SUPPLEMENTATION OF NEEM AND NISHYINDA LEAVES AS GROWTH PROMOTERS IN QUAIL

A THESIS
BY

MD. SHAHRIAR HAQUE
REGISTRATION NO: 1605511
SEMESTER: JANUARY– JUNE 2018
SESSION: 2016-2017

MASTER OF SCIENCE (MS)
IN
PHYSIOLOGY

DEPARTMENT OF PHYSIOLOGY AND PHARMACOLOGY
HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY UNIVERSITY, DINAJPUR-5200, BANGLADESH.

JUNE 2018

SUPPLEMENTATION OF NEEM AND NISHYINDA LEAVES AS GROWTH PROMOTERS IN QUAIL

A THESIS
BY

MD. SHAHRIAR HAQUE
REGISTRATION NO: 1605511
SEMESTER: JANUARY– JUNE 2018
SESSION: 2016-2017

Submitted to the
Department of Physiology
Faculty of Post Graduate Studies
Hajee Mohammad Danesh Science and Technology University,
Dinajpur-5200

MASTER OF SCIENCE (MS)
IN
PHYSIOLOGY

DEPARTMENT OF PHYSIOLOGY AND PHARMACOLOGY
HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY UNIVERSITY, DINAJPUR-5200, BANGLADESH.

JUNE 2018

SUPPLEMENTATION OF NEEM AND NISHYINDA LEAVES AS GROWTH PROMOTERS IN QUAIL

A THESIS
BY

MD. SHAHRIAR HAQUE
REGISTRATION NO: 1605511
SEMESTER: JANUARY– JUNE 2018
SESSION: 2016-2017

Approved as to the style and content by

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

(Dr. Rakibul Islam)
Chairman, Examination committee

DEPARTMENT OF PHYSIOLOGY AND PHARMACOLOGY
HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY UNIVERSITY, DINAJPUR-5200, BANGLADESH.

JUNE 2018

DEDICATED
TO MY
BELOVED PARENTS

ACKNOWLEDGEMENT

I am ever grateful and indebted to the Almighty Allah without whose grace I would have ever been able to pursue my higher studies in this field of science and to complete my research work successfully for the degree of Master of Science (MS) in Physiology.

I am sincerely desires to express my heartfelt respect, deepest sense of gratitude, sincere appreciation and profound indebtedness to my respected teacher and Research Supervisor, ***Professor Dr. Rakibul Islam****, Chairman, Department of Physiology and Pharmacology, Faculty of Veterinary and Animal Science (FVAS), Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur for his constant supervision, scholastic guidance, uncompromising principles, helpful advice, constant inspiration, affectionate feeling, radical investigation and constructive criticism in all phases of this study and preparing the manuscript.*

I am finds it a great pleasure in expressing my heartfelt gratitude and immense indebtedness to my honorable teacher and respected Research Co-Supervisor, ***Dr. Fahima Binthe Aziz,*** *Associate Professor, Department of Physiology and Pharmacology, Faculty of Veterinary and Animal Science (FVAS), Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur, for her sympathetic supervision, kind co-operation, inspiration and valuable suggestions, constructive criticism and valuable advice for the completion of the research work and preparation of the thesis.*

I am wishes to express my cordial respect and profound gratitude to my teachers ***Dr. Md. Mahmudul Hasan,*** *Assistant Professor and* ***Dr. Mst. Misrat Masuma Parvez, Lecturer****, Department of Physiology and Pharmacology, Faculty of Veterinary & Animal Science HSTU for their valuable advice and constant inspiration throughout the entire period of study.*

I am expresses my cordial appreciation to all the office staff of the Department of Physiology and Pharmacology, HSTU, Dinajpur.

Finally, I expresses heartfelt gratitude and gratefulness to my beloved parents, brother, sister, friends and all well wishers for their blessing, inspiration, sacrifice and moral support which opened the gate and paved the way to my higher studies and also provided my with the best of everything in my life.

The Author

June, 2018

ABSTRACT

The aim of this work was to investigate the effects of nishyinda *(Vitex nigundo)* and neem (*Azadirachta indica*) leaves on growth performance and hematologic parameter in quail. A total of 40, 14th day old Japanese quail were randomly assigned into groups T_0, T_1, T_2 and T_3 and continued up to 42 days of age . Birds were reared in cage. The group T_0 was kept as a control whereas group T_1, T_2 and T_3 were fed 2% neem, 2% nishyinda and 2% (neem + nishyinda) respectively, with commercial diet. At 14 days of age the initial average live body weights of T_0, T_1, T_2 and T_3 were 25.33±0.88, 26.67±0.88, 25.67±0.33, 26.33±0.88 respectively. On the 42 days of age the final live weight of T_0, T_1, T_2 and T_3 were 117.33±0. 88,124.33±1.76, 121.33±1.20, 130.67±1.45 respectively. The highest body weight was obtained in T_3 followed by T_0 which differ significantly ($P<0.01$) from each other. The feed consumption was similar for all groups throughout the experimental period. Cumulative feed consumption for T_0, T_1, T_2 and T_3 were 430, 428, 425 and 435 gm respectively. Feed Conversion Ratio (FCR) for the T_3 and T_1 were from the control group which improved significantly were 4.17±0.09 and 4.38±0.05 respectively during 2 to 6 weeks of age. But no significant ($P>0.05$) difference among the mean value of hematologic parameters of quails. It is concluded that supplementation with 2% of combined (1%) neem and (1%) nishyinda leaves powder in diet in treatment group caused significant increase in live body weight and weekly weight gain, Feed Consumption and FCR as compared to that of control group of quail.

Key word: Neem leaves, Nishyinda leaves, Japanese quail, Growth performance, Hematological parameter.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

B. wt.	: Body Weight
Conc.	: Concentration
ESR	: Erythrocyte Sedimentation Rate
Hb	: Hemoglobin
PCV	: Packed Cell Volume
TEC	: Total Erythrocyte Count
FCR	: Feed Conversion Ratio
et al.	: Et alia (associates)
CID	: Chicken Infectious Dose
SM	: Sample Mean
SE	: Standard Error
&	: And
WHO	: World Health Organization
Ec	: *Escherichia coli*
NLE	: Neem Leaf Extract
IBD	: Infectious Bursal Disease
ERK	: Extracellular Single Regulated Kinase
JNK	: c-Jun N-terminal Kinase
LPS	: Lipopolysaccharide
BALF	: Bronchoalveolar Lavage Fluid
etc.	: Etcetra
FAO	: Food and Agricultural Organization
HSTU	: Hajee Mohammad Danesh Science
%	: Percentage
MCP	: Monocyte Chemoattractant Protein
M.S	: Master of Science
i.e.	: That is
Fig.	: Figure
Gm	: Gram
ANOVA	: Analysis of Variance

NNTT	: Neem, Nishyinda, Tulsi, Turmeric
i.e.	: That is
J.	: Journal
Kg	: Kilogram
Lit	: Liter
Ltd.	: Limited
Mg	: Milligram
Ml	: Milliliter
mm^3	: cubic millimeter
No.	: Number
Vol.	: Volume
µg	: Microgram
%	: Percent
@	: At the rate of
<	: Less than
>	: Greater than
±	: Plus minus
0^oC	: Degree centigrade

CHAPTER I
INTRODUCTION

Poultry industry is a promising sector in Bangladesh. Poultry farming offers opportunities for fulltime or part-time employment, particularly for women, children or elderly person in the farm operations. Moreover, from the poultry industry biogas and organic fertilizer can be prepared .Bangladesh is a densely 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. (Hamid *et al.,* 2017).

Demand of protein of this booming population is a great threat for us. Weather of Bangladesh is very much friendly for poultry farming. There are so many sources of protein of birds. Quail meat is one of them. Because the duration of quail 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. Quail meat is popular to all of us and there is no religious restriction to consume. Quail meat contains more protein than the chicken (Ihejirikamba, 2012).

Quail farming in Bangladesh was started in 1992 and remained static for about one decade (1992- 2003) since its inception, thereafter, gradually increased till 2009 (highest in 2009) and gradually declined thereafter (Nasar *et al.,* 2016). The reasons might be outbreak of epidemics, faulty management systems, higher price of feeds, the higher incidence of different infectious diseases, and lack of veterinary care. (Das *et al.,* 2008; Rahman *et al.,* 2010; Siddiqui *et al.*, 1996). Majority of the farmers in Bangladesh have practiced mixed type quail farming. (Rahman *et al.,* 2016) reported that layer parent stock and broiler or meat type quail were only reared by 21.1%, 3.8% and 9.6% farmers, respectively. Mixed type quail farming is practiced worldwide because Japanese quails are suited for commercial rearing for egg and meat production under intensive management (Egbeyale *et al.,* 2013). This is because of their hardiness and ability to thrive in small cages (Odunsi *et al.,* 2007); the relative short generation interval and cheaper cost of production (Ojo *et al.,* 2014). In a recent study found that Japanese quail produce hatching egg weight ranges from 10 to 12 g, average body weight at 5-6 weeks is 180-200 g, and adult body weight is 200- 250 g. However, (Sultan *et al.,* 2013) reported that there might be a significant variation in all the laying parameters among different local and imported stocks of Japanese quails. The

domestic quail shows rapid growth and attains sexual maturity at 5-6 weeks of age. Nowadays, bobwhite strains are slaughtered at 5 weeks of age with a weight of 160-250g.

In our country, most of the broiler quail farms had an average size ranging from 5000-6000 birds/ farm and the average marketing age of these birds was 30 days (Rahman *et al.,* 2016). The average weight for broiler quail is 110-120 g at slaughter and 75-80 g after dressing. The female birds were heavier in weight than the male both at slaughter and after dressing. In a previous study, (Sultana *et al.,* 2016) found the highest weight of 162.5 g/quail and an average weight of 145.8 g/bird experimentally in Bangladesh with different dietary nutrients supplementation. In the poultry world, quail meat and egg production is negligible when compared to broilers and layer chicken. In addition, the global profile of production is quite different from the one of its larger relative (except for China). Besides, the sector does not seem to be experiencing any substantial and sustained growth, despite attractive marketing features of the meat. In Bangladesh, quail is not yet popular because of some unique characteristics such as; sensitive bird, cannibalism rate is very high; management is uncommon in the farmer level, high chick mortality, egg production peculiarity, low body and egg weight (Redoy *et al.,* 2017). Quail tend to be quite sensitive to daylight length. To get desired egg production from adult quail lighting system must be provided (Pizzolante *et al.,* 2006).

Quail birds are very sensitive to high salt level in the feeds. The optimum level of this mineral should be kept at 7% and in no case, be more than 7% (Nance 1965).Since the farmers use commercial chicken broiler or layer feed for feeding quail, certainly it does not match the exact nutrient requirements. So, it's an additional problem for imbalance nutrients requirement and availability.

Many forms of cannibalism occur in quail raised in captivity. Cannibalism comprises vent pecking, feather pecking, toe pecking, head pecking and nose pecking. The latter, which is the most common type of cannibalism among quail, is generally seen only in birds of two to seven weeks of age (Randall *et al.,* 2008). Cannibal birds peck at the top of the nose where the fleshy portion merges with the beak and the victim may die from loss of blood (Redoy *et al.,* 2017).

Quail is very small bird. Mature male and female are approximately 140 and 200 g. Japanese quail farming has enormous potentiality and could be an alternative to chicken farming

particularly in providing gainful employment, supplementary income and as a valuable source of meat and egg, quail farming should be encouraged and promoted in Bangladesh (Rahman *et al.,* 2010).

Although Japanese quails are comparatively more resistant to infectious diseases than chickens, like salmonellosis, coccidiosis, infectious coryza, enteric diarrhea, and pneumonia have etc. (Rahman *et al.,* 2010). So, no vaccination is given to quails. Any medicine that is given is administered through drinking water.

Quail meat is a sweet and delicate white game meat with extremely low skin fat and low cholesterol value. Ihejirikamba (2012) reported in his paper that quail meat was rich in micronutrients and a wide range of vitamins including the B complex, folate and vitamin E and K. Now a day the people are being more and more health conscious with emphasis given to low cholesterol meat. Compare to ruminants and other non-ruminant species chicken meat contained lower cholesterol. Quail meat is leaner than chicken meat. It is therefore recommended for people with high cholesterol levels and those who want to maintain a low level of cholesterol. (Schönfeldt *et al.,* 2013).

This business is a very lucrative business. Quail bird farming is five times better than chicken and turkey rearing, and a person with 400 quail laying birds is better off than a person with a person with 2000 laying chickens. Many people are interested to rear quail on commercial basis due to lower initial investment and risk rather than commercial broiler farming (Islam *et al.,* , 2014). Commercial quail production is established mainly for meat in Europe and for eggs in Japan (Minvielle, 1999). Meat type quails are marketed at about 4 weeks of age in China (Minvielle, 1999). The demand of commercial quail production is increasing day by day in the country (Islam *et al.,* 2014). Meat type quails are more popular than egg type quail production in Bangladesh (Rahman *et al.,* 2010).

According to our socio-economic situation, the knowledge of our farmer is very little because most of them are not properly trained for quail production, but unemployed young generation is coming in this business for short return of value and profit. Pharmaceutical companies take this advantage. They are convincing farmers for using antibiotics as a growth promoter or life savings for chicken. 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 causing serious human health hazards with drug residues. (Kamal *et al.,* 2015).

