blood cell count (WBC) did not alter significantly ($p>0.05$). The mean differential counts of the extract-exposed chickens indicated that the mean values for monocytes, basophils and eosinophils increased significantly ($p<0.05$) with increasing dose, while mean values for lymphocytes and heterophils decreased significantly ($p<0.05$). The significance of these findings is discussed.

3. Dorababu, 2006 showed that standardized aqueous extract o fGarlic (Allium sativum) leaves (AIE) has been reported to show both ulcer protective and ulcer healing effects in normal as well as in diabetic rats. To study the mechanism of its ulcer protective/healing actions, effects of AIE (500 mg/ kg) was studied on various parameters of offensive acid-pepsin secretion in 4 hr pylorus ligation, pentagastrin (PENTA, 5 micro g/kg/hr)-stimulated acid secretion and gastric mucosal proton pump activity and defensive mucin secretion including life span of gastric mucosal cells in rats. AIE was found to inhibit acid-pepsin secretion in 4 hr pylorus ligated rats. Continuous infusion of PENTA significantly increased the acid secretion after 30 to 180 min or in the total 3 hr acid secretion in rat stomach perfusate while, AIE pretreatment significantly decreased them. AIE inhibited the rat gastric mucosal proton pump activity and the effect was comparable with that of omeprazole (OMZ). Further, AIE did not show any effect on mucin secretion though it enhanced life span of mucosal cells as evidenced by a decrease in cell shedding in the gastric juice. Thus, our present data suggest that the ulcer protective activity of AIE may be due to its anti-secretary and proton pump inhibitory activity rather than on defensive mucin secretion. Further, acute as well as sub acute toxicity studies have indicated no mortality with 2.5 g/kg dose of AIE in mice and no significant alterations in body or tissues weight, food and water intake, haematological profile and various liver and kidney function tests in rats when treated for 28 days with 1 g/kg dose of AIE.

4. Hudha, 2010 studied that A total of 96 straight run day old (cobb 500) broilers were fed *ad libitum* on a starter (crumble) containing 13.23 MJ ME/kg, 245g CP/kg, 40g CF/kg (max), 12g Ca/kg, 7.5g available phosphorus/kg, 6.5g methionine (max)/kg, 14g cystine/kg, 50g fat/kg, 140g moisture (max)/kg from day old to 14 days of age and thereafter on a grower (pellet) containing 13.33 MJ ME/kg and 240g CP/kg, 40g CF (max)/kg, 12g Ca/kg and 7.5g available phosphorus/kg, 6g methionine (max)/kg, 14g cystine/kg, 50g fat/kg, 110g moisture (max)/kg up to 35 days of age. They were provided with 0, 0.05, 0.10, and 0.15% acetic acid (AA) in drinking water to observe the effect of AA on growth and meat yield. Body weight and feed intake were higher ($p<0.05$) on 0.15% AA level than that on control, 0.05 and 0.10% AA level. However, Feed conversion was lower on 0.15% AA than those on 0, 0.05 and 0.10% AA. Feed cost /broiler significantly increased ($p<0.01$) with increasing AA levels. Increased cost for producing each kg broiler on 0.15% AA than that on other levels perhaps indicates that AA level should be below 0.15% to optimize economic performance. Dressing yield was

increased with increasing AA levels ($p<0.05$). Drumstick meat was higher ($p<0.01$) on 0.05% AA than those on other levels. Proportion of thigh meat and feather did not vary among 0, 0.05 and 0.15% AA but significantly varied on 0.10% level. On the other hands no significance differences ($p>0.05$) observed in breast, dark, breast: dark, wing meat, abdominal fat, skin, liver, heart, gizzard, spleen, head, neck, wing bone, thigh bone, and blood weight by using different level of AA. It can be concluded that supplementation of AA in drinking water might improve growth; feed conversion and meat yield of broilers.

5. Halim, 2003 studied that combination (1:1) of water extract of dried extract of root and leaves (200 mg/kg body wt) of A. augusta and A. indica respectively was administered orally to alloxan diabetic rats once a day for 8 weeks. This treatment caused significant lowering of blood sugar in fasted as estimated by glucose tolerance test. The treatment resulted in a significant reduction in serum lipids. Aqueous extract also decreased the formation of lipid peroxides estimated as thiobarbituric acid reactive substance, (TBARS), and increased antioxidants (superoxide dismutase, catalase, glutathione peroxidase and glutathione transferase) in erythrocytes. There was reduction in LPO as TBARS in heart, liver, kidney, and muscles. It also prevented decrease in body weight. Present study showed that Abroma augusta roots and A. indica leaves when given together as water extract had hypoglycaemic action and had better effect than given alone.

6. Habib, 2005 showed that a research work of herbal medicine viz. Garlic (Allium sativum) extract (*Azadirachta indica*), nayantara leaf extract (*Catharanthus roseus)* and bitter melon fruit (*Momordica charantia*) juice with the patent drug gliclazide (Comprid®, Square Pharmaceuticals Bangladesh Ltd.) were studied on blood glucose level, hematological parameters and on body weight in rats. Twenty-five apparently healthy adult rats were randomly divided into 5 equal groups namely A, B, C, D and E. One group (group A) was kept as control. The rest four groups (B, C, D and E) of rats were treated with gliclazide (Comprid®) @ 4.5 mg/kg bd. wt./day, Garlic (Allium sativum) extract (NLE) @ 500 mg/kg bd. wt/day, nayantara leave extract (NtLE) @ 500mg/kg bd. wt./day and bitter melon fruit juice @ 500 mg/kg b. wt./day respectively for 14 consecutive days. Blood glucose levels were significantly ($P<0.01$) reduced in all treated four groups of rats (39.78-44.31%) in comparison to their pre-treatment values. Total erythrocyte count (TEC), total leukocyte count (TLC) and differential leukocyte count (DLC) were not changed significantly in any treated group (B, C, D & E). Eosinophil and monocytes and hemoglobin contents were decreased significantly

($P<0.01$) in all groups. Among the herbal drugs used in the study bitter melon fruit juice was more effective (7.45%) in increasing the body weight in comparison with other herbal preparations i.e. NtLE (7.4%) and NLE (4.86%). From the present study, it may be further revealed that although the patent drug gliclazide was found to be highly effective, as blood glucose lowering agent, but the efficacy of three Different combined form of herbal preparations was also seemed to be encouraging.

7. Lavinia, 2009 studied that essential oils from aromatic plants have an antimicrobial activity against many bacterial pathogens [13]. We have conducted an in vivo experiment to study the effect of some aromatic plants and in particular to investigate the effect of oils extracted from these plants at the immune level and duodenal morphology. During the experiment 90 chicken broilers were divided in three experimental groups: control group (C), group 1 (G1) and group 2 (G2). The chicken broilers from group G1 had received feed with 0.05% incorporated oils extracted from savory (Satureja hortenis), mint (Mentha piperita) and sea-buckthorn (Hippophae rhamnoides). Group G2 received a premix of plants (savory, mint and sea-buckthorn) during daily feeding. The control group (C) received normal feed with no supplements. The amount of lysozyme detected at group G1 was doubled (28.55 mcg/cm3) compared to G2 (13.2 mcg/cm3) and the control (11.42 mcg/cm3). The incorporation of extracted oils in food resulted in a powerful stimulation of intestinal mucous membrane, manifested by development of intestinal villi, the hypertrophy of villi, hyperplasic hypertrophy of capillary network and the stimulation of leukocytes infiltration. The muscular hypertrophic processes and leukocyte infiltration are visible in the endomesium and perimesium of the muscular tunic. Microscopical images of the G2 group taken from the duodenum sections suggest the stimulation of angiogenesis. The processes are however of smaller intensity in the G1 group. This work shows that essential oils extracted from plants improve the immune response and also are able to cause changes of the duodenal mucosa with beneficial effects for the animal.

8. Mahmood, 2009 studied that The present work was aimed at knowing the effect of various levels of garlic (*Allium sativum*) and kalongi (*Nigella sativa*) as herbal growth promoters on the (i) growth performance of broilers and on the (ii) dressing percentage, relative weight of heart, gizzard, liver, spleen and pancreas of the broilers. One hundred and fifty day old broiler (Hubbard) chicks were divided in five groups viz., A, B, C, D and E. Group A served as control and was fed ration without any supplementation.