Due to the prohibition of most of antimicrobial growth promoters (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 have led to their prohibition for use in animal feed in the European Union (Cardozo *et al.,* 2004). Feed additives are added to the ration with the purpose of obtaining some special effects. The main objective of adding feed additives is to boost animal performance by increasing their growth rate, better-feed conversion efficiency, greater livability and lowered mortality in poultry birds. These feed additives are termed as "growth promoters" and often called as non-nutrient feed additives. 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. 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 and poultry feeding. So, scientists are again concentrating on the use of our ancient medicinal system to find beneficial herbs and plants, which can be safely used to increase the production. 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 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. Also these herbal growth promoters have shown to exert therapeutic Effects against liver damage due to feed contaminants like aflatoxin (Ghosh *et al.,* 1992).

Various herbal products are being used as growth promoters in the poultry rations like garlic (Ahmad, 2005). Medicinal plants are cheap and renewable sources of pharmacologically active substances and are known to produce certain chemicals that are naturally toxic to bacteria (Basile *et al.,* 1999). Neem tree as one of the most researched tree in the world has attracted world-wide prominence due to its vast range of medicinal properties like antibacterial, antiviral, antifungal, antiprotozoal, hepatoprotective and various other properties without showing any adverse effects (Kale *et al.,* 2003).

Nishyinda (*Vitex negundo* L.) is a hardy plant, flourishing mainly in the Indian subcontinent. It possesses phyto-chemical secondary metabolites, which impart a variety of medicinal uses.

The leaves of nishyinda may be applied locally to swellings from rheumatoid arthritis and sprains. The juice of the leaves is used for the treatment of foetid discharges. (Sultana *et al.,* 2016).

The principal constituents of the leaf juice are casticin, isoorientin, chrysophenol D, luteolin, p-hydroxybenzoic acid and D-fructose. Herbal agents could serve as safer alternatives as growth promoters due to lower cost, reduced toxicity and minimum health hazards. Biological trials of certain herbal formulations as growth promoter have shown encouraging results and some of the reports have demonstrated improved weight gain and feed efficiency, lowered mortality, and increased immunity and viability in poultry (Kumar, 1991). Some herbal growth promoters exert therapeutic effects against liver damage due to feed contaminants like aflatoxin (Ghosh, 1992). Polyherbal products promote growth and feed efficiency of birds because of their antibacterial and hepatoprotective properties (Wankar *et al.,* 2009).

Due to adverse side effects arising from the use of synthetic forms of growth promoters, consideration should be given to alternative natural supplements. neem and nishyinda leaves (*Azadirachta indica*, and *vitex negundo*) have been found to be rich source of active ingredients essential to the growth of farm animals. Also, they are relatively abundant. This study hereby investigates the combined effect of neem and nishyinda leaves supplementation on the growth performance and hematological parameter of quail.

Therefore, the present study was designed to know the effects of neem and nishyinda on growth performance with following objective:

1. To know the effects of neem and nishayinda supplement on body weight, feed conversion ratio in quail.
2. To determine the effects of neem and nishyinda leaves supplement on hematological parameter of quail.

CHAPTER II
REVIEW OF LITERATURE

This chapter present the review of relevant literature, which consist of the effects of neem and nishyinda leaves as a growth promoter in quail. Many researchers have been conducted researches in these topics .But very limited research work has been performed in case of quail.

Description of neem: Botanical Name: *Azadirachta indica*. The scientific or Latin family name derives from the Persian word "azaddhirak" which means precious wood. Azadirachta indica is sometimes confused with Melia azedarach (Chinaberry). The two species are closely related and have a similar medicinal effect. Other Common Names are Margosa, azadirachta, bead tree, holy tree, Indian lilac tree, nim tree, pride of China, nim (Hindi), nimba (Sanskrit), Neem des Indes (French), lila de la India (Spanish). The neem tree is believed to be originally native to Sri Lanka, India, Pakistan, and Burma.

It is now cultivated and has become naturalized in many other tropical countries including Malaysia, Indonesia, Australia and West Africa. It's not only grown for its medicinal applications but also as an ornamental tree, to provide shade and for fuel and timber. Neem is both drought resistant and can grow in poor soil, and it is highly resistant to pests and diseases. neem is a member of the Mahogany family or Meliaceae. It is a fast growing evergreen tree that can grow up to 15 meters in height. It has long branches that form a broad crown. The bark is gray and rough and the leaves are pinnate, up to 30 cm long with 8-19 leaflets with saw-toothed edges. The flowers are small, yellowish-white and fragrant and form in clusters. The fruit is round, hard and yellow and contains one single seed. The bark, leaves, seeds and the small branches are all used in herbal medicine. The oil obtained from the seeds (up to 50%) is also used medicinally. The oil from the seeds is often referred to as margosa oil. The leaves and bark have a bitter taste and are mostly used in tea form, often combined with other herbs such as spearmint and cinnamon. The flowers produce a nectar that can be used as a sweetener. The healing properties of neem are mainly due to some bitter substances, known as triterpenes (limonoids), with azadirachtin as one of the main active ingredients. In addition, neem contains beta-sitosterol, tannins, polysaccharides, flavonoids and essential oil.

Chemical composition of neem: Neem leaves are chemically composed of proteins, fibers, ether, ash and other compounds, Bonsu *et a.l*, showed that neem leaves contain Crude protein 15.8%, Crude fiber 14.6%, Ether extract 8.5%, Ash 4.5%, Moisture 13.0% and NFE 56.6%, These percentages vary from one place to another due to variations in nutrient composition of the soil where the neem plant is grown.

Uses of Neem:

Neem has a long record of safety to human and animal health and wide acceptability as an herbal medicine. Its use as a medicine is quoted in the ancient Ayurveda, the oral traditions of which have been traced back to 4000 BCE by scholars. It is one of the few trees that have withstood modern scientific scrutiny. Traditional plant based systems of medicine are primary sources of health care for close to 80% of the world's population (WHO Report, 2000). Given the global trend towards natural, herbal, alternative and complementary medicine, this figure will increase further. Neem boosts the immune system on all levels while helping the body fight infections even before the immune system is called into action. Unlike synthetic antibiotics, neem does not destroy the beneficial bacteria in the human body and other micro organisms needed to maintain optimum health. Every part of this fascinating plant is packed with anti-bacterial, anti-fungal, anti-viral, anti-histamine, anti-septic and immune stimulating compounds for treating hundreds of maladies. Neem offers a non-toxic alternative to powerful and sometimes damaging prescription medicines. It also has powerful skin rejuvenating qualities.

Plant materials in their natural or synthesized form are also present in substantial proportions in allopathic medicines and in a range of other products in health, beauty and 'wellness' business segment. Thus, apart from the health element and crucial livelihood options in rural areas, neem presents a large and growing commercial market as well. Therefore, increasing the number of neem trees to about 1 for every Bangladeshis would have a greater impact in improving public health, especially in the rural areas where health care facilities are minimal. Some other commonly known traditional treatments with neem, widely practiced in South Asia including Bangladesh, include the following:

Overall Health:

The cooling property of the neem bark is used to soothe exhaustion. Its antiseptic and astringent properties render it useful for healing wounds.

Skin care:

Neem's anti-bacterial and anti-allergic properties make it effective in tackling skin problems such as acne, psoriasis and eczema. In Ayurveda, epidermal problems were believed to be caused by raised sugar levels in the body and neem's bitter taste was said to balance out excess sugar. Scientists have recently discovered that alkaloids, nimbin and nimbidin found in neem leaves, have properties which make it effective in treating athelete's foot, ringwarm and yeast-like fungus infections. Traditional use involves crushing the leaves into a paste and applying directly to wounds or affected skin area. Virus Inhibition: As it has been seen to inhibit virus multiplication. Neem leaf concoctions are commonly used to treat chicken pox and measles. Neem leaves are boiled in hot water and used for bathing to soothe sores. Neem oil can also be used to soothe mosquito bites and mild burns.

Description of Nishyinda:

Vitex negundo, commonly known as the Chinese chaste tree, five-leaved chaste tree, or horseshoe vitex, is a large aromatic shrub with quadrangular, densely whitish, tomentose branchlets. It is widely used in folk medicine, particularly in South and Southeast Asia. *Vitex negundo* is an erect shrub or small tree growing from 2 to 8 m (6.6 to 26.2 ft) in height. The bark is reddish brown. Its leaves are digitate, with five lanceolate leaflets, sometimes three. Each leaflet is around 4 to 10 cm (1.6 to 3.9 in) in length, with the central leaflet being the largest and possessing a stalk. The leaf edges are toothed or serrated and the bottom surface is covered in hair. The numerous flowers are borne in panicles 10 to 20 cm (3.9 to 7.9 in) in length. Each is around 6 to 7 cm (2.4 to 2.8) inlong and are white to blue in color. The petals are of different lengths, with the middle lower lobe being the longest. Both the corolla and calyx are covered in dense hairs. The fruit is a succulent drupe, 4 mm (0.16 in) in diameter, rounded to egg-shaped. It is black or purple when ripe. *Vitex negundo* is native to tropical Eastern and Southern Africa and Asia. It is widely cultivated and naturalized elsewhere. Countries it is indigenous to include Afghanistan, Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Japan, Korea, Kenya, Madagascar, Malaysia, Mozambique, Myanmar,

Nepal, Pakistan, the Philippines, Sri Lanka, Taiwan, Tanzania, Thailand, and Vietnam. *Vitex negundo* are commonly found near bodies of water, recently disturbed land, grasslands, and mixed open forests.

Chemical composition of nishyinda : The principal constituents of the leaf juice are casticin, isoorientin, chrysophenol D, luteolin, p-hydroxybenzoic acid and D-fructose. The main constituents of the oil are sabinene, linalool, terpinen-4-ol, β-caryophyllene, α-guaiene and globulol constituting 61.8% of the oil.

Uses of Nishyinda:

It suppresses kappa vata, alleviates vata and relieves pain. It enhances intellect. Its paste when applied externally, relieves pain, cures oedema and swelling, and cleanses and heals ulcers and wounds. It is anthelmintic and kills worms and micro organisms. When used internally, it is anti-pyretic and cures bronchial asthma. It cures urinary problems and due to its warmth it is emmenogogue. It is anti- dermatoses and cures itching. It is anti- physical strength. It cures eye and nose related disorders and cures otorrhoea. Give 2-4 gm powder of its fruits, 2-3 times a day. It cures disorders of nasal passages and minds Grind its leaves and prepare cake of the paste and tie it on ear lobes. It cures headache. Use its decoction for gargles. It cures all the throat and mouth related disorders.

In case of boils in mouth, apply its oil on tongue, mouth and lips. Also mix oil in lukewarm water and keep this water in mouth for some time.

In case of sourness and swelling of throat, mix its oil in slightly warm water to gargle. It cures the throat problems. Use its oil on lips to cure the cracks and dryness of lips. In case of pus in ear, put 1-2 drops of its medicated oil mixed with honey, in the ear. Grind its paste and take its nasya. It cures multiondular tuberculosis. Tie its root in child neck. It causes early teething in the child. Boil its 20 gm leaves in 400 ml water till water is reduced to ¼. In the resulting decoction add 2 gm peepal powder and give 10-20 gm of this decoction to the patient, 2- 3 times a day. It cures fever, chronic rhintic and deafness. Boil its 10 gm leaves in 100ml water and give this to the patient every morning and evening. It cures fever, chronic rhinitis and arthritis. In case of swelling of the stomach caused by indigestion or accumulation of wind and stomach pain, give 10 ml juice of its leaves with 2 black peppers and ajowan, every morning and evening. It enhances the digestion power and relieves the

stomach pain. It helps to release the gas and cures swelling of the stomach caused by indigestion or accumulation of wind. In case of irregular or incomplete menstrual cycle give 2 gm powder of its seeds every morning and evening. It normalizes the menstrual cycle. In case of malaria fever if the liver of the patient enlarges, give 2 gm powder of nirgudi with 1 gm black myrobalan and 10 gm cow urine or give 2gm Nirgudi powder with 500mg black kutki and 500mg rasot, every morning and evening. In case of fever due to cough and swelling of lungs, give juice of its leaves or give decoction of its leaves with 1gm peeper powder mixed in it, to the patient.

Effects of Neem and Nishyinda leaves as growth promoters:

(Alam *et al.,* 2015) the efficacy of neem leaves powder as a growth promoter on the performance of broilers was determined in this study .Broiler chicks of 01day old were divided into four groups, I_0, I_1, I_2 and I_3 which were supplemented with neem leaf powder @ 0gm, 1gm, 2gm and 3gm/kg of broiler ration, respectively. Weekly observations were recorded for live body weight, weight gain, feed consumption, feed efficiency and blood parameters of birds for six weeks. All the treated groups I_1 (810.01±276.93), I_2 (850.06±264.50) and I3 (844.11±260.94) showed significantly ($P<0.01$) higher means for live body weight than that of control I_0 (768.69) group. The weekly weight gain, feed consumption and feed efficiency of all treated groups were non significant compared to that of control group. The study suggests the potential use of neem leaf powder to improve the growth of broiler

(Ahuja *et al.,* 2015) Vitex negundo (nirgundi, in Sanskrit and Hindi) is a deciduous shrub naturalized in many parts of the world. Some consider it to have originated in India and the Philippines. There is no reference to nirgundi in the Vedas, while several references occur in post-Vedic works. In India, the plant has multifarious uses: basketry, dyeing, fuel, food, stored-grain protectant, fi eld pesticide growth promoter, manure, as medicine for poultry, livestock, and humans. It is used in all systems of treatment–Ayurveda, Unani, Siddha, Homeopathy, and Allopathy. It is commonly used in folk medicine in India, Bangladesh, China, Philippines, Sri Lanka, and Japan. True to its meaning in Sanskrit (that which keeps the body free from all diseases), it is used to treat a plethora of ailments, ranging from headache to migraine, from skin affections to wounds, and swelling, asthmatic pains, male and female sexual and reproductive problems. Referred to as sindhuvara in Ayurveda, nirgundi has been used as medicine since ancient times. It is taken in a variety of ways, both

internally and externally. The whole plant, leaves, leaf oil, roots, fruits, and seeds are administered in the treatment of specifi c diseases. However, in Ayurveda, the leaves, roots, and bark are the most important parts. The present paper deals with the distribution and history of nirgundi, and its uses in rituals, religious rites, as an insecticide and as medicine. The paper also presents a scientific validation of its traditional agricultural uses as storage, fi eld, and household insecticide, as well as pharmacological evidences on its use in folk medicine and Ayurveda.

(Nodu *et al.,* 2016) was evaluate the Effect that neem leaf extract on growth, haematology and biochemical profiles and organs weight of broiler chickens to justify its inclusion in the diet of growing broiler chickens. 120 day old chicks divided into four treatment groups T_1, T_2, T_3 and T_4 of thirty (30) birds each were administered clean drinking water with 0g, 3g, 4g and 5g neem extract respectively. Impacts of neem extract treatments on growth indices suggested that neem extract favored growth with final body weight range of 2447 and 2620g. Organ weights showed no deviation from standard values for healthy broiler birds. Hematology and serum biochemistry values were in conformity with standards for healthy broiler birds. Birds on 3g of neem extract in their drinking water out performed birds in other treatments in assessed growth rate indices. We therefore conclude that 3g of Neem extract in their drinking water growing broiler birds encourages healthy growth and may serve as supplements for antibiotics, especially when birds are raised in areas with minimal access to veterinary service.

(Ezzat *et al.,* 2017) evaluate the use of herbs and medicinal plants to feed poultry has recently been used as a safe and natural material to stimulate the immune system, treating diseases or using them as catalysts of growth and thus positive impact on the productive performance of poultry. Recent reports have indicated that the use of antibiotics is prohibited many countries due to adverse effects on the health of the consumer as a result of the survival of the residues of these antibiotics in the tissues of the bird's body. The active compounds found in the neem plant have a wide and varied effects on human health as it is considered antibacterial, viruses, malaria, infections and antioxidants. The main objective of this study is to review the research currently under way on the neem plant, which is one of the most important medicinal and herbal plants.

(Ayoola *et al.,* 2015) was conducted a feeding trial for 56 days to investigate the effect of neem (*Azadirachta indica*) leaf meal on the growth performance and carcass traits of broiler chickens. The neem leaf meal was used in replacing parts of wheat offal in the diets of 192 day-old broiler chickens fed ad libitum at 0.1, 0.2 and 0.3% levels of inclusion. The experimental birds were randomly distributed into four treatments. Each treatment was sub-divided into three replicates of sixteen (16) birds. Medications were administered only to the birds in treatment 1(control group) while vaccination was administered across the treatment during the course of the experiment. Growth parameters were taken on weekly basis and data obtained were subjected to one way analysis of variance (ANOVA) in a completely randomized design. There was a significant ($P<0.05$) effect of varying dietary inclusion of NLM only on average weight gain among the birds at the starter phase. Groups fed 0.3% NLM recorded the highest average weight gain (430.63g) as against 421.00, 392.57 and 394.97g recorded for the control, 0.1% and 0.2% NLM groups, respectively. Neem leaf meal had nosignificant ($P<0.05$) effect on broiler performance at the finisher phase across the treatment groups. Mortality was not affected ($P>0.05$) at any of the growth phases. Carcass traits; cut- parts (except neck) and organs showed no influence ($P>0.05$) of NLM inclusion. It can then be recommended that the neem leaf meal inclusion up to 0.3% in the diets of the broiler chickens can be used as growth promoters during the chick phase of growth.

(Alam *et al.,* 2014) was aimed at knowing the effect of polyherbal extracts {neem (N), nishynda N), tulsi (T) and turmeric (T) i.e. NNTT} as growth promoter at the (i) growth performance of broiler and on the (ii) dressing percentage, relative weight of heart, gizzard, liver, spleen and pancreas of the broiler. A total of 50 day-old broiler chicks were purchased from kazi farms limited and randomly divided in two groups, viz., A and B. Group A served as control and was without any supplementation in drinking water. Whereas group B were supplemented with 1ml of polyherbal (NNTT) extracts per liter drinking water. Live body weight was recorded at on 7th day and the final weight was recorded on 42nd day, total feed consumption, feed efficiency and blood parameters of birds were recorded on 21st day and on 42nd day. The treatment groups i.e. B (1700±51.73) recorded significantly ($P<0.05$) higher means for live body weight than that of control group A (1600±31.23). The birds in group B supplemented with 1ml polyherbal extracts gained the highest live weight among the treated groups and showed the best feed conversion ratio (1.85). It is, therefore, concluded that dietary inclusion of polyherbal (NNTT) extracts in the drinking water may be used for economical and efficient production of broiler.

(Rahman *et al.,* 2014) an extract of nishyinda *(Vitex negundo)* leaves, black pepper *(Piper nigrum)* and cinnamon *(Cinnamomum verum)* (polyherbal extract) were used as growth promoter in broilers. A total of 20 day-old broiler chicks were purchased and after seven days of acclimatization randomly divided into two equal groups. No vaccination schedule was practised and no antibiotics were added in rations. Group A served as control while group B was supplemented with polyherbal extract 1 mL/litre in drinking water. Weekly body weight gain up to six weeks was measured and blood tests were performed at 21 and 42 days. Polyherbal extract significantly ($P<0.05$) improved weight gain. There was no change in haematological parameters. It can be concluded that the polyherbal extract was safe as a growth promoter in broiler production without adverse effects on chicken health.

(Sultana *et al.,* 2016) was conducted to evaluate the efficacy of neem (*Azadirachta indica*) leaf, nishyinda (*Vitex nogundo*) leaf and Turmeric rhizome (*Curcuma longa*) powdered supplementation in drinking water as a growth promoter in broiler chickens. A total of 40 day-old Cobb 40 broiler chicks were purchased from local hatchery (Nourish Poultry & Hatchery Ltd.) and after seven days of acclimatization chicks were randomly divided into two groups, A and B. The group A was kept as a control and not treated. The group B was supplemented with neem, nishyinda leaves and Turmeric dried powder with feed and water. Weekly observations were recorded for live body weight gain up to 5 weeks and hematological tests were performed at 7 and 35 day's age of broiler to search for hematological change between control (A) and treatment (B) groups. The initial body weight of groups A and B on 7day of this experiment were 130±4.35 gm, respectively and after 35day of experiment final body weight were 150±47.35 gm and 1600±58.56 gm, respectively; the net body weight gain were 1320±43.79 gm and 1470±54.25 gm, respectively and economics of production were analyzed and found that net profit per broiler was Tk. 17.24 and Tk. 30.00, respectively. The treatment group B was recorded statistically significant (at 1% level) increase for live body weight than that of control group A. The hematological difference, while Hb. estimation does not show significant difference from control group. The results suggest that better growth performance could be achieved in broilers supplemented with neem, nishyinda leaves and Turmeric rhizome extract.

(Sarker *et al.,* 2014) the study was conducted to determine the efficacy of aqueous extract of neem leaves against colibacillosis and as a growth promoter in broilers. A total of 40 commercial day-old broiler chicks were randomly divided into four equal groups; viz. A, B,

C and D. Group A was kept as non-treated control, Group B and C was treated with 1% neem leaves in drinking water for six weeks, and colibacillosis was induced at 2nd week in group C and D. In group D, neem leaves treatment continued from 2nd to 6th week after the colibacillosis induction to compare its antibacterial efficacy to prophylactic effect. *Escherichia coli* induction rate was 200µl per bird where 1 ml contains approximately 1X106 CFU (Colony Forming Unit). Data were recorded for live body weight, weekly gain in weight and hematological parameters of birds for six weeks. Clinical examination and antibacterial sensitivity studies suggests administration of aqueous extract of neem leaves significantly ($p<0.001$) improved body weight gain in the neem treated groups but did not prevent *E. coli* induced colibacillosis in broilers.

(Wankar *et al.,* 2009) A experiment was conducted on 120 day old broiler chicks divided into four groups, T_0, T_1, T_2 and T_3 which were supplemented with neem leaf powder @ 0gm, 1gm, 2gm and 3gm/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 T_1 (813.03), T_2 (855.07) and T_3 (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 nonsignificant increase in weekly gain in weight, feed consumption and feed efficiency as compared to that of control group.

(Molla *et al.,* 2012) an extract of nishyinda (*Vitex negundo*) leaves, black pepper (*Piper nigrum*) and cinnamon (*Cinnamomum verum*) (polyherbal extract) were used as growth promoter in broilers. A total of 20 day-old broiler chicks were purchased and after seven days of acclimatization randomly divided into two equal groups. No vaccination schedule was practised and no antibiotics were added in rations. Group A served as control while group B was supplemented with polyherbal extract 1 ml/litre in drinking water. Weekly body weight gain up to six weeks was measured and blood tests were performed at 21 and 42 days. Polyherbal extract significantly ($P<0.05$) improved weight gain. There was no change in haematological parameters. It can be concluded that the polyherbal extract was safe as a growth promoter in broiler production without adverse effects on chicken health.

(Mahejabin *et al.,* 2015) the study was conducted to determine the efficacy of mixture of neem, turmeric and papaya leaf extract on growth performances of broilers. A total of 40 days-old broiler chicks, after 7 days acclimatization, were randomly divided into two equal

groups. Group A (n=20) was reared as control group with normal feed and water, while group B (n=20) was supplemented with 2% neem, turmeric and papaya leaf extract @ 1 ml per liter of drinking water. No vaccination schedule was practiced and no antibiotics were added in rations. Weekly observations were recorded for live body weight, weekly gain in weight, weekly feed consumption and feed efficiency and blood parameters of birds for five weeks. Body weight in the treatment group was significantly increased ($P<0.05$). However, there was no significant difference in the blood parameters (TEC, Hb, PCV, ESR) between treatment and control groups. Supplementation of neem, turmeric and papaya leaf extract in the treatment group caused improvement in the feed efficiency as compared to that of control group. Treated birds had higher body weight, weekly gain in weight, feed consumption and feed efficiency. These results may be due to antimicrobial and anti-protozoal properties of neem, turmeric and papaya leaf extract which help to reduce the microbial load of birds and improved the feed consumption and feed efficiency of the birds. The study suggests that these medicinal plants may be used as an alternative to antibiotic growth promoters.

(Kamal *et al.,* 2015) The experiment was conducted to evaluate the efficacy of neem (*Azadirachta indica)*, nishyinda (*Vitex nogundo*) and Papaya (*Carica papaya*) leaves powdered supplementation in drinking water as a growth promoter in broiler chicks. A total of 40 day-old Cobb 500 broiler chicks were purchased from local hatchery (Nourish Poultry & Hatchery Ltd.) and after seven days of acclimatization chicks were randomly divided into two groups, A and B. The group A was kept as a control and not treated. The group B was supplemented with neem, nishyinda and Papaya dried leaves powder with feed and water. Weekly observations were recorded for live body weight gain up to 6th weeks and hematological tests were performed at 17^{th} and 35^{th} day's age of broiler to observe hematological changes between control (A) and treatment (B) groups. The initial body weight of groups A and B on 7^{th} day of this experiment were 140±3.56 gm and 140±4.35 gm, respectively and after 35^{th} day of experiment final body weight were 1450±47.35 gm and 1650±58.56 gm, respectively; the net body weight gain were 1310±43.79 gm and 1510±54.25 gm, respectively and economics of production were analyzed and found that net profit per broiler was Tk.24.21 and Tk.34.78, respectively. The body weight was significantly increased ($p<0.01$) in treatment group compared to control group A. The TEC, ESR and PCV value of treatment group showed significant difference ($P<.05$), while Hb estimation did not show significant difference in control group. The results suggest that better growth performance could be achieved in broilers supplemented with neem, nishyinda and Papaya extract.

(Adeyemo *et al.,* 2012) a study was designed to investigate the combined effects of neem and pawpaw leaves supplementation on performance and carcass characteristics of broiler chickens from 14–56 days of age. 360 of one day-old unsexed Arbor acre broiler chickens were randomly allotted to the following diets T_1 (0% leaf meal), T_2 (0.5% NLM), T_3 (2% PLM), T_4 (0.5% NLM+PLM), T_5 (1% NLM+PLM) and T_6 (2% NLM+PLM). Results obtained from the study indicated that supplementation of NLM and PLM improved the dressing percentages, the highest values of 89.29% and 87.55% were obtained for birds on T_5 and T_6 respectively which were significantly different ($p<0.05$) when compared with the value obtained from which was 76.83%. The eviscerated weight differs significantly across the treatments, birds on T_5 and T_6 had significantly better ($p<0.05$) results of 76.93% and 75.85% respectively compared to treatments 4 and 5 which had 69.33% and 73.13% respectively. Body weight gain, feed consumed and feed conversion ratio of the broiler chickens improved in the treatments fed diets supplemented with leaf meal although and there were no significant ($P>0.05$) differences.

(Mostofa *et al.,* 2014) the study was conducted to determine the efficacy of aqueous extract of neem leaves against colibacillosis and as a growth promoter in broilers. A total of 40 commercial day-old broiler chicks were randomly divided into four equal groups; viz. A, B, C and D. Group A was kept as non-treated control, Group B and C was treated with 1% neem leaves in drinking water for six weeks, and colibacillosis was induced at 2nd week in group C and D. In group D, neem leaves treatment continued from 2nd to 6th week after the colibacillosis induction to compare its antibacterial efficacy to prophylactic effect. Escherichia coli induction rate was 200 µl per bird where 1 ml contains approximately 1X10 6 CFU (Colony Forming Unit). Data were recorded for live body weight, weekly gain in weight and hematological parameters of birds for six weeks. Clinical examination and antibacterial sensitivity studies suggests administration of aqueous extract of neem leaves significantly ($p<0.001$) improved body weight gain in the neem treated groups but did not prevent E. coli induced colibacillosis in broilers.