Whereas group B and C were fed ration supplemented with 0.5% and 1.0% kalongi, respectively. Similarly the birds in-group D and E were fed ration supplemented with 0.5% and 1.0% garlic, respectively. The experimental rations consisted of broiler starter mash and broiler finisher mash, which were fed from 2-4 and 5-6 weeks of age, respectively. The supplementation of kalongi and garlic in the broiler ration significantly ($P<0.05$) improved the weight gain of the birds of various groups as compared to those of control group. The birds' (in group D) using ration supplemented with 0.5% garlic gained the highest live weight (1588 g) among the treated groups and the best-feed conversion ratio (1.91). Different levels of the herbal growth promoters did not exhibit any significant influence upon the feed intake values of the experimental groups. There was no difference ($P>.05$) between the average dressing percentages, relative giblet weight (heart, gizzard, liver & spleen) and relative pancreas weight of the broilers fed rations with or without supplementation of garlic or kalongi. It is therefore concluded that dietary inclusion of garlic or kalongi in the rations may be used for economical and efficient production of broilers.

9. Mohan, 2008 studied that a cost-benefit analysis was made of the effect of three organic growth-promoters on yield and quality of two vegetable crops, brinjal (*Solanum melonogena)* and tomato *(Lycopersicon esculentum*), grown under field conditions. Traditional Ayurvedic growth-promoters, Panchagavya and Amrit Pani, were compared with Bokashi made using Effective Microorganisms (EM) technology. The results indicate higher yield and lower glycoalkaloid content in Bokashi-treated crops, followed by Panchagavya. Panchagavya was the most cost-effective growth-promoter followed by Amrit Pani and then Bokashi. We recommend the use of Panchagavya as an organic growth-promoter for small and marginally profitable vegetable-crop farmers.

10. Perić, 2009 studied that Subsequent to banning of use of antibiotics as growth promoter sin poultry nutrition, numerous studies turned to finding of alternative solutions, i.e. other, natural substances, which would have positive effect on chicken growth and feed conversion. Today, several groups of these additives are in use, and most often probiotics, prebiotics, enzymes, acidifiers, antioxidants and phytogene additives. Considering that each of the stated groups has its own specificities, objective of this work was to present main mechanism of their action and to present their effect on production results in fattening of broiler chickens through review of research published in this field.

11. Saxena, 2004 conducted that type 2 diabetes has become a global epidemic. Modern medicines, despite offering a variety of effective treatment options, can have several adverse effects. Ayurveda, a science that uses herbal medicines extensively, originated in India. Of considerable interest is the adoption of Ayurveda by the mainstream medical system in some European countries (e.g., Hungary), emphasizing this modality is increasing worldwide recognition. From ancient times, some of these herbal preparations have been used in the treatment of diabetes. This paper reviews the accumulated literature for 10 Indian herbs that have antidiabetic activity and that have been scientifically tested. Few of these herbs, such as Momordica charantia, Pterocarpus marsupium, and Trigonella foenum greacum, have been reported to be beneficial for treating type 2 diabetes. Mechanisms such as the stimulating or regenerating effect on beta cells or extrapancreatic effects are proposed for the hypoglycemic action of these herbs.

12. Tipu, 2006 showed that the medicinal plants and herbs have been used for many years in the treatment of various diseases in animals and human beings. Now a day, utilization of these medicinal plants is increasing. These are used in animal feed as the growth promoters. Due to prohibition of most of the antimicrobial growth promoters in animal feed because of their residual effects, plant extracts are becoming more popular. They act as antibacterial, antioxidant, anticarcinogenic, antifungal, analgesic, insecticidal, anticoccidial and growth promoters. These plant extracts compete with the synthetic drugs. Majority of medicinal plants do not have the residual effects. *Azadiracht indica, Zizyphus vulgaris, Ocimum gratissimum* and *Atlanta monophylla* have the strong antibacterial activity, whereas ocimum plant has strong antioxidant, anticarcinogenic, antifungal, analgesic and antipyretic properties. Leaves of Allium sativum are used for feeding and reducing the parasitic load of animals. The fruit ofAllium sativum also has the anticoccidial activity for poultry.

13. Tollba, 2009 showed that An experiment was performed to reduce the intestinal pathogenic bacteria populations of broiler chicks under normal or heat stress conditions by using medical herbs (Garlic leaves), probiotic (biogen) or sand as a litter. A total of 240, unsexed one week old Hubbard chicks, were assigned into four equal groups, 60 chicks in each with two replicate in floor pens: 3 of 4 groups were fed an experimental diet and used the wheat straw as a litter, thus, inoculation of 2g biogen (bacteria concentration as probiotic) / kg of feed, 200 mg Garlic (Allium sativum) extract (medical plant) / kg of feed or without inoculation (control), respectively. Chicks in the fourth

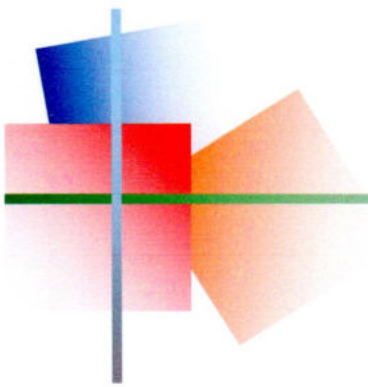
group were fed control diet and used sand as a litter. At 35 days of age, each group was divided into two equal sub-groups, the first was kept under normal conditions (23C) while, the second sub-group was exposed to 38°C for 3 hrs daily for 6 days from 35 to 40 days of age with 70 % relative humidity. Inclusion of biogen and Garlic (Allium sativum) extract in broiler feed at either normal temperature (23°C) or high temperature (38°C) allowed the statistically significant ($P<0.05$) improvement of the following parameters: body weight gain, feed consumption, feed conversion, mortality rate, carcass characteristics in terms of relative weight of dressing, giblets, and also lymphoid organs in terms of bursa and thymus relative weights. Blood total protein as well as albumin and globulin fraction, Tri-iodothyronine (T3), hemoglobin and hematocrit were increased ($P<0.05$). Conversely, plasma cholesterol and total lipids values were ($P<0.05$) reduced. Besides, creatinine, AST and ALT enzymes were not affected. Moreover, the total erythrocytic, leukocytic and leukocytic differential counts except heterophil cells were ($P<0.05$) increased. However, using the sand as a litter in broiler pens resulted insignificant improvement in the previous parameters, except the mortality rate was ($P<0.05$) improved with either normal or high temperature conditions. Furthermore, there were significant ($P<0.05$) decreases total count of some intestinal (ilium and caecum) or faeces pathogenic bacteria (total viable count, E. coli, Salmonella, staphylococci and Coccidia ovum) with all experimental groups including the sand as a litter treatment. On the other hand, there were ($P<0.05$) decreases in body weight gain, feed consumption, (T3), plasma total proteins and increase in mortality rate of chicks subjected to heat stress, by the way, experimental treatments reduced the deleterious effects of heat stress. Probiotics or Garlic (Allium sativum) extract was efficient as antibacterial and immuno-stimulant activities in controlling the intestinal pathogenic bacteria, consequently, improving broiler performance, physiological and bacteriological status. Therefore, It could be advisable to give more attention for importance of inclusion bacteria concentration (probiotics) and medical plant (Garlic leaves) on broiler diets or using the sand as a litter in broiler house in either normal or stressed environmental condition.

14. Wankar, 2009 studied that An experiment was conducted on 120 day old broiler chicks divided into four groups, T0, T1, T2 and T3 which were supplemented with Garlic (Allium sativum) extract @ 0ml, 1ml, 2ml and 3ml/kg of broiler ration, respectively. Weekly observations were recorded for live body weight, weekly gain in weight, weekly feed consumption and feed efficiency of birds for six weeks. All the treatment groups T1

(813.03), T2 (855.07) and T3 (834.21) recorded significantly ($P<0.01$) higher means for live body weight than that of control T0 (768.69) group. All the treatment groups showed non-significant increase in weekly gain in weight, feed consumption and feed efficiency as compared to that of control group.