(Khatun *et al.,* 2013) the efficacy of tulsi (*Ocimum sactum*) and neem (*Azadirachta indica*) leaves extract as a growth promoter were studied in broiler. A total of 40 day-old broiler chicks were purchased from Kazi hatchery and after three days of acclimatization the chicks were randomly divided into four groups (n=10). No vaccination schedule was practiced and no antibiotic was added in ration of group A, B, C, and D respectively. Group A served

control without any supplements while group B, C and D were supplemented with combination of Tulsi and neem extract @ 1 ml, 2ml and 3 ml/liter of drinking water. Live body weight gain was recorded weekly up to 6th weeks and hematological studies were performed at 21st and 42nd day of experiments. At the end of 42nd day of experiment final body weight of group A, B, C and D were 1561± 12.10 g, 1698± 12.87 g, 1608± 12.04 g and 1763± 13.28 g, respectively. The birds of group D utilized their feed more efficiently among the treatment groups ($p<0.05$). The net body weight gain were, 1533± 11.98 g, 1443± 11.32 g and 1588± 12.10 g in treated groups compared to control group (1393± 11.07 g) and total net profit per broiler was 19.08, 40.10, 20.68 and 45.07 Taka , respectively. Hematological parameterss (TEC, PCV, Hb and ESR) were not significantly changed among the treated and control group suggesting no side effects of herbal extracts in broiler. It can be concluded that tulsi and neem extract is economic and safe in broiler production.

(Nayaka *et al.,* 2013) An experiment was conducted to study the efficiency of inclusion of neem, turmeric, vitamin E and its combinations on performance and hematological parameters for a period of six weeks with 288 day old Raja II broiler chicks. Basal diet was supplemented with *Azadirachta indica* (Neem 8g/kg feed), Curcuma longa (Turmeric 2g/kg feed) and Vitamin E 0.2g/kg feed) individually and in combination to form eight test diets. Each test diet was fed ad libitum for 42 days. The result of the present stumdy identified no significant difference in body weight of chicks fed with supplemented diets. Whereas, addition of either neem alone or in combination with turmeric and vitamin E induced significant growth depression in birds compared to control birds. Supplementation of neem, turmeric, Vitamin E and their combinations in broiler diets did not exhibit any significant effect on feed intake and feed conversion ratio during all the weeks of age. The percentage livability of birds under different treatments was statistically non-significant. Hematological parameters in broilers revealed that the hemoglobin concentration in neem fed group was significantly ($P<0.05$) higher (10.5 g/dL) when compared to turmeric fed group (9.85 g/dL), otherwise diet containing turmeric alone recorded lowest value of hemoglobin. Feeding of neem alone and its combination with turmeric and vitamin E increases significantly PCV values as compared to control. The supplementation of turmeric or vitamin E alone to basal diet did not significantly change PCV values.

(Singh *et al.,* 2015) The present work aimed at studying growth pattern and carcass traits in pearl grey guinea fowl fed on dietary neem (*Azadirachta indica*) leaf powder (NLP) over a

period of 12 weeks. Day old guinea fowl keets (n=120) were randomly assigned to four treatment groups, each with 3 replicates. The first treatment was designated as control (T_0) in which no supplement was added to the feed, while in treatments T_1, T_2 and T_3, NLP was provided as 1, 2 and 3 g per kg of feed, respectively. The results revealed a significant increase in body weight at 12 weeks; 1229.7 for T_1, 1249.8 for T_2, and 1266.2 g T_3 compared to 1220.0 g for the control group ($P<0.05$). The results also showed that the supplementation of NLP significantly increased feed intake (P□0.05) which might be due to the hypoglycaemic activity of neem. A significant increase was also found in the feed conversion ratio (FCR) of the treated groups over the control, showing that feeding NLP to the treated groups has lowered their residual feed efficiency. The results of the study demonstrate the beneficial effects of supplementing NLP on body weight gain and dressed yield in the treated groups in guinea fowl. NLP is, therefore, suggested to be used as a feed supplement in guinea fowl for higher profitability.

(Fatema *et al.,* 2014) this study was conducted to determine the efficacy of neem leaves (N), Ginger (G) and Black pepper (BP) NGBP extract as a growth promoter in broilers. A total of 20 day old broiler chicks were purchased from Kazi Farms and after seven days divided into two groups A and B. No vaccination schedule was practiced and no antibiotics were added in ration. The A group was not supplemented with NGBP extract in drinking water. The B group was supplemented with NGBP extract @ 1ml/litre in drinking water for consecutive 5 weeks started from 7th day of experiment. The FCR value in Group A was 1.89 and in group B was 1.88 as a result it indicated that NGBP extract played vital role to protect mortality in Group B. From this initial study this may be concluded that production of broilers in by using NGBP extract was economic than control group. In Bangladesh broilers production is mainly organized by unemployed and its demand is very high because it supports marketing within 35 – 42 days. Short return of money but major problems is cost of production. The treatment group B recorded statistically non- significant for live body weight at 1st and 2nd weeks than that of control group A but found statistically significant at 3rd ($p<0.01$), 4th ($P<0.05$) and 5th ($P<0.01$) weeks of age and the Hematological parameters (TEC, PCV, Hb, ESR) showed statistically significant ($p<0.01$) difference as compared to control A group.

(Unigwe *et al.,* 2016) A ten-week experiment using twenty four (24) weaner rabbits (Chinchila x New Zealand White) aged 8 to 9 weeks with an average initial body weight of 431.20+0.74g were randomly allocated to four treatment diets of T_1 (control), T_2 (5% NLM),

T_3 (10% NLM) and T_4 (15% NLM) in a completely randomized design. They were fed for 10 weeks during which data on growth and haematology were collected and analysed using analysis of variance (ANOVA) and means separated using Duncan Multiple Range Test. The results showed that the average total body weight gains were 739.60g (T_1), 717.85g (T_2), 740.18g (T_3) and 729.45g (T4).There was no significant difference ($p>0.05$) when T_1 and T_3 as well as T_2 and T_4 were compared but significant ($p<0.05$) when T_1 and T_2 as well as T_3 and T_4 were compared. Also the average weekly feed intake showed that T_1, T_2, T_3 and T_4 consumed 313.91g, 313.24g, 312.48g and 314.69g respectively. However, there was significant difference ($p<0.05$) when all the treatments were compared in this respect. The feed conversion ratio (FCR) showed that T3 (4.22) was the best followed by T_1 (4.24), T_4 (4.31) and T_2 (4.36) with significant differences ($p<0.05$) among them except ($p>0.05$) between T_1 and T_3. The haematological indices showed that though all the parameters fell within the normal physiologic ranges, the Packed Cell Volume was 37.62% (T_1), 38.42% (T_2), 39.60% (T_3) and 39.03% (T_4) and when compared, were all significantly different ($p<0.05$) except ($P>0.05$) for T3 and T4 while the haemoglobin concentration showed that T_1 (13.47g/dl) was significantly different ($p<0.05$) from T_2 (14.18g/dl), T_3(14.34g/dl), and T_4 (13.97g/dl). The white blood cell count showed that T_3 (10.62 x109/L) had the highest value followed by T_1 (10.12 x109/L), T4 (9.34 x109/L) and T_2 (9.18 x109/L) with a significant difference ($p<0.05$) occurring when T_1 and T_3 were compared to T_2 and T_4 while the red blood cell counts indicated that T_1 had the highest value of 4.92 -52- x106/L followed by T_3(4.89 x106/L), T_2 (4.73 x106/L) and T_4 (4.65 x106/L) without any significant difference among the treatments. All the values fell within the normal range. It is therefore recommended that inclusion of neem leaf meal in the diets of rabbits up to 10% is not detrimental since it improved feed conversion ratio (FCR), growth performance and had no negative effect on haematological values.

(Bwana *et al.,* 2016) the study was designed to investigate the role of aqueous suspensions of Neem *(Azadirachta indica)* and Stinging Nettle *(Urtica dioica)* powders fed in drinking water on the growth performance of indigenous chicken. Twelve indigenous chicks were randomly allocated into three groups 1, 2 and 3, each consisting four chicks. All the birds were raised in deep litter for 14 days before transfer into individual cages. Group 1 and 2 were treated with aqueous suspensions of neem and Stinging Nettle powders respectively in drinking water while Group 3 served as control and was given pure water *ad lib.* The neem and Stinging Nettle powders were reconstituted at a rate of 10g/litre of water, boiled, filtered and fed in

their crude forms. The experiment lasted 8 weeks. Weekly weights were measured and used as the response parameters for growth. Differences in mean weights between groups were compared using student's t-test and $p<0.05$ was considered statistically significant. Higher numerical weight gains were found in the neem group (510.75g at 64g/week) compared to the Stinging Nettle group (483.25 at 60g/week). There was however no significant difference ($P>0.05$) between the mean weekly weights of the neem and Stinging Nettle groups. The present findings suggest that neem supplementation in routine diets of indigenous chicken offer better prospects of enhancing the productivity of indigenous chicken in Kenya.

(Shyma *et al.,* 2013) he present study was performed to evaluate the potential of four herbal preparations namely *Withania somnifera, Tinospora cordifolia, Azadirachta indica* and E Care Se Herbal against the haematological effects of chicken infectious anaemia virus (CIAV) in chicks and their live body weight gains. Briefly, six experimental groups (A to F), containing fifteen chicks each, were treated with herbal preparations separately from day old age. The chicks of Groups A to D were fed with *W. somnifera* (1% pure extract), *T. cordifolia* (1% pure extract), *A. indica* (0.2% pure extract) and E Care Se Herbal (0.1% in drinking water), respectively, while groups E and F were kept as virus positive and control group, respectively. Groups A to E were given infection with 40 times 50% chicken infectious dose (CID50) of CIAV A strain intra- muscularly on 14th day of age. Haematological parameters and body weight of the chicks of all the groups were recorded at weekly intervals for up to 10 weeks. The chicks of herbal treatment groups (A-D) showed significant improvement in their mean body weight gain and haematological indices viz., packed cell volume, haemoglobin level total white blood cell, red blood cell and percentage lymphocyte counts, when compared with the virus infected group (E). In conclusion, the prophylactic /therapeutic application of these herbal preparations is suggested to combat depressed haematological parameters and stunted growth in chicks during CIAV infection. Further explor above studies would strengthen the potential role of herbs against this economically important avian pathogen causing huge economic losses to poultry farmers.

(Feroza *et al*., 2017) Experiment was carried out to assess the efficacy of ethanolic extract of papaya (*Carica papaya*) and neem (*Azadirachta indica*) plant seeds on *Ascaridia galli* infectivity in broiler chicken. A total of eighteen broiler birds were randomly selected that were divided into three groups (A, B and C) with 6 birds in each group. The birds were then artificially infected with *Ascaridia galli* @ 2000 eggs/bird. Ethanolic extracts of papaya and

neem were applied to Group B and C, respectively while Group A was left untreated that served as control. The fecal egg count (FEC) was conducted on weekly basis. The pre-treatment values of FEC in all the groups found negative from day 0 to 14 after artificially inducing infection. On day 21st, the FEC pretreatment values in group A, B and C were recorded as 1424.5, 1346.3 and 1806.4, respectively. The FEC post treatment values of groups B and C were significantly (P>0.05) decreased as compared to the control (group A). However, no significant difference was observed between group B and C. It was concluded that the ethanolic extract of both the papaya and neem was effective in controlling the *Ascaridia galli* infection in chicken. However, papaya extract was found more effective than Neem.

(Ravva *et al*., 2015) *Escherichia coli* O157: H7 (EcO157) shed in cattle manure can survive for extended periods of time and intervention strategies to control this pathogen at the source are critical as produce crops are often grown in proximity to animal raising operations. This study evaluated whether neem (*Azadirachta indica*), known for its antimicrobial and insecticidal properties, can be used to amend manure to control EcO157. The influence of neem materials (leaf, bark, and oil) on the survival of an apple juice outbreak strain of EcO157 in dairy manure was monitored. Neem leaf and bark supplements eliminated the pathogen in less than 10 d with a D-value (days for 90% elimination) of 1.3 d. In contrast, nearly 4 log CFU EcO157/g remained after 10 d in neem-free manure control. The ethyl acetate extractable fraction of neem leaves was inhibitory to the growth of EcO157 in LB broth. Azadirachtin, a neem product with insect antifeedant properties, failed to inhibit EcO157. Application of inexpensive neem supplements to control pathogens in manure and possibly in produce fields may be an option for controlling the transfer of food borne pathogens from farm to fork.

(Alzohairy *et al.,* 2016) NEEM (*Azadirachta indica*) is a member of the Meliaceae family and its role as health-promoting effect is attributed because it is rich source of antioxidant. It has been widely used in Chinese, Ayurvedic and Unani medicines worldwide especially in Indian Subcontinent in the treatment and prevention of various diseases. Earlier finding confirmed that neem and its constituents play role in the scavenging of free radical generation and prevention of disease pathogenesis. The studies based on animal model established that neem and its chief constituents play pivotal role in anticancer management through the modulation of various molecular pathways including p53, pTEN, NF-κB, PI3K/Akt, Bcl-2,

and VEGF. It is considered as safe medicinal plants and modulates the numerous biological processes without any adverse effect. In this review, I summarize the role of *Azadirachta indica* in the prevention and treatment of diseases via the regulation of various biological and physiological pathways.