Nutritional Value of Garlic

Principle	Nutrient Value	Percentage of RDA
Energy	149 Kcal	7.5%
Carbohydrates	33.06 g	25%
Protein	6.36 g	11%
Total Fat	0.5 g	2%
Cholesterol	0 mg	0%
Dietary Fiber	2.1 g	5.5%
Vitamins		
Folates	3 µg	1%
Niacin	0.700 mg	4%
Pantothenic acid	0.596 mg	12%
Pyridoxine	1.235 mg	95%
Riboflavin	0.110 mg	8%
Thiamin	0.200 mg	17%
Vitamin A	9 IU	<1%
Vitamin C	31.2 mg	52%
Vitamin E	0.08 mg	0.5%
Vitamin K	1.7 µg	1.5%
Electrolytes		
Sodium	153 mg	10%
Potassium	401 mg	8.5%
Minerals		
Calcium	181 mg	18 %
Copper	0.299 mg	33%
Iron	1.70 mg	21%
Magnesium	25 mg	6%
Manganese	1.672 mg	73%
Phosphorus	153 mg	22%
Selenium	14.2 µg	26%
Zinc	1.160 mg	10.5%
Phyto-nutrients		
Carotene-ß	5 µg	--
Crypto-xanthin-ß	0 µg	--
Lutein-zeaxanthin	16 µg	--



CHAPTER 3

MATERIALS & METHODS

CHAPTER 3

MATERIALS AND METHODS

The experiment was conducted at the Department of Physiology & Pharmacology, Hajee Mohammad Danesh Science and Technology University, Dinajpur.

Study Area: Belal poultry farm in Basherhat, Dinajpur

Study Duration: 1st May-2014 to 18th June-2014 (42Days)

To complete the research work following steps were followed.

3.1 Collection and processing of plant materials

Garlic and Black pepper were selected for effectiveness as growth promoter on broilers. Mature and disease free Garlic and Black pepper were collected from HSTU campus.

3.1.1 Preparation of Garlic extracts

For the preparation of dust, the garlic's were dried in sun for 10 days and followed by oven at 55-60°C for 2 days. The dried garlic's were pulverized with a blender. A 25 (unit) mesh diameter sieve was used to obtain the fine dust, after then dust was preserved in airtight plastic container until they were directly used for screening and preparation of water extract. 100g Garlic powder was added to 100ml of distilled water and was shaking overnight at room temperature to make 100% extract.

3.1.2 Preparation of Black pepper extracts

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. A 112 (unit) mesh diameter sieve was used to obtain the fine dust, after then dust was preserved in airtight plastic container until they were directly used for screening and preparation of water extract. 100g Black pepper powder was added to 100ml of distilled water and was shaking overnight at room temperature, filtered to make 100% extract.

All the chicken of treated and control groups were closely observed after treatment and following parameter were studied:

Experimental Layout

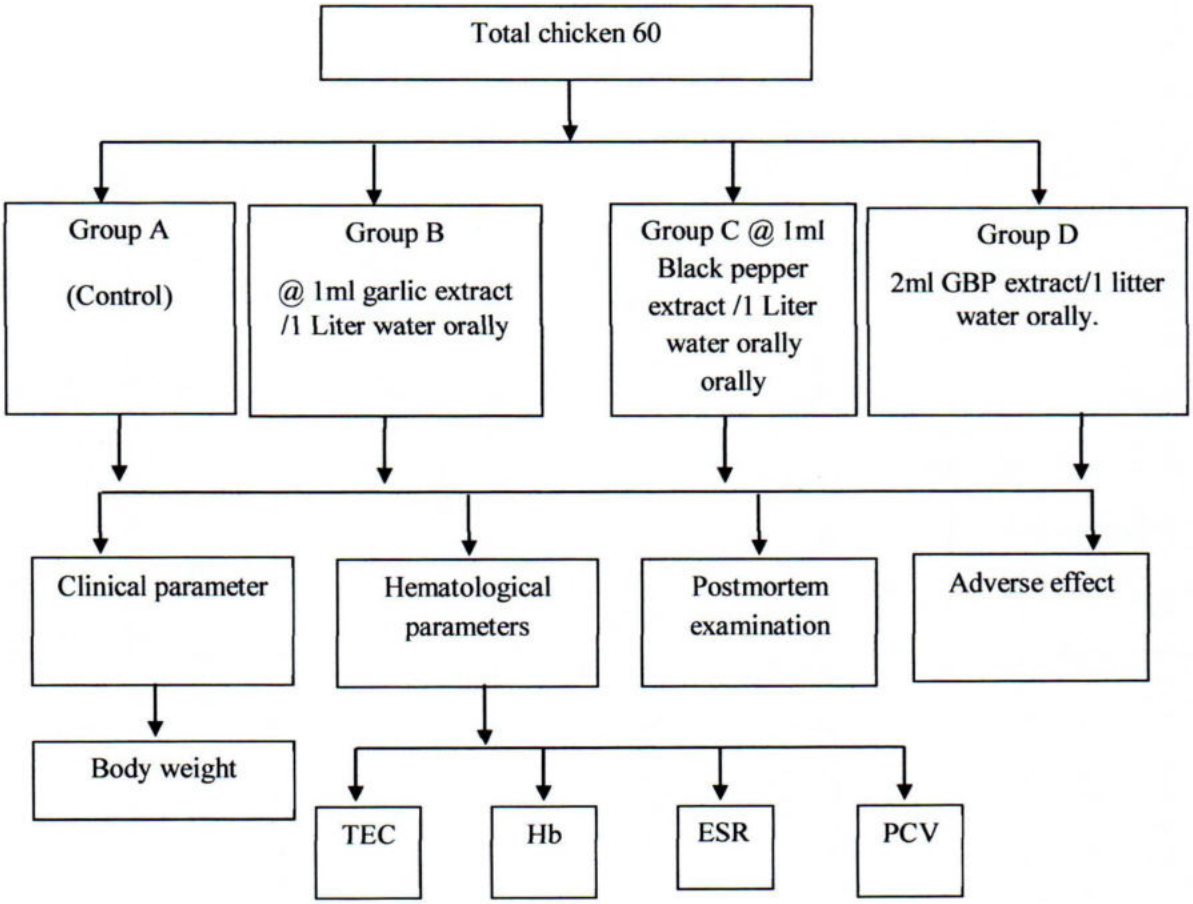


Fig. 3.1 Layout of the experiment

3.1.3 Preparation of GBP extracts

For the preparation of GBP extract, 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. A 112 (unit) mesh diameter sieve was used to obtain the fine dust then, the garlic's were dried in sun for 10 days and followed by oven at 55-60°C for 2 days. The dried garlic's were pulverized with a blender. A 25 (unit) mesh diameter sieve was used to obtain the fine dust. Finally 100gm Black pepper dust and 100gm Garlic dust mix together, from this mixing 200gm powder mixed with 200ml water to make a 100% extract.

3.2 Preparation of the Experimental house and equipment:

An open sided house was partitioned into 12 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 cholorine solution (500ppm). The room was left vacant for 14 days. Later, it was again disinfected with Finis solution (1 gm/litre) 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.

3.2.1 Collection and management of chickens:

Day old chicks marketed by CP Bangladesh Ltd. were purchased from local market for this experiment. The experiment was carried in poultry shed in HSTU. Day old broiler chicks were (60 in number) brought in the experimental shed. The body weight of all selected chicken ranged from 100 to 120 gm respectively. 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 10 days for the adaptation. The broiler chicks were kept in the same compartment for 7 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 appropriately.

3.3 Experimental diets:

The commercial broiler starter and pre-starter diets manufactured by New Hope poultry feed Ltd. was purchased from the local agent in Dinajpur.

3.4 Routine management:

The commercial management procedures were followed during the whole experimental period.

3.4.1 Litter management:

Fresh and dried husk was used as a litter at a depth of 2 cm. The litter was disinfected with Finis® solution. The litter was stirred three times a week from 14 days to prevent cake formation. Litter material when found damp was replaced by new litter.

3.4.2 Floor space:

Each pen was 2.5 ft x 2 ft which was for seven birds. Therefore, the space given for each bird was 1 square ft.