(Kulkarni *et al.,* 2008) Reactive oxygen species are implicated in various inflammatory disorders. *Vitex negundo* is mentioned in Ayurveda as useful in treating arthritic disorders. The present work was undertaken to evaluate the antioxidant potential and anti-inflammatory activity of the plant. The total methanol extract of the plant was standardized in terms of total polyphenols. The standardized extract in a dose of 100 mg/kg caused a comparable reduction in edema with that of diclofenac sodium (25 mg/kg) when evaluated for antiinflammatory activity by carrageenan-induced rat paw edema method. The extract also exhibited a strong free radical scavenging activity by 1,1-diphenyl-2-picrylhydrazyl method and caused a significant reduction in the formation of thiobarbituric acid reacting substances when evaluated for its lipid peroxidation inhibitory activity. The results strongly suggest that radical quenching may be one of the mechanisms responsible for its anti-inflammatory activity.

(Durrani *et al.,* 2008) A research study was conducted to investigate growth promoting and immunomodulatory effects of neem leaves' infusion on broilers at the NWFP Agricultural University, Peshawar, Pakistan during June and July. One hundred and sixty day-old chicks were randomly divided into four groups, designated as A, B, C and D. Each group was replicated four times with 10 chicks per replicate, reared in open sided house. Birds of group A, B and C were given 4% concentrated Neem leaves' *(Azadirachta indica)* infusion @ of 30ml, 40ml and 50ml L-1 of fresh drinking water respectively, and group D was kept as control. Mean feed and water intake were higher ($P<0.05$) in control group as compared to others. Group C exhibited better ($P<0.05$) mean body weight gain, feed conversion ratio (FCR) and dressing percentage. Although, weight of giblet and other body organs (thigh, leg, intestine and abdominal fat) were same, significantly ($P<0.05$) higher mean breast weight was recorded in group C than in other groups. Mean feed cost was significantly higher for group D than A, B and C. Mean gross return for group C was significantly higher than other groups. Significantly ($P<0.05$) higher mortality was observed in group D as compared to group A, B and C. Mean antibody titer against Infectious Bursal Disease (IBD) virus for group C was significantly ($P<0.05$) higher than rest of three groups. It was found that Neem *(Azadirachta*

indica) infusion successfully improved antibody titer, growth performance and gross return at the level of 50 ml/liter of fresh drinking water.

(Redoy *et al.,* 2017) the aim of this paper is to review the current status of quail production, problems and its future prospects in Bangladesh. Poultry industry is an important sub-sector of livestock production in Bangladesh that plays a crucial role in economic growth and simultaneously creates numerous employment opportunities. As a fundamental part of animal production in Bangladesh, the industry is committed to supplying nation with a cheap source of good quality nutritious animal protein in terms of meat and eggs. Approximately 25% of the protein consumed in Bangladesh originates from poultry. Despite this data, Bangladesh is still one of the lowest poultry meat consuming countries in the world. Here per capita meat consumption is only 1.2 kg per person per year and per capita egg consumption is also about 32 eggs per person per year. With increasing incomes, the demand for meat, especially the cheaper option of poultry meat, and eggs is set to rise. More importantly, quail becomes a promising poultry species in Bangladesh due to their smaller body size, hardiness against common chicken diseases, easy management, quick return over the invest, less labor cost and investment required for the farming. But still now the rearing quail is not yet popular like chicken farming due to poor marketing channel, subsistence farming, lack of specialized feed, lack of available day-old chicks, high chick mortality etc. Scientific feeding, training to the farmers about their management, creating organized marketing channel will be the probable solution for vitalizing this species in Bangladesh.

(Lee *et al.,* 2017) Neem (Azadirachta indica A. Juss.) leaf has been reported to exert anti-inflammatory, antibacterial and antioxidant effects. The purpose of this study was to investigate the protective effects of neem leaf extract (NLE) against cigarette smoke (CS)- and lipopolysaccharide (LPS)-induced pulmonary inflammation. Treatment with NLE significantly attenuated the infiltration of inflammatory cells, such as neutrophils and macrophages in bronchoalveolar lavage fluid (BALF). NLE also reduced the production of reactive oxygen species and the activity of neutrophil elastase in BALF. Moreover, NLE attenuated the release of pro-inflammatory cytokines, such as tumor necrosis factor-α (TNF-α) and interleukin (IL)-6 in BALF. NLE inhibited the recruitment of inflammatory cells and the expression of monocyte chemoattractant protein-1 (MCP-1) in the lungs of mice with CS- and LPS-induced pulmonary inflammation. NLE also decreased the expression of inducible nitric oxide synthase (iNOS) in the lungs of the mice CS- and LPS-induced pulmonary

inflammation. Furthermore, treatment with NLE significantly attenuated the activation of extracellular signal-regulated kinase (ERK) and c-Jun N-terminal kinase (JNK) in the lungs mice exposed to CS and LPS. NLE also inhibited the phosphorylation of nuclear factor (NF)-κB and inhibitor of NF-κB (Iκ B) in the lungs of mice expose to CS and LPS. These findings thus suggest that NLE has potential for use in the treatment of chronic obstructive pulmonary disease.

(Panda *et al.,* 1990) the technological advances in the processing and preservation of quail eggs and meat, evaluation of their nutritive values and development of further processed products there from are reviewed. The review of egg and egg products covers the physical and chemical composition of eggs, the influence of age and season on egg quality, storage stability of shell eggs and further processed products including pickled and brined eggs. Aspects concerning optimal slaughter age of quails and their processing, yields of carcass and meat, abdominal fat, nutrient composition, preservation and further processed meat products like pickled, tandoori (roasted), fried and smoked quail are also highlighted in this paper.

CHAPTER III
MATERIALS AND METHODS

The experiment was conducted in research shed under the department of Physiology and Pharmacology, Hajee Mohammad Danesh Science & Technology University, Dinajpur. The duration of experiment was 28 days. The total number of 40 quails were randomly selected and divided into 4 groups (T_0, T_1, T_2 and T_3) at completely randomized design for assessing the effects of neem and nishyinda leaves supplement on growth performance and hematological parameter of quail. Group T_0 were kept as control. Group T_1, T_2 and T_3 were fed 2% neem, 2% nishyinda, 2% (neem + nishyinda) leaves powder supplement in feed respectively.

Layout of the experiment

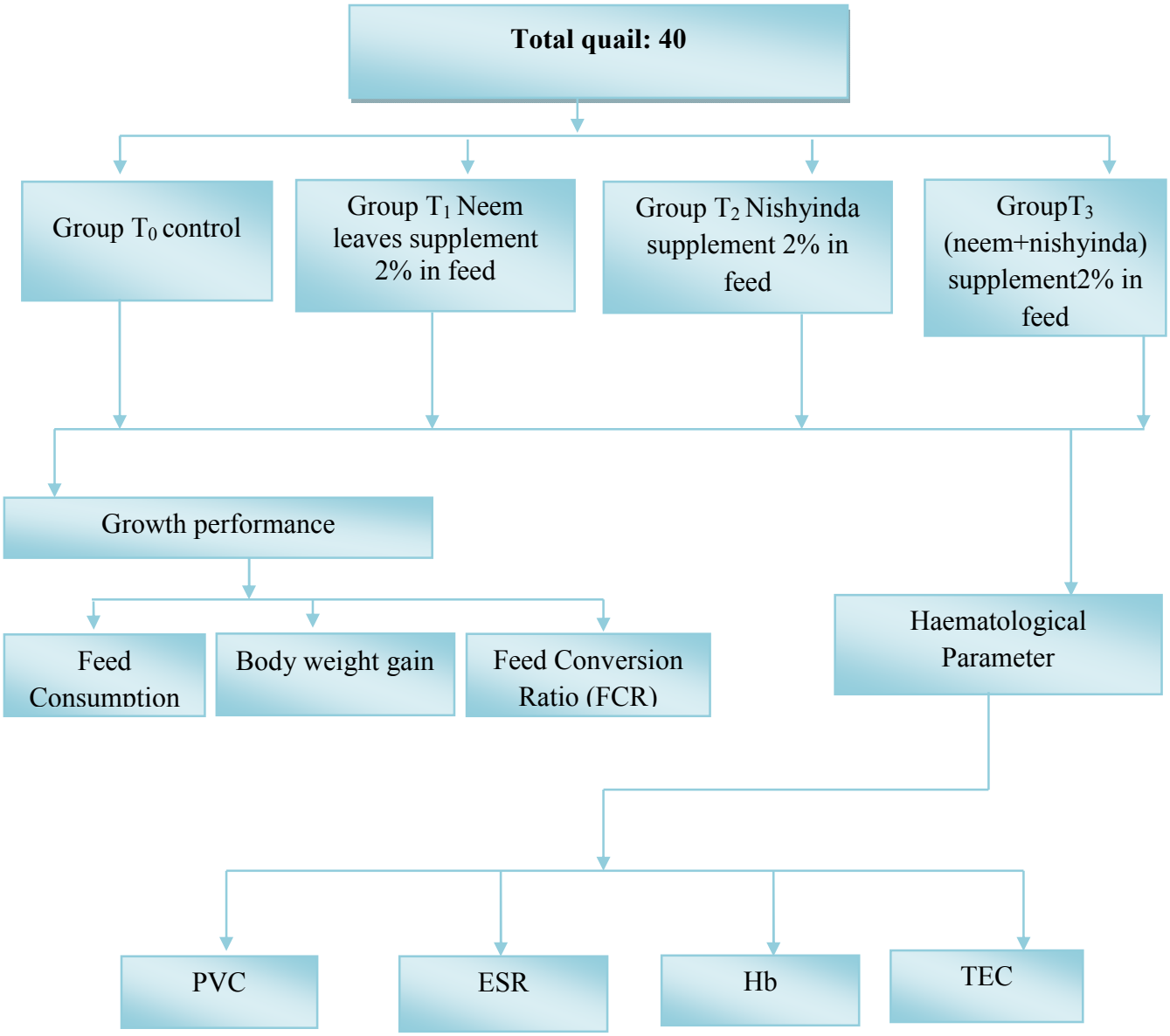

Figure 1: Layout of the experimental design

3.1 Collection and management of quails

At 14th days of age, Japanese quails were collected from Abdul Hakim quail hatchery, Gaibandha. The body weight of assigned quails were taken with digital balance and data were recorded. The finally selected 40 quails were housed under normal husbandry condition and reared quail in cage. All of them were fed with commercial crumbled plus mesh quail feed (Bangla feed mill) and fresh water.

Composition of commercial feed:

Crude protein (g/kg) -200

ME (MJ/kg) -12.76

ME to CP rations (MJ^{g-1}) -0.06

Fat (g/kg) -25

Fiber (g/kg) -50

Moisture (g/kg) -120

Calcium (g/kg) -12

Phosphorus (g/kg) -6

Lysine (g/kg) -12

Figure 2: Collection and management of Japanese quail in experimental shed

3.2 Measurement of body weight

The body weight of each quail measured with the help of digital balance.

Figure 3: Measurement of body weight of experimental quail

3.3 Collection of neem and nishyinda leaves

Neem and nishyinda leaves were collected from Basherhat, Dinajpur.

Figure 4: Collection and processing of nishyinda plant *(Vitex nigundo)*

Figure 5: Collection and processing of neem leaves (*Azadirachta indica*)

Figure 6: Preparation of nishyinda leaves powder

Figure 7: Preparation of neem leaves powder

3.4 Preparation of Herbal growth promoter

Neem and nishyinda leaves were dried in the sun and grinded. The grinded leaves were added with commercial quail ration and served to different groups.

Figure 8: Preparation of experimental diet

3.5 Determination of growth performance

Live body weight was recorded first day of examination. Then every week live body weight was recorded up to 42 days of experiment.

Body weight gain = Final body weight - Initial body weight

3.5.1 Live body weight gain

During the 42nd days experimental period, live body weight gain was calculated.

3.5.2 Feed consumption

Feed consumption were recorded from 14 days to 42 days of age.

3.5.3 Feed conversion ratio

After calculation of body weight gain and feed consumption calculated feed conversion ratio.

3.6 Hematological parameters

Blood samples were collected from wing vein of quail of both control and treated groups at 21st and 42nd days to study the effect and variation among the group 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)

Figure 9: Collection of blood from the experimental quail

3.6.1 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 × 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.

3.6.2 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 gm %. The above procedure was matched by the Helligehemometer method as described by (Lamberg and Rothstein 1977).

3.6.3 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).

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

3.6.4 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 1^{st} hour.

3.6.5 Statistical analysis

All analyses were performed by SPSS Program Version 22.

CHAPTER IV
RESULTS

This experiment was conducted to study the efficacy of neem and nishyinda leaves as a growth promoter in quails. This experiment was held under the department of Physiology and Pharmacology, Faculty of Veterinary and Animal Science, HSTU. 40 number of 14^{th} day old chicks were randomly divided into 4 groups T_0, T_1, T_2 and T_3 for assessing the efficacy of neem and nishyinda as growth promoter on Japanese quails. The experimental units were kept in cage system in and 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 times. The experiment was conducted according to the completely randomized design and data about per group body weight, weekly body weight and weekly feed consumptions were recorded during the experimental period (2-6 weeks of age). The physical appearance of birds of all the treated groups was better than the control group.

The birds of the treated groups shown good response to attendance, better glossy plumage and they took feed more rapidly than the control group.