3.4.3 Brooding:

The bird was brooded with one 100 watt electric bulb in each pen from day old to 21 days. The bulb was just hanged just above the bird's level at the center of each pen. Brooding temperature was kept 32°c at the beginning of the first week of age and decreased gradually in subsequent week until adjusted to the normal environmental temperature. Increasing or decreasing of temperatures were done by lowering or raising the bulbs according to the temperature prevailed and the birds behavior.

3.4.4 Lighting:

The birds were exposed to 12 hours of lighting and a dark period of 1 hour per day throughout the experimental period. After 21 days only one 60 watt electric bulb was set at a height of 240 cm which provide sufficient lighting up to the end of experiment. The dark provision was practiced to make broilers familiar with possible darkness due to electricity failure.

3.4.5 Feeder and waterer management:

For the first 2 days, feeds were given on tray feeders and water was supplied in a round. After two days of age, one trough feeder and one round waterer were provided for each replicate pen. Each waterer was placed on two flat bricks. Feeders were cleaned everyday at morning and afternoon and fresh clean drinking water was supplied for all times.

3.4.6 Feeding and drinking:

Immediately after distribution of chicks in the pens electrolyte and vitamin solutions were provided to drinking water for four hours. Then dietary treatment was applied to the chicks. Control 0 ml/liter (group A), 1 ml/liter drinking water (group B), 1 ml/liter (group C) and 1 ml + 1 ml/liter drinking water were supplied to the experimental birds.

Feed was supplied four times daily for the first seven days and gradually reduced to three times. Initially feed was given on tray feeder and thereafter through feeder was used to feed the birds. Leftover feeds were mixed with fresh feed into the feeder in the morning and spoiled feed was excluded by taking weight of the waste feed. Feed was supplied adlibitum and water was made available all the items.

3.4.7 Immunization:

The birds were vaccinated against New castle disease at 5^{th} day and infectious bursal disease (Gumbaro) at 10^{th} day and infectious bursal disease (Gumbaro) again as 17^{th} day finally New castle disease at 21th days of age.

3.4.8 Biosecurity and sanitation:

Proper hygienic and sanitation programs were followed during the experimental period. To prevent the outbreak of disease strict biosecurity was maintained during the experimental period. The following measures were taken to maintain the biosecurity.

- Visitors were not allowed to enter in the house.
- All equipment's in the experimental house were kept clean.
- Dead birds were removed promptly.

All the chicken of treated and control groups were closely observed for 42 days after treatment and following parameter were studied.

3.5 Experimental design

All the 60 chicken's randomly divided into 4 groups (A,B,C,D) for assessing the efficacy of Garlic and Black pepper extract as growth promoter on broilers.

Chickens of group 'A': 15 chickens were kept as control and were not treated.

Chickens of group 'B': 15 chickens were treated with Garlic extract @ 1ml /1 liter in drinking water.

Chickens of group 'C': 15 chickens were treated with Black pepper extract @1m/1 liter in drinking water.

Chickens of group 'D': 15 chickens were treated with GBP extract @ 2ml/1 Litter drinking water.

Fig-1: Black Pepper

Fig-2: Garlic

Fig-3: Grinder Machine

Fig-4: 112 Unite Sieve (Water soluble form)

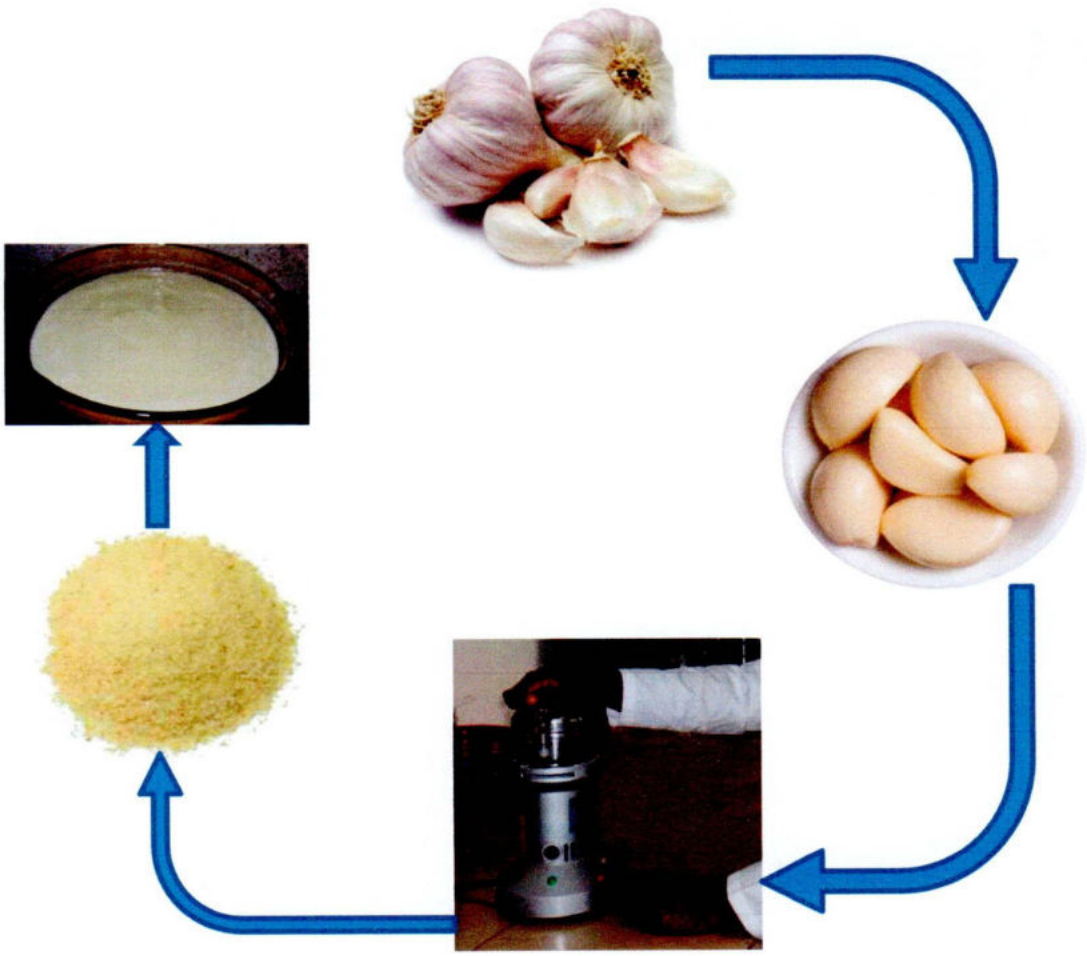


Fig-5: Preparation of Garlic Extract

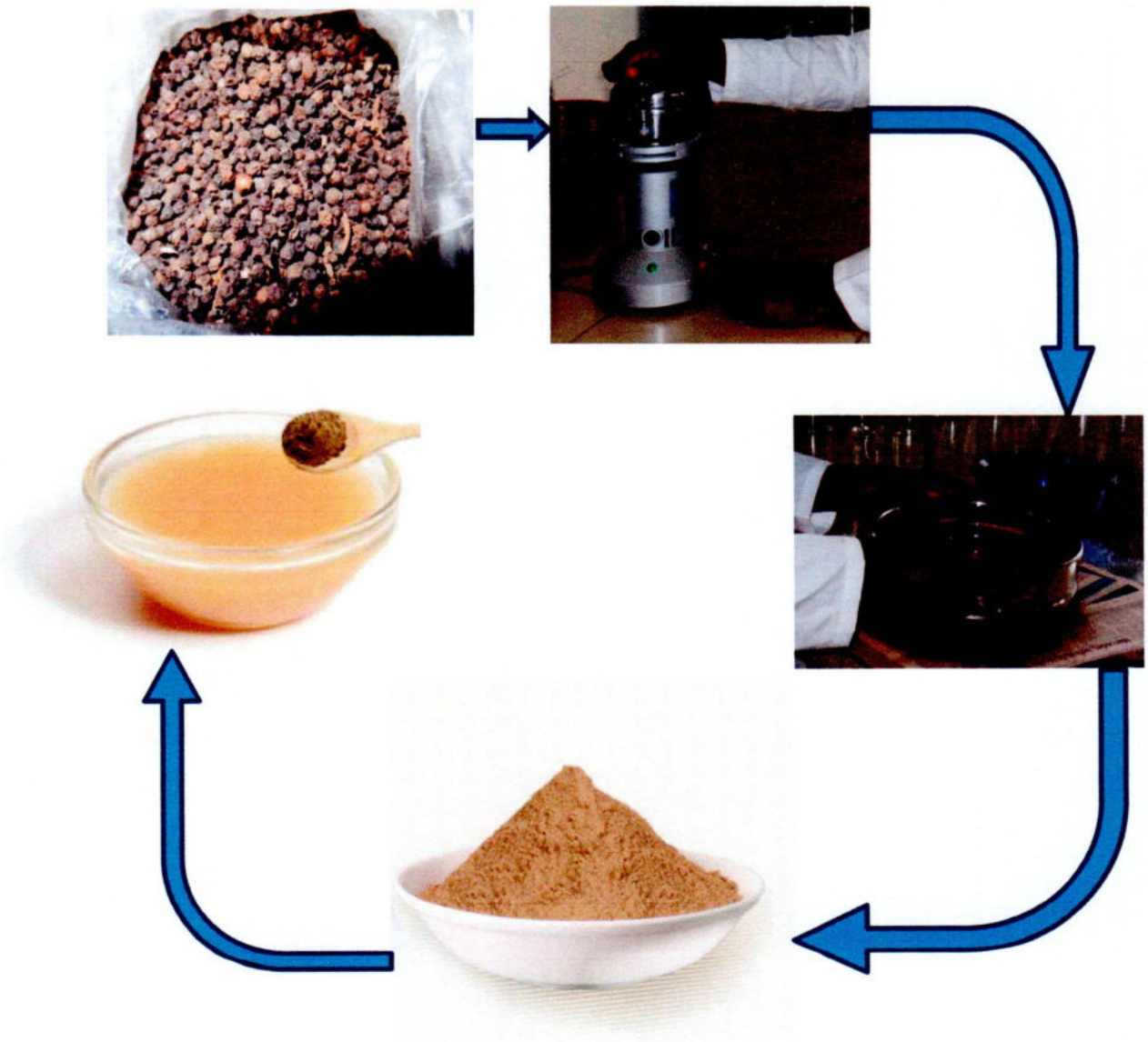


Fig-6: Preparation of Black Pepper Extract

Fig-7: Day old Chicks

Fig-8: Weighting Broiler at Grower stage

Fig-9: Experimental Broiler Shed

Fig-10: Block -A (Control)

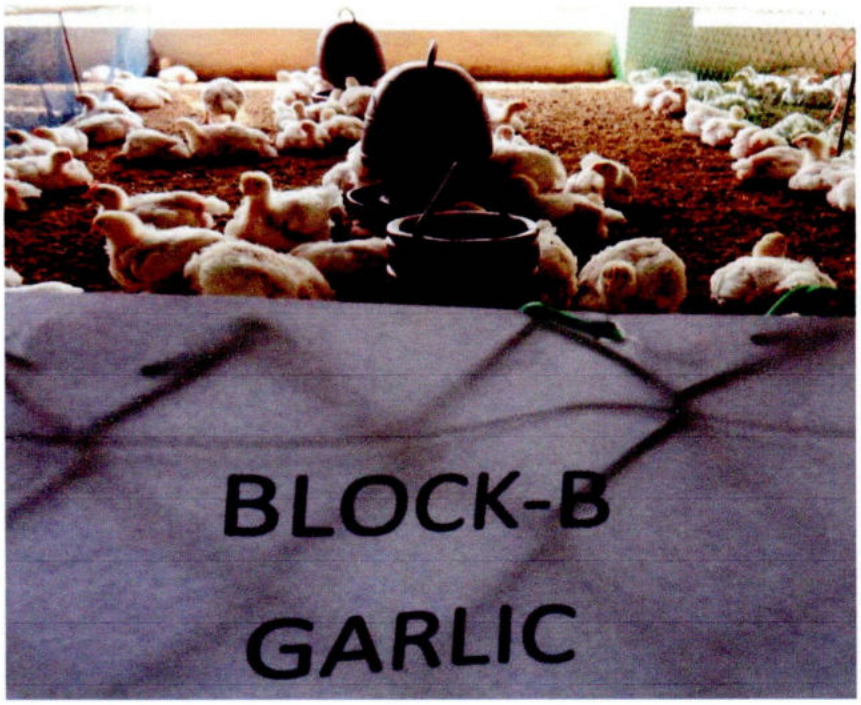


Fig-11: Block –B (Garlic)

Fig-12, Block-C (Black Pepper)

Fig-13: Block-D (GBP)

Fig-14: Final stage of Broiler

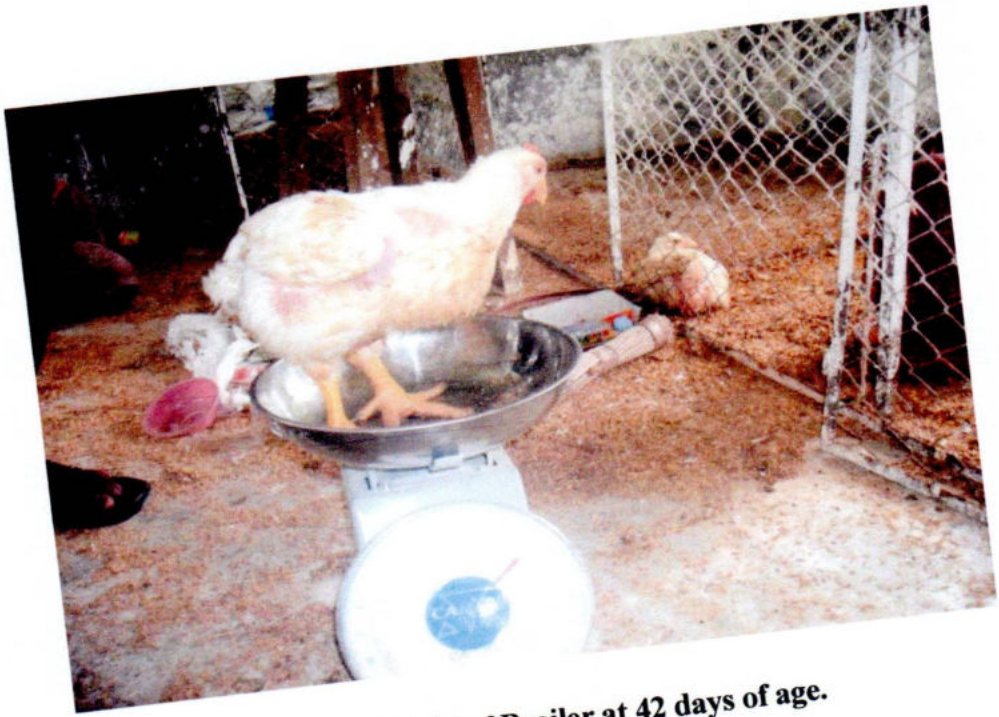


Fig-15: Weight of Broiler at 42 days of age.

Fig-16: Blood Collection through wing Vein.