4.1 Effect of neem and nishyinda Supplementation on Growth Performance of Quail

The observations for live body weight (g) means of T_0, T_1, T_2 and T_3 groups after six weeks of the experimental period 117.33±0.88, 124.33±1.76, 121.33±1.20, 130.67±1.45 respectively (Table 1). So, quail of Group T_3 (supplemented with 2% neem and nishyinda) got the maximum weight ($p<0.01$) followed by Group T_1 (supplemented with 2% neem) and group T_2 (supplemented with 2% nishyinda) among all of the experimental groups and the control group T_0 (without supplementation of neem or nishyinda) got the lowest body weight. Similarly, quail of group T_2 show higher FCR, dressing yield, breast and thigh weight among groups.

Table 01. Body weight patterns of experiment

Days	Control (group T_0) n=10	Treatment (Group T_1) n=10	Treatment (Group T_2) n=10	Treatment (Group T_3) n=10	p value	Level of significance
Day 14	25.33±0.88	26.67±0.88	25.67±0.33	26.33±0.88	0.629	NS
Day 21	45.33±1.20	46.67±0.88	45.67±0.33	47.33±1.44	0.548	NS
Day	64.67^{a} ±1.45	70.33^{bc} ±.88	67.67^{ab} ±0.67	72.33^{c}±0.88	0.004	**
Day 35	89.67^{a}±1.45	94.67^{a}±1.76	91.00^{a}±1.53	102.33^{b}±1.45	0.002	**
Day 42	117.33^{a}±0.88	124.33^{b}±1.76	121.33^{ab}±1.20	130.67^{c}±1.45	0.001	**

Different letters in the same row indicate the significant difference

** = Significant at 1% level of significance (P<0.01)

* means significant at 5% level of significance (P<0.05)

NS = Not significance (P>0.05)

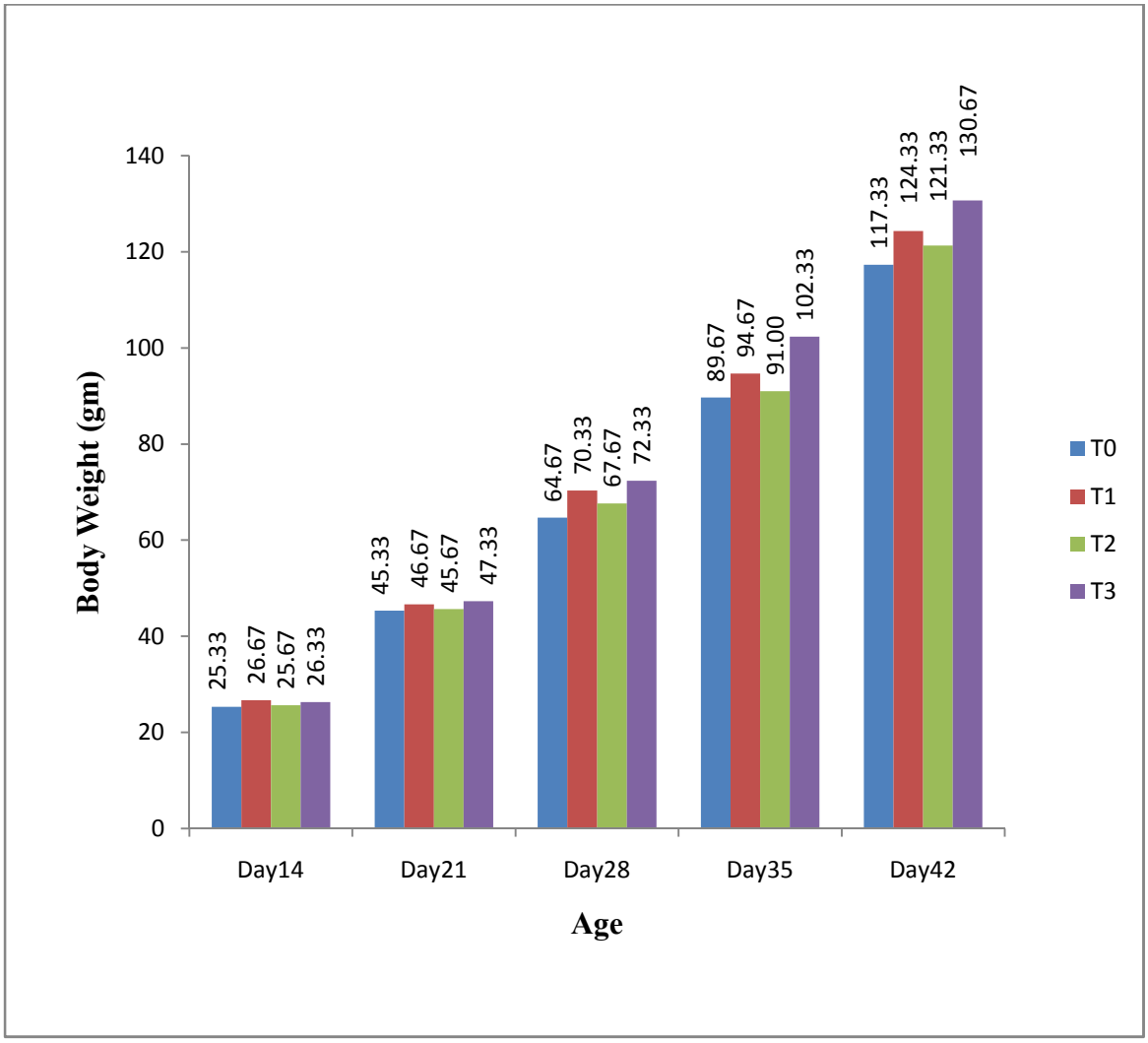

Figure 10: Body weight of experimental quail from 14 day to 42 days of age supplemented with neem, nishyinda and commercial feed

Table 02. Initial and final live weight, weight gain, feed consumption and feed conversion ratio of quail supplemented with or without neem and nishyinda on 14 day and 42 day of age.

Variable	Treatment	Average weight (Mean±SEM) (gm)	P value	Significance level
Initial live weight (gm) on 14 day	T_0	25.33±0.88	0.629	NS
	T_1	26.67±0.88		
	T_2	25.67±0.33		
	T_3	26.33±0.88		
Final live weight (gm) on 42 day	T_0	117.33^{a}±0.88	0.001	**
	T_1	124.33^{b}±1.76		
	T_2	121.33^{ab}±1.20		
	T_3	130.67^{c}±1.45		
Weight gain (gm)	T_0	92.00^{a}±1.5 3	0.009	**
	T_1	97.67^{ab}±1.20		
	T_2	92.33^{a}±2.91		
	T_3	104.33^{b}±2.19		
Feed consumption (gm)	T_0	430		
	T_1	428		
	T_2	425		
	T_3	435		
FCR	T_0	4.68^{b}±0.76	0.024	*
	T_1	4.38^{ab}±0.05		
	T_2	4.6^{b}±0.15		
	T_3	4.17^{a}±0.09		

Different letters in the same column indicate the significant difference

** = Significant at 1% level of significance (P<0.01)

* means significant at 5% level of significance (P<0.05)

NS = Not significance (P>0.05)

Body Weight Gain

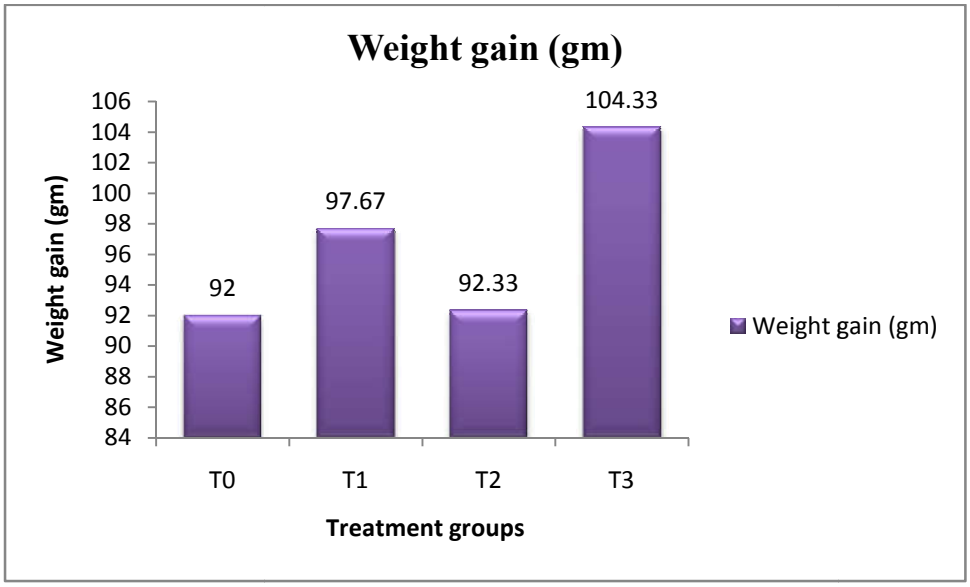

Figure 11: Body weight gain of experimental quail

Feed Conversion Ratio

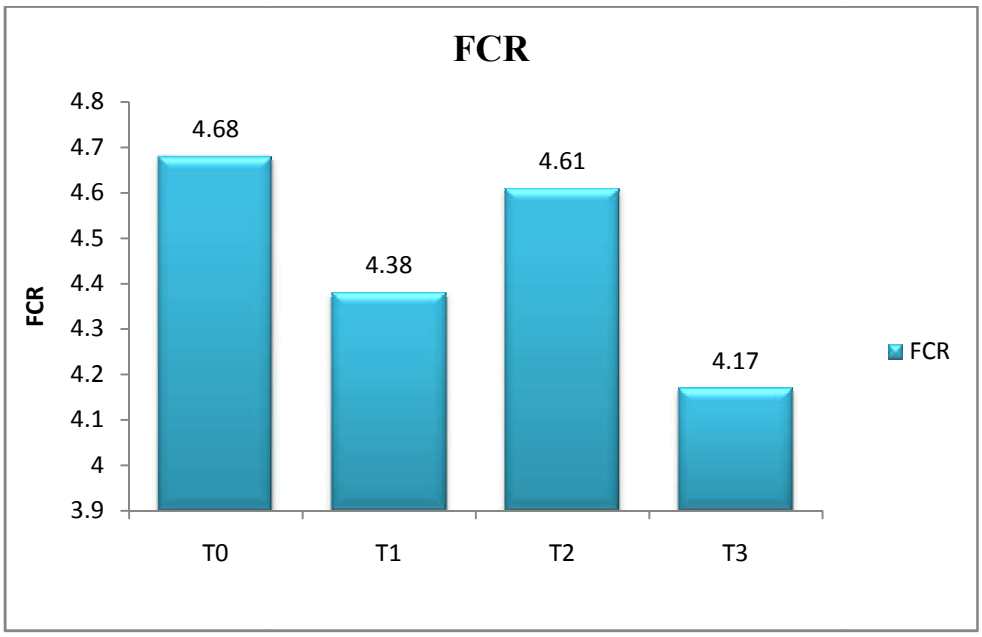

Figure 12: Feed conversion ratio of experimental quail

4.2 Study of neem and nishyinda leaves on Hematological Parameters of quail

Observation of hematological parameter (TEC, Hb, ESR and PCV) on 21th and 42th day did not show any significant variation (P<0.05) between the control and treatment groups.

Table 03. Hematological Parameters of quail supplemented with or without neem and nishyinda.

Blood Parameters	Day	Treatment group				Significance value
		T_0 (Mean±SEM)	T_1 (Mean±SEM)	T_2 (Mean±SEM)	T_3 (Mean±SEM)	
TEC	21 Day	2.03±0.33	2.13±0.33	2.07±0.33	2.20±0.58	NS
	42 Day	2.13±0.00	2.30±0.00	2.17±0.00	2.27±0.00	NS
Hb	21 Day	8.23±0.33	8.50±0.12	8.30±0.12	8.50±0.06	NS
	42 Day	8.43±0.67	8.67±0.67	8.40±0.06	8.70±0.12	NS
PCV	21 Day	36.20±0.12	36.40±0.12	36.30±0.12	36.50±0.12	NS
	42 Day	36.30±0.12	36.56±0.12	36.38±0.10	36.73±0.07	NS
ESR	21 Day	10.30±0.06	10.20±0.06	10.25±0.03	10.10±0.06	NS
	42 Day	10.06±0.06	10.20±0.12	10.00±0.06	10.13±0.12	NS

Different letters in the same row indicate the significant difference

** = Significant at 1% level of significance (P<0.01)

* means significant at 5% level of significance (P<0.05)

NS = Not significance (P>0.05)