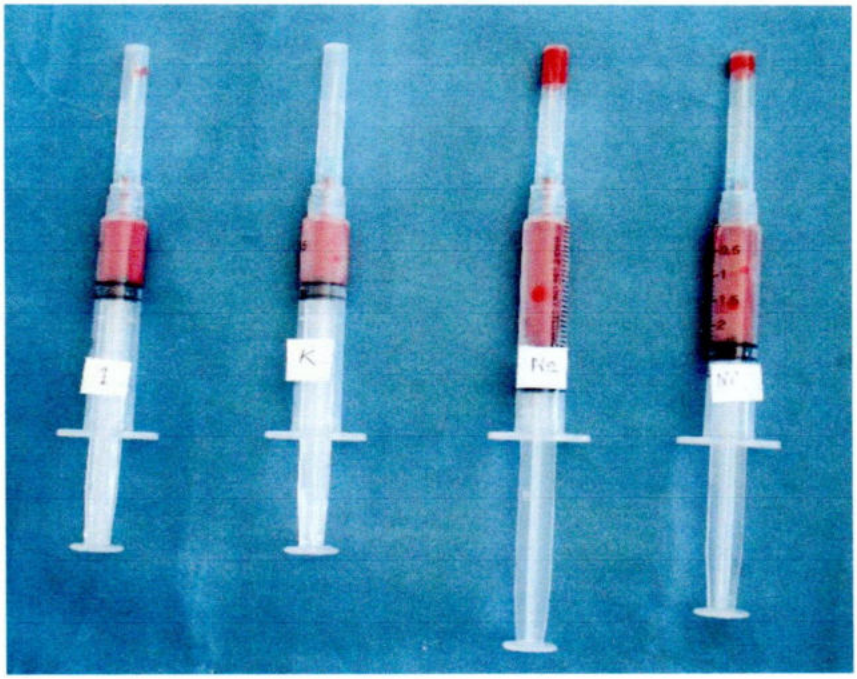


Fig-17. Blood samples for hematological tests

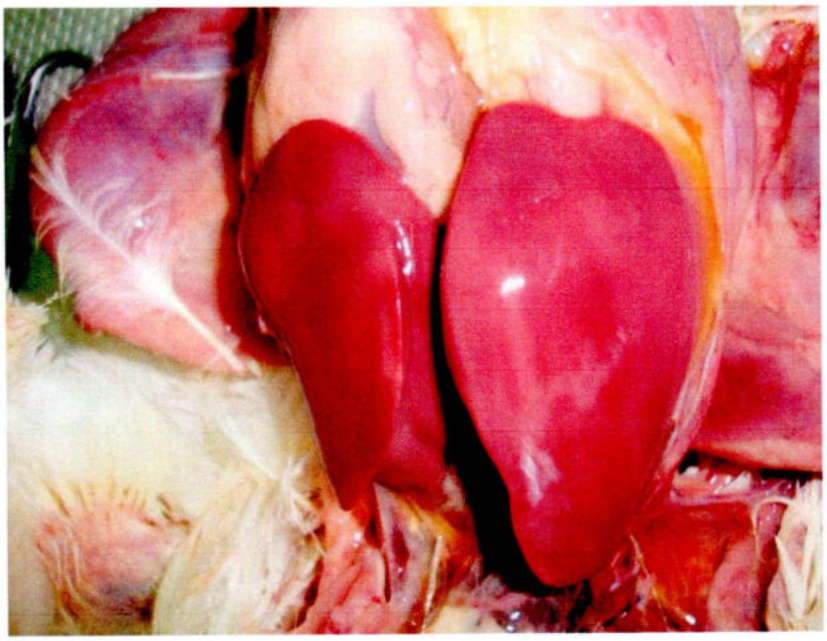


Fig-18: Visceral part after slaughtering.

3.5.1 Clinical examination

i) The effects of the garlic and black pepper extract and GBP on body weight, feed consumption and water consumption were recorded.

ii) Chickens under trial and control groups were weighed with Electric weighing machine. The weight of each chicken was taken before feeding in the morning, in noon and afternoon. The average of these three weights was calculated and recorded.

Mean live weight gain of each group of chickens on 7^{th}, 14^{th}, 21^{th}, 28^{th}, 35^{th} and 42^{th} days, were recorded.

3.5.2 Hematological parameters

Blood samples were collected from wing vein of chicken of both control and treated groups at pre-feeding and during feeding period at 7 days interval to study the effect of the garlic (*Allium sativum*) black pepper *(Piper nigrum)* 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 (10x) 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 (45x). 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 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 hydrochloric acid (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 Hellige Hemometer 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 haematocrit 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 haematocrit tube was placed in the centrifuge machine and was centrifuged for 30 minutes at 3000 rpm. Then,

the haematocrit or PCV was recorded by reading the graduation mark; the percent volume occupied by the haematocrit 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 haematocrit 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.

3.6 Postmortem examination for side effects

Three chickens from each group were slaughtered to see if there were any pathological changes present on 21^{th} day, 42^{th} day of treatment. There was no significant pathological change in any internal organs of the chickens of treated groups.

3.7 Statistical analysis

The data were analyzed statistically between control and treated groups of chicken by the well know student's test ('t' test).

CHAPTER 4

RESULTS AND DISCUSSION

CHAPTER 4

RESULTS AND DISCUSSSION

This experiment was conducted to evaluate the efficacy of garlic, Black pepper, GBP extracts as a growth promoter in poultry. The experiment was held under the Department of Physiology and Pharmacology, Faculty of Veterinary and Animal Science.A total number of 60 DOC (Day old chicks) were randomly divided into 4 equal groups (A,B,C,D).

The experimental units were kept on a floor litter system in separate pens. A weight amount of the ration was offered to the birds twice a day and the left over feed was collected to calculate feed consumption of the birds. Fresh and clean water was made available at all the completed randomized design and data about per replicate body wt. weekly feed consumptions were recorded during the experimental period (1-42 days of age).

The birds using ration supplemented with 1ml of garlic, black Pepper and GBP extract (group A,B,C,D) gained the highest live wt. among the treated groups (Table- I).

In Group A (Control group, n=15) live weight were measured and found as initial live wt.46±1.80g, final live wt. 1600±58.02g, weight gain 1456±45.90g and FCR 1.875.

In Group B (n=15) initial live wt. 45±1.10.30g, final live wt 1700±63.04g, weight gain 1555±36.90g and FCR 1.85.

In Group C (n=15) initial live wt. 46±1.80final live wt 1640±58.02g, weight gain 1500±45.90 and FCR 1.865.

In Group D (n=15) initial live wt. 46±1.10final live wt 1730±63.04g, weight gain 1559±36. And FCR-1.82

Statistical analysis of the data did not show any difference ($P<0.5$) between the dressing percentages of the birds of different feeding groups (Table II).

Statistical analysis of the data did not show any difference between the relative gizzard weights of the birds of different feeding groups (Table II).

Statistical analysis of the data did not show and difference between the relative spleen weight of the birds of different feeding groups using ration with are without supplementation of garlic, GBP extract (Table II).

Economics of Production:

The average rearing cost of broiler kept under different treatment groups viz A,B C, D were Tk.173.20, Tk.179.00, Tk. 175.52 and Tk.177.2 (Table III). Including the cost of labour because the experiment was conducted on the local poultry farm shed at Basherhat, Dinajpur. Miscellaneous cost summed up Tk. 15 per broiler, which included the estimated cost of electrically gas, litter disinfectant. The average live weight of broilers in group A,B,C,D were 1.6 kg 1.7**kg ,1.64kg and 1.73*kg respectively. The broiler was sold in live weight basis at the rate of TK 132tk/kg. The net profit/Kg live weight in the respective group excluding the cost of labours was found taka 17.94, taka 26.7, taka 24.98, taka 29.57 respectively. The level of garlic, black pepper and GBP extracts used is the ration exhibited their effect on the profit margin of the broiler.

4.1 Effect of Garlic, Black Pepper and GBP extracts supplementation on growth in broiler

The observations for live body weight (g) means of A,B,C,D groups after six weeks of the experimental period were 1600±58.02gm,1700±63.04**gm, 1640±58.02gm and 1730±63.04*gm respectively. It is observed from the results in Table I, that supplementation of Garlic (*Allium sativum*), Black Pepper and Garlic +Black pepper extract in B,C,D group of broilers significantly ($P<0.01$) increased the mean live weight as compared to control (A) group. Similarly Manwar *et al.,* (2005) supplemented Garlic, Black Pepper and GBP extract @ 1 ml drinking water and reported significant increase in the live body weight of broilers in the treated groups when compared with control group. It is observed from Table I. That the final live weight gains in weight (g) for A and D groups were 1600±58.02 and 1730±63.04* respectively

The treatment groups of broilers (D) showed numerically highest body weight gain as compared to control (A) group.