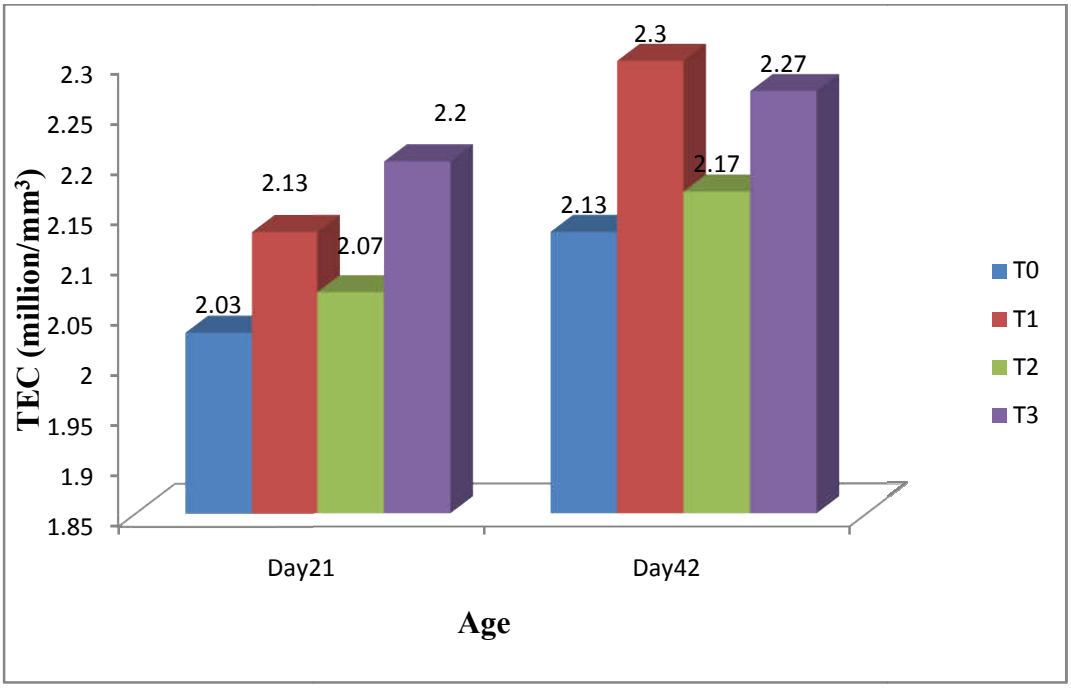

Figure 13: Total erythrocyte count (million/mm^3) of the control and treatment groups

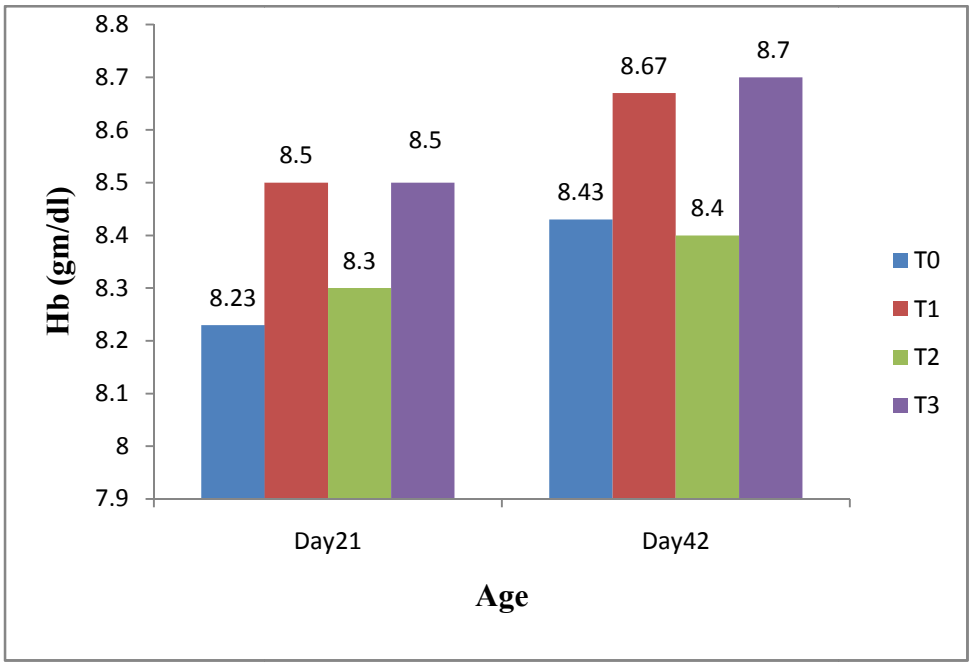

Figure 14: Hemoglobin Concentration (gm/dl) of the control and treatment groups

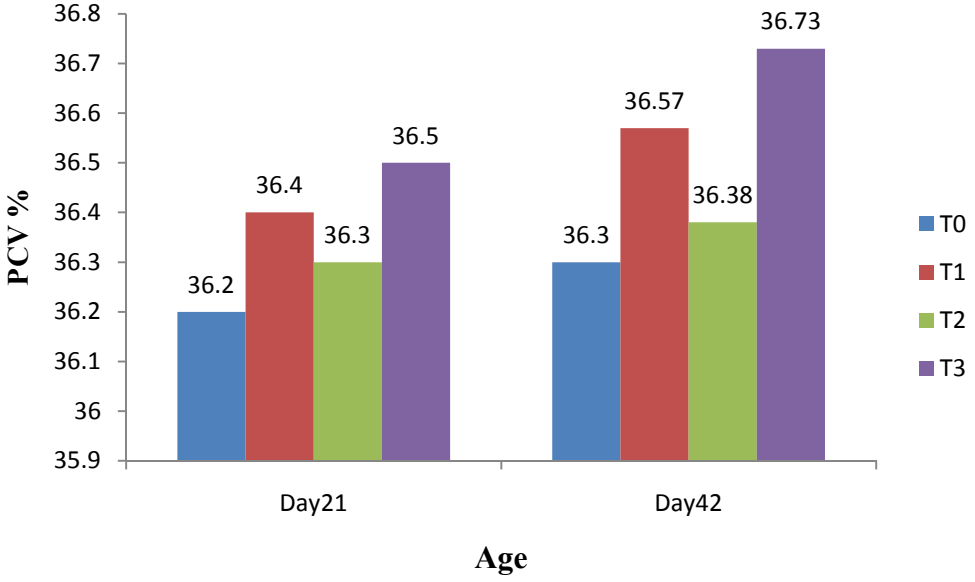

Figure 15: Packed Cell Volume (%) of the control and treatment groups

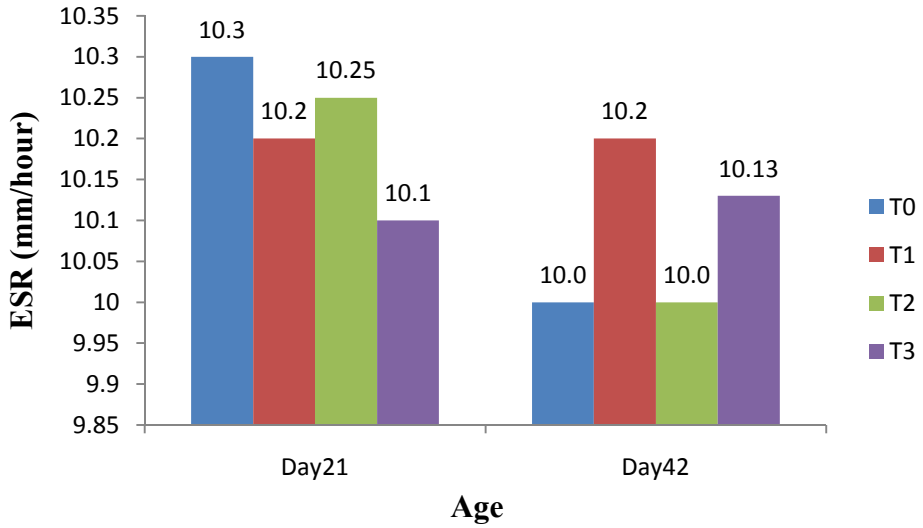

Figure 16: Erythrocyte Sedimentation Rate (mm/hr) of the control and treatment groups

CHAPTER V
DISCUSSSION

Feeding of combined neem and nishinda differed significantly ($P<0.05$) among the weekly body weight of the birds during the experimental period. Further, T_3 group birds had apparently higher weekly body weight compared to the other three groups throughout the experiment. This may be attribute to the beneficial effect of neem possibly due to to its vast range of medicinal properties like antibacterial, antiviral, antifungal, antiprotozoal, hepatoprotective and various other properties without showing any adverse effects and nishyinda which possesses phyto -chemical secondary metabolite (Kale *et al.,* 2003).

Live Body Weight

The observations for live body weight (g) means of T_0, T_1, T_2 and T_3 groups after six weeks of the experimental period were 117.33±0. 88, 124.33±1.76, 121.33±1.20, 130.67±1.45 g respectively (Table 1) and graphically presented at (figure 10). So quails of Group T_3 (supplemented with 2% neem and nishyinda) got the maximum weight ($p<0.01$) followed by Group T_1 (supplemented with 2% neem) and group T_2 (supplemented with 2% nishyinda) among all of the experimental groups and the control group T_0 (without supplementation of neem or nishyinda) got the lowest body weight. This may be attributed to the beneficial effects of Combine supply of neem and nishyinda.

Supplementation of neem, nishyinda and papaya leaf in poultry feed improved the weight gain of the quail in this study. These results are in line with the findings of Meraj (1998), who reported that higher weight gain in broilers, drinking water and feed supplemented with neem, nishyinda and Papaya. . The improvement in body weight, feed efficiency is similar to the finding of (Kamal *et al.,* 2015), who observed significant ($P<0.01$) improvement in live weight of broiler chicks than control diet when they were fed with combined 2% neem and nishyinda replacing same meal, while lower live weights were recorded in control group. Similar findings were observed by (Mahejabin *et al.,* 2015) who reported that supplementation of neem, turmeric and papaya leaf extract in the treatment group caused improvement in the feed efficiency as compared to that of control group. However hematologic parameters were non-significant. Another experiment was conducted by (Alam *et al., 2014)*. Who found that the treatment groups significantly ($P<0.05$) higher means for

live body weight than that of control group. The birds in treatment group supplemented with 1ml polyherbal extracts (neem, nishyinda, tulsi and turmeric) gained the highest live weight among the treated groups.

Feed Consumption

The average feed consumption of quails from 14 to 42 days of age in different groups were presented in (Table 2) In the present study average feed consumption were 430g, 428g, 425g and 435g among the experimental groups T_0, T_1, T_2 and T_3 respectively. The quails of treatment groups T_1, T_2 and T_3 consumed more or less similar to control group T_0. Similarly r results were obtained by (Kamal *et al.,* 2015) who observed feed consumption for groups treated with neem, nishyinda and papaya leaves meal was similar to control (A-3150g, B-3000g) group.

Feed Conversion Ratio

The feed conversion ratio of T_0, T_1, T_2 and T_3 groups at 42 days of the experimental period were 4.68±0.76 , 4.38±0.05 , 4.61±0.15, 4.17±0.09 respectively (Table 2) and graphically presented at (figure 12). So quails of Group T_3 (supplemented with 2% combine neem and nishyinda) got the maximum weight ($p<0.05$) followed by Group T_1 (supplemented with 2% neem) and group T_2 (supplemented with 2% nishyinda) among all of the experimental groups and the control group T_0 (without supplementation of neem or nishyinda) got the lowest body weight. (Kamal *et al,.* 2015) reported chickens fed diets containing 2% combine neem and nishyinda powder significantly improved feed conversion ratio compared to control group.

Hematological Parameters of Quails

Total Erythrocyte Count (million/ mm^3)

Total erythrocyte count of T_0, T_1, T_2 and T_3 groups at 21 days were 2.03±0.3, 2.13±0.33,2.07±0.33,2.20±0.58 respectively (Table 3) and at 42 days were 2.13±0.00, 2.30±0.00, 2.17±0.00, 2.27±0.00 respectively (Table 3). The values of TEC in all treated groups and control group were more or less similar and the values were within the normal range. Although these values show a little fluctuation they were not statistically significant ($p>0.05$). Similarly (Alam *et al.,* 2014) reported that the Total Erythrocyte Count were not significantly ($p>0.05$) differed by the dietary inclusion of neem and nishyinda in bird.

Packed Cell Volume (%)

Packed Cell Volume of T_0, T_1, T_2 and T_3 groups at 21 days were 36.20±0.12, 36.40±0.12, 36.30±0.12, 36.50±0.12 respectively (Table 3) and at 42 days were 36.30±0.12, 36.56±0.12, 36.38±0.10, 36.73±0.07 respectively (Table 3). The values of PCV in all treated groups and control group were more or less similar and the values were within the normal range. The highest PCV was recorded in group T_3 followed by T_1, T_2, and control group T_0 was lowest at 42 days of age. Although these values show a little fluctuation they were not statistically significant ($p>0.05$). Similarly (Alam *et al.,* 2014) and (Mahejabin *et al.,* 2015) reported that the Pack Cell Volume (PCV) values were not significantly ($P>0.05$) differed by the dietary inclusion of neem or nishyinda in birds but the highest PCV was recorded in treatment groups compared to control group.

Hemoglobin (g/dl)

Hemoglobin count of T_0, T_1, T_2 and T_3 groups at 21 days were 8.23 ±0.33, 8.50 ± 0.12, 8.30 ± 0.12 and 8.50 ± 0.06 respectively (Table 3) and at 42 days were 8.43 ± 0.67, 8.67 ± 0.67, 8.40 ± 0.06 and 8.70 ± 0.12 respectively (Table 3) . The values of Hb in all treated groups and control group were more or less similar and the values were within the normal range. The highest Hb was recorded in group T_3 than control group T_0 at 42 days of age. All the data were statistically not significant ($p>0.05$). Similarly (Alam *et al.,* 2015) and (Mahejabin *et al.,* 2015) reported that the Hb counts were not significantly ($p>0.05$) differed by the dietary inclusion of neem or nishyinda in birds but the highest Hb was recorded in treatment groups compared to control group.

Erythrocyte Sedimentation Rate (mm/1st hour)

Erythrocyte sedimentation rate of T_0, T_1, T_2 and T_3 groups at 21 days were 10.30 ± 0.06, 10.20 ± 0.06, 10.25 ± 0.03 and 10.10 ± 0.06 respectively (Table 3) and at 42 days were 10.06 ± 0.06, 10.20 ± 0.12, 10.00 ± 0.06 and 10.13 ± 0.12 respectively (Table 3). The values of ESR in all treated groups and control group were more or less similar and the values were within the normal range. These values show a little fluctuation they were not statistically significant ($p>0.05$). Similarly (Alam *et al.,* 2014) and (Mahejabin *et al.,* 2015) reported that the Erythrocyte Sedimentation Rate values were not significantly ($P>0.05$) differed by the dietary inclusion of neem or nishyinda in birds.

CHAPTER VI
CONCLUSIONS

This experiment was conducted to evaluate the efficacy of neem and nishyinda in growth performance and hematologic parameters in quail. The study was conducted at the poultry farm, Physiology and Pharmacology department, Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur-5200.

A total of 40, 14th day old Japanese quail were randomly allocated to groups T_0, T_1, T_2,and T_3 respectively and continued up to 42 days of age . Birds were reared on cage. The group T_0 was kept as a control and not treated. Group T_1, T and T_3 were fed 2% neem, 2% nishyinda and 2% (neem + nishyinda) respectively with commercial diet. The initial average live body weights at 14 th day were 25.33±0.88, 26.67±0.88, 25.67±0.33, 26.33±0.88 respectively. The final live weight at 42th day were 117.33±0. 88, 124.33±1.76, 121.33±1.20, 130.67±1.45 respectively. The highest body weight was obtained in T_3 followed by T_0 which differ significantly ($P<0.01$) from each other. The feed consumption was similar for all groups all over the experimental period. Cumulative feed consumption for T_0, T_1, T_2, and T_3 were 430, 428, 425 and 435 g respectively. Feed conversion ratio (FCR) improved significantly for T_3 and T_1 which were 4.17±0.09 and 4.38±0.05 respectively during 2-6 weeks of age. FCR for T_2 and T_0 were poorer i.e. 4.61±0.15, 4.68±0.76 Survivability was distinctly better for all of the treatment groups, which indicate neem and nishyinda had no toxic effect. But the no significant ($P>0.05$) difference among the mean value of hematologic parameters of quails.
It is concluded that supplementation with 2% of neem and nishyinda leaves powder in diet in treatment group caused significant increase in live body weight and improvement in weekly weight gain and compared to that of control group of quail. My study showed that this formulations could be used as an alternative to growth promoters in quail that helps to meet protein demand. In Bangladesh, no much trial has been performed to evaluate the effects of neem and nishyinda leaves in quail. So, further study should be needed to find alternative herbal growth promoter.

REFERENCES

Adeyemo, G.O. and Akanmu, A.M. (2012): Effects of Neem (*Azadirachta Indica*) and Pawpaw (*Carica papaya*) Leaves Supplementation on Performance and Carcass Characteristics of broilers. *International Journal of Current Research Vol. 4, Issue, 12, pp. 268-271, December, 2012.*

Ahuja S.C., Siddharth Ahuja, and Uma Ahuja (2015): *Nirgundi* (*Vitex negundo*) Nature's Gift to Mankind. *Asian Agri-History Vol. 19, No. 1, 2015 (5–32).*

Alam N., Jashim Uddin, Most. Tahera Dil Akter, Mst. Ishrat Zerin Moni, Firoj Alom, Abdur Rahman, and Md. Abdullah Al Noman (2014): Broiler Production By Using Polyherbal Medication (Neem, Nishyinda, Tulsi And Turmeric Extract). *International Journal of Innovation and Applied Studies ISSN 2028-9324 Vol. 9 No. 3 Nov. 2014, pp. 1161-1175.*

Alok. K. Wankar, R.N. Shirbhate, K.B. Bahiram, S.A. Dhenge and R.A.J asutkar (2009): Effect of neem (*Azadirachta Indica*) leaf powder supplementation on growth in broilers. *Veterinary World, Vol.2 (10):396-397.*

Abu Nasar, Md., Aminoor Rahman, Md., Nazmul Hoque, Anup Kumar Talukder, and Ziban Chandra Das (2016) A survey of Japanese quail (Coturnix coturnix japonica) farming in selected areas of Bangladesh . *Vet World. 2016 Sep; 9(9): 940–947.*

Ayoola AA, Egbeyale LT, Ekunseitan DA, Adegoke AV Adeyeri OP. (2015): The effect of neem (*Azadirachta indica*) leaf meal on the growth performance and carcass characteristics of broiler chickens. *Journal Home > Vol 42, No 2 (2015) >.*

Bwana, M.O.1, Njagi, L.W.1, Nyaga, P.N.1, Mbuthia, P.G.1, Bebora, L.C.1, Wahome, M.W.1, Mutinda, W.U.3 & Kitala, P.M.2 (2016): Growth promotive effects of neem and stinging nettle in indigenous chickens in Kenya. *RUFORUM Working Document Series (ISSN 1607-9345) No. 14 (1): 833-838.*

Cardoso K., Gandra R.F., Wisniewski E.S., (2004). Dnak and Groel are induced in response to antibiotic and heat shock in Acinetobacter baumannii. *J Med Microbiol. 2004; 59 (Pt 9): 1061–8.*

Charis, K., 2000. A novel look at a classical approach of plant extracts. *Feed Mix (special issue on Nutraceuticals), 19-21.*

Das S.C, Chowdhury S.D, Khatun M.A, Nishibori M, Isobe N, Yoshimura Y. (2008) Poultry production profile and expected future projection in Bangladesh. *World's Poult. Sci. J. 2008:99–118.*

Durrani F.R., Chand N., Jan M., Sultan A., Durrani Z. and S. Akhtar (2008): immunomodulatory and growth promoting effects of neem leaves infusion in broiler chicks. *Sarhad J. Agric. Vol.24, No.4, 2008.*

Fatema M.N., Mostofa M., Rahman S., Afrin S. and Latif M.A. (2014): Effects of Neem Leaves, Ginger and Black Pepper Extract As A Growth Promoter In Broilers. *ISSN: 2309-7892, Page: 139-144, Volume 01, Issue 03.*

Feroza1 S., Arijo1 A.G. and. Zahid I.R. (2017): Effect of papaya and neem seeds on *Ascaridia galli* infection in broiler chicken. *Pakistan Journal of Nematology* (2017) 35 (1): 105-111.

Ghosh T.K. (1992). Efficiency of liver herbal product on counteracting flatoxin on broiler birds. *Indian Poultry Review 32: 33–34*.

Hamid M.A., Rahman M.A., Ahmed S. and K.M. Hossain (2017). Status of Poultry Industry in Bangladesh and the Role of Private Sector for its Development. Asian Journal of Poultry Science, 11: 1-13.

Hasanain N. Ezzat, Suha S. Abood and Hasan S.A. Jawad Z. (2017): A review on the effects of neem (*Azadirachta indica*) as feed additive in poultry production. *Journal of Entomology and Zoology Studies 2018; 6(1): 1331-1333.*

Ihejirikamba (2012). The essence of quail eggs. *Retrieved from http://segunawosanya.word press.com/2012/10/06/the-essence-of-quail-eggs/ on 23rd April, 2012.*

Islam M.S., Faruque S., Khatun H. and Islam M.N. (2014) Effects of Quail Genotypes on Hatchability Traits, body Weight and Egg Production. *Journal of Bangladesh Academy of Sciences, Vol. 38, No. 2, 219-224.*

Kale B.P., Kothekar M.A., Tayade H.P., Jaju J.B., Mateenuddin M. (2003). Effect of aqueous extract of Azadirachta indica leaves on hepatotoxicity induced by antitubercular drugs in rats. *Indian Journal of Pharmacology, 35: 177-180*.

Khatun S., Mostofa M., Alom F., Uddin J., Alam M.N. and N.F. Moitry (2013) : Efficacy of Tulsi and Neem Leaves Extract In Broiler Production. *Bangl. J. Vet. Med*. (2013). 11 (1): 1- 5.

Kulkarni R.R., Virkar A.D., and Priscilla D'mello (2008):Antioxidant and Anti-inflammatory Activity of *Vitex negundo. Indian J Pharm Sci. 2008 Nov-Dec; 70(6): 838–840.*

Kumar, K., Ayyappan, S., Murjani, G., Bhandari, S., (1991). Utilization of mashed water hyacinth as feed in carp rearing. *In: Proceedings of the National Symposium on Freshwater Aquaculture, CIFA Bhubaneswar, India. Bhubaneswar, CIFA, pp. 89-91.*

Lee J.W., Ryu H.W., Park S.Y., Park H.A., Kwon O.K., Yuk H.J., Shrestha K.K., Park M, Kim J.H., Lee S., Oh S.R., Ahn K.S. (2017): Protective effects of neem (Azadirachta indica A. Juss.) leaf extract against cigarette smoke- and lipopolysaccharide-induced pulmonary inflammation. *Int J Mol Med. 2017Dec; 40 (6): 1932-1940.*

M. R. Molla, M. M. Rahman, F. Akter and M. Mostofa1 (2012): Effects of Nishyinda, black pepper and cinnamon extract as growth promoter in broilers. *The Bangladesh Veterinarian* (2012) 29(2): 69 – 77.

Mahbub Mostofa, Fatema Akter, Mr Sultana (2014): Effects of aqueous extract of Neem (Azadirachta indica) leaves as growth promoter and anti-colibacillosis in broilers. *July 2014 DOI: 10.3329/bjas.v43i2.20715.*

Maurice Randall, Gerry Bolla (2008) Raising Japanese quail. *January 2008, Primefact 602, Second Edition.*

Meraj MS (1998). Comparative Effect of using Neem, Nishyinda and Papaya on Growth Promoter in Broiler Chickens. *Annals of Biological Research, 2 (4): 373- 378.*

Minvielle F, Hirigoyen E and Boulay M (1999). Associated effects of the roux plumage colormutation on growth, carcass traits, egg production, and reproduction of Japanese quail.

Mizanur R. **,** Fatema Akter, Mahbub Mostofa (2014): Effects of Nishyinda, black pepper and cinnamon extract as growth promoter inbroilers. *DOI: http://dx.doi.org/ 10.3329/bvet.v29i2.14345 Bangl. vet. 2012. Vol. 29, No. 2, 69-77.*

Mohammad A. Alzohairy (2016): Therapeutics Role of *Azadirachta indica* (Neem) and Their Active Constituents in Diseases Prevention and Treatment*. Evid Based Complement Alternat Med. 2016; 2016: 7382506.*

Morshedul A., Faiz Khan Rakib ATM, Abdullah A.H.S., Aiful H. and Ashraf A. (2015): Effects of neem leave powder as a growth promoter in broilers. *International Journal of Natural and Social Sciences, 2(2): 22-26.*

Mostofa Kamal ABM, Farjana Boby, Zinat Shahjada, A.K.M. Lutfuzzaman, Abdullah-A Motin, Khondoker Jahengir Alam, Mahbub Mostofa1(2015): Effects of Neem, Nishyinda and Papaya leaves as growth promoters in broiler chicks. *International Journal of Natural and Social Sciences 2 (2015) 49-55.*

Nahid Nawrin Sultana, Soheli Jahan Mou, Mahbub Mostofa and Md. Abdur Rahman (2016): Efficacy of Neem Leaf, Nishyinda Leaf and Turmeric Rhizome Supplementation on the Growth Performance of Broiler Chicken. *Res. Agric. Livest. Fish. Vol. 3, No. 2, August 2016: 331-338.*

Nance M (1965). Salt tolerance and salt preference in the japanese quail as a function of prior experience drinking NaCl solutions*. MS thesis, Faculty of the Graduate College Oklahom State University, Stillwater, Oklahoma*.

Nodu M.B., Okpeku M., Akpoveta Z.A., Iroegb D.O. (2016): Evaluation of *azadirachta indica* leave extract on hematology and biochemical profiles, organs weight and growth parameters of broiler chickens. *Volume 32 (5). Published August, 01, 2016 www.jnsciences.org E-ISSN 2286-5314.*

Nusrat Mahejabin, Mahbub Mostofa, Fatema Akter, Shobhan Das, Morshedul Alam (2015): Effects of Neem, turmeric and papaya leaf extract mixture on growth performance of broilers*. International Journal of Natural and Social Sciences 2 (2015) 17-21.*

Odunsi A. A, Rotimi A. A, Amao E. A.(2007) Effect of different vegetable protein sources on growth and laying performance of Japanese quails (Coturnix coturnix japonica) in a derived savannah zone of Nigeria. *W. Appl. Sci. J. 2007;3(5):567–571.*

Ojo V, Fayeye T. R, Ayorinde K. L, Olojede H.(2014) Relationship between body weight and linear body measurements in Japanese quail (Coturnix coturnix japonica) *J. Sci. Res. 2014;6(1):175–183.*

Panda B., Singh R.P. (1990): Developments in processing quail meat and eggs. *World's Poultry Science Journal 46(03):219 – 234.*

Pizzolante CC; Faltarone ABG; Garcia EA; Saldanha ESPB; Deodato AP; Sherer MR; Mendes AA; Mori C; Pelicia K (2006). Production performance and egg quality of quails (Coturnix japonica) during several periods of the day. *Rev. Bras. Cienc. Av*.

Rahman M. S, Rasul K. M. G, Islam M. N(2010). Comparison of the productive and reproductive performance of different color mutants of Japanese quails (*Coturnix japonica*) Dhaka, Bangladesh: *Proceedings of the Annual research Review Workshop BLRI, Savar; 2010. pp. 50–56.*

Redoy MRA, AAS Shuvo and and M Al-Mamun (2017): A review on present status, problems and prospects of quail farming in Bangladesh. *Bangl. J. Anim. Sci. 2017. 46 (2): 109-120.*

Redoy R.A., Abdullah Al Sufian Shuvo, Mohammad Al-Mamun (2017). A review on present status, problems and prospects of quail farming in Bangladesh. *DOI:10.3329 /bjas.v46i2.34439.*

Schönfeldt H.C., Pretorius