Table 1. Initial and final live weight, weight gain, feed consumption and feed conversion ratio of broilers fed different levels garlic, black Pepper and GBP extract from 1 to 6 weeks of age

Variables	Control (A)	Treatment Groups		
		Garlic (B)	Black Pepper (C)	GBP (D)
Initial live weight (g) of day old chicks	46±1.80	45±1.10	46±1.80	46±1.10
Initial live weight (g) on 7th day	144±7.30	145±7.30	140±7.30	141±7.30
Final live weight (g) on 42nd day	1600±58.02Ns	1700±63.04**	1640±58.02	1730±63.04*
Weight gain (g)	1456±45.90NS	1555±36.90**	1500±45.90	1559±36.90*
Feed consumption (g)	3000	3150	3060	3100
Feed conversion ratio (FCR) g feed consumed/g weight gain	1.875	1.85	1.865	1.82

Mean values within the same row, which have different superscripts, were significantly different ($P<0.05$). In this and other tables,

A = control,

B = 1 ml garlic,

C=1ml black pepper and

D= 2ml GBP extract

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

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

NS= Non significant

Table 2. Dressing percentages, relative weights of heart, gizzard, liver spleen and pancreas of broilers on 42nd day in control and treatment groups

$$\textbf{Relative weight (g)} = \frac{\text{Weight of organ}}{\text{Live body weight of bird}} \times 100$$

	Control	Treatment		
	A (n=3) Mean± S.E.M	Garlic B (n=3) Mean±S.E.M	Black Pepper C (n=3) Mean±S.E.M	GBP D (n=3) Mean±S.E.M
Dressing percentage	63.01±1.02	63.59±1.02	63.59±1.02	63.59±1.14
Relative heart weight	0.45±0.09	0.45±0.21	0.45±0.21	0.46±0.20
Relative gizzard weight	1.48±0.076	1.48±0.33	1.48±0.33	1.52±0.28
Relative liver weight	2.60±0.047	2.60±0.15	2.60±0.15	2.61±0.20
Relative spleen weight	0.12±0.005	0.12±0.024	0.12±0.024	0.12±0.040
Relative pancreas weight	0.28±0.018	0.28±0.028	0.28±0.028	0.29±0.029

Table 3. The Data showing economics of broiler production among control group (A) and treatment group (B,C,D) from 1 day-old to 6 weeks of age.

Description	A	B	C	D
Cost/chick (Taka)	32	32	32	32
Average feed consumed (Kg)/chicks	3.000	3.150	3.060	3.100
Feed price/Kg (Taka)	42	42	42	42
Cost of herbal growth promoters/Chicks (Taka)	0.00	6	7	9
Total Feed cost /Chick(Taka.)	126.20	132.3	128.52	130.2
Miscellaneous/Chicks (Taka)	15	15	15	15
Total cost/broiler (Taka)	173.20	179.00	175.52	177.2
Average live weight (Kg)	1.6±58.02	1.7±63.04*	1.64±58.02	1.73±63.04*
Sale price/Kg live wt. (Taka.)	132	132	132	132
Sale price/broiler (Taka)	211.20	224.4	216.48	228.36
Net profit/broiler (Taka.)	38	45.4	40.96	51.16
Profit/Kg live weight (Taka)	17.94	26.7	24.98	29.57

Mean values within the same row, which have different superscripts, were significantly different ($P<0.05$). In this and other tables, A = control, B = 1 ml barlic, C=1ml black pepper, D=1ml GBP extract. Supplementation with garlic (*Allium sativum*), black pepper and GBP extract was found to be more profitable than control group 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 garlic (*Allium sativum*), black pepper and GBP were more beneficial in broilers production.

4.2 Study of garlic (*Allium sativum*), black pepper and GBP extract on hematological parameter of broilers

Observation of hematological parameter (RBC, Hb, PCV, ESR) on 21st day and 42nd day did not show any significant difference ($P<0.05$) between the control (A) and garlic (*Allium sativum*), black pepper and GBP-Group B, C, D.

Table 4. Hematological parameters of broiler

Days of post treatment	Treatment		Mean ± SEM	Significance value
21st day	RBC million/mm^3	Control	191.35±6.37	NS
		Garlic	195.3±7.50	
		Black Pepper	196.4±6.30	
		GBP	197.32±7.54	
	Hb (gm%)	Control	6.00±0.14	
		Garlic	6.30±0.05	
		Black Pepper	6.25±0.10	
		GBP	6.47±0.07	
	PCV (%)	Control	16.33±0.88	NS
		Garlic	17.5±0.60	
		Black Pepper	17.00±0.50	
		GBP	19.00±0.60	
	ESR (mm in 1st hour)	Control	10.67±0.86	
		Garlic	8.55±0.50	
		Black Pepper	8.66±0.88	
		GBP	8.50±0.40	
42nd day	RBC million/mm^3	Control	248.70±13.87	NS
		Garlic	295.10±12.2	
		Black Pepper	296.21±13.50	
		GBP	297.67±12.12	
	Hb (gm%)	Control	6.92±0.27	NS
		Garlic	7.62±031	
		Black Pepper	7.63±29	
		GBP	7.64±0.2	
	PCV (%)	Control	17±0.61	NS
		Garlic	19.21±0.50	
		Black Pepper	20.20±0.37	
		GBP	20.71±0.34	
	ESR (mm in 1st hour)	Control	7.00±0.60	NS
		Garlic	6.00±0.57	
		Black Pepper	5.00±0.45	
		GBP	4.00±1.01	

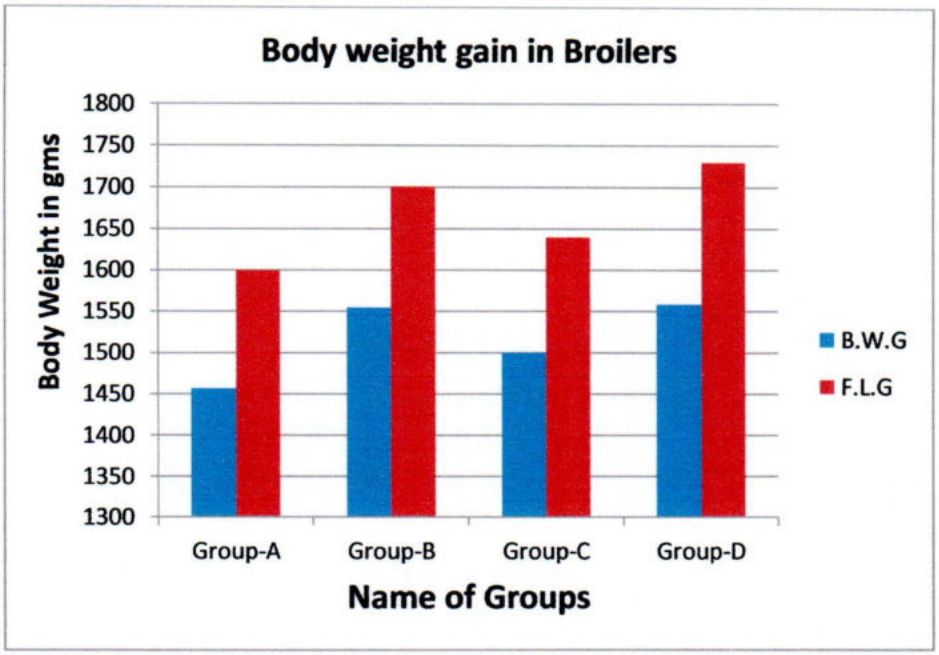


Fig-19: Body weight gain in broilers

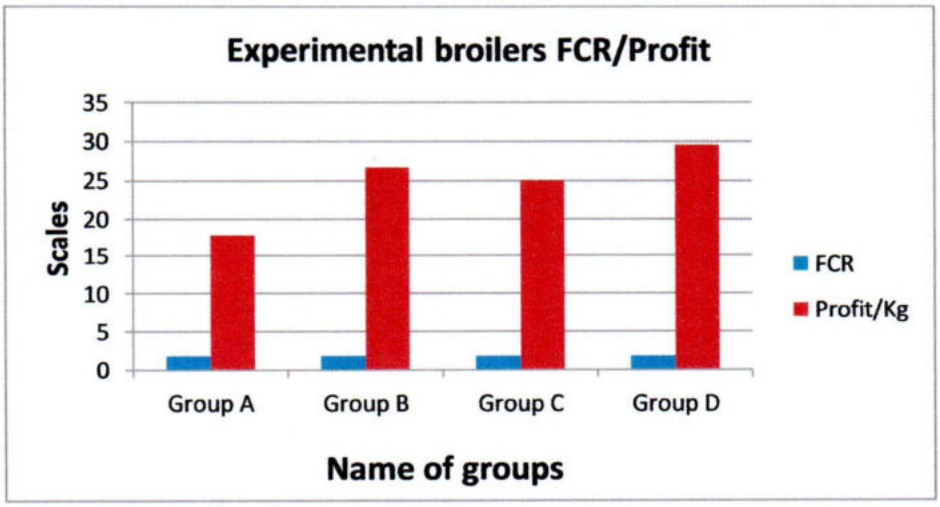


Fig-20: FCR/ profit per kg live broilers

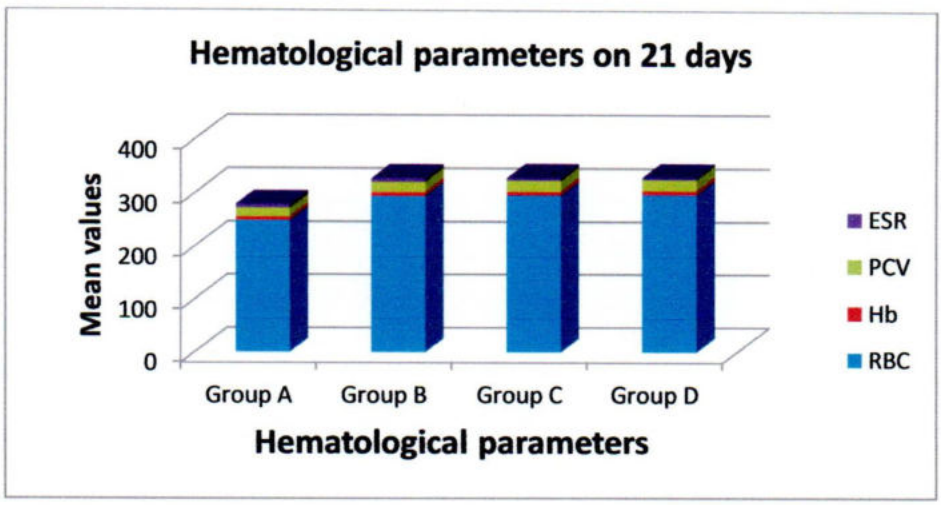


Fig-21: Hematological parameters of broiler on 21st day

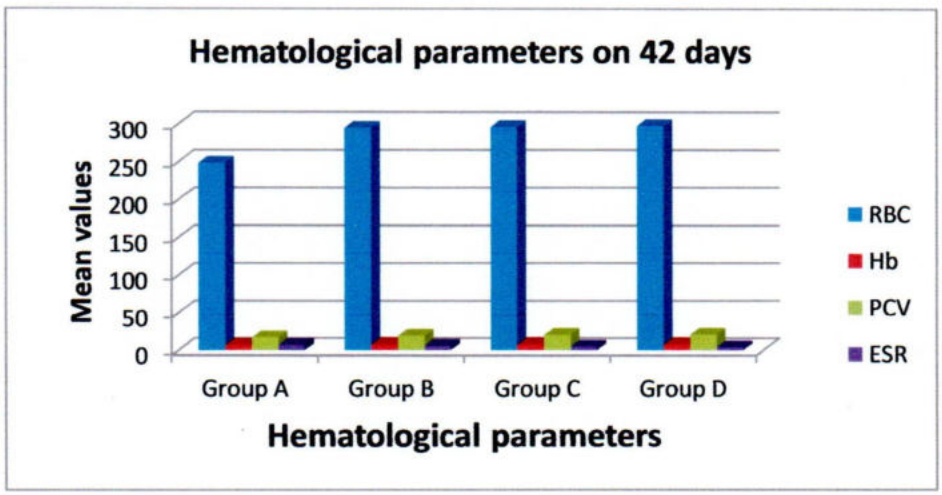


Fig-22: Hematological parameters of broiler on 42nd day

Supplementation of garlic (*Alliusativum*), black pepper and GBP extract in the treatment caused improvement in the feed efficiency as compared to that of control group. Similarly, Nagalakshmi *et al.,* (1996) reported increase in feed efficiency in garlic (*Allium sativum*), black pepper and GBP-Group A,B,C,D, which is in agreement with the findings of the present study. Birds supplemented with garlic (*Allium sativum*), black pepper and GBP extract had higher body weight, weekly gain in weight, feed consumption and feed efficiency. These results may be due to antimicrobial and Anti-Protozoal properties (Kumar *et al.,* 2005) of garlic (*Allium sativum*), black pepper and GBP, which help to reduce the microbial load of birds and improved the feed

consumption and feed efficiency of the birds. It is concluded that supplementation with 1 ml of garlic (*Allium sativum*), black pepper and GBP extract in drinking water of the treatment groups caused significant increase in live body weight and improvement in weight gain and feed efficiency as compared to that of control group of poultry.

Garlic (*Allium sativum*), black pepper and GBP extract has effects as alternative growth promoter. The extract showed no mortality, without any antibiotic and vaccination and also taking proper bio-security. This result may be due to antibacterial, anti-inflammatory, anti-stress, antifungal, insecticidal and liver tonic properties of Garlic (*Allium sativum*), Black Pepper and GBP extract which help to ensure the microbial load of birds and improve the feed consumption and feed efficiency. Care should be taken to ensure its safe use for medicinal references. Similar results have been reported by Sharma and Reddy (2002), where the broilers fed rations with added kalongi, fetched more profit than those using rations without supplementation of this herbal growth promoter. Increase in the profit margin of the birds fed rations containing herbal growth promoters may be attributed to the better efficiency of feed utilization, which resulted in more growth and better feed to gain ratio, ultimately leading to higher profit margin in the broilers reared on garlic (*Allium sativum*), black pepper and GBP extract supplementation.

CHAPTER 5

SUMMARY AND CONCLUSION

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SUMMARY AND CONCLUSION

In this experiment garlic, black Pepper and GBP extract was studied in terms of growth promoter on broilers. The experiment was conducted in the Department of Physiology and Pharmacology, Faculty of Veterinary and Animal Science, HSTU, Dinajpur. 60 DOC (day old chicks) were equally divided into four groups (n=15) to carry out this research work.

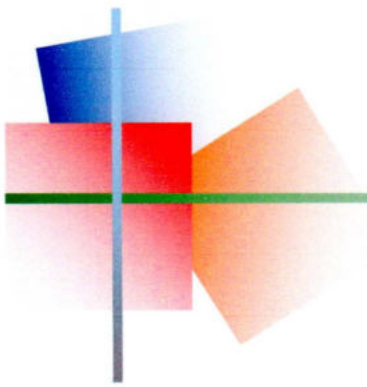
Keeping one group as normal control group (A) and others three groups (B,C and D) as group subjected to treatment with garlic, black pepper and GBP extract. The group of B was supplemented with garlic extract @ 1 ml/liter in drinking water, C was supplemented with black pepper extract @1ml/1L water, GBP extract@ 2ml/1L in drinking water and the group of A was provided with the fresh water. Weekly observations were recorded in live body weight for 42 days and blood parameters of birds at 21st and 42nd days. The treatment group B,C,D recorded statistically significant ($p<0.05$) increase for live body weight than that of control group A. Net live weight gain was increased in garlic, black Pepper and GBP treated group (1700±63.04g**, 1640±58.02g 1730±63.04g*) than control group is 1600±58.02gm and profit/ Kg live broiler was Tk26.7 Tk.24.98, Tk. 29.57 in treatment group and in control group was Tk. 17.94.

This research work shows that continuous treatment with garlic, black pepper and GBP extract produced a significant ($p<0.05$) increase in live body weight but there is no significant ($p<0.05$) change on blood parameters.

In fact, only few trials have been performed to evaluate the medicinal value of Garlic, Black Pepper and GBP extract. I did the work in short-term basis (only 42 days) and modern equipment's were also not available. Before field application of garlic, black pepper and GBP extract as growth promoter and as an alternative for antibiotic growth promoter further trial on a large scale basis is needed and also to make the findings more accurate and effective further study is essential to determine the different antibody levels

in broilers of treated group by exposing some organisms in experimental broilers before culling of experimental birds.

In Bangladesh broiler farming is very difficult for small scale farmer and they are getting looser. For this reason in my experiment I observed that production cost can be reduced by eliminating vaccines and antibacterial. This is a preliminary work and the technology is very simple. Farmers could adopt this technology without any specialized technical knowledge and medicinal ingredients are available. As a result by using GBP extract small scale farmers would be able to sustain in their farming business and produce broilers without any drug residues.



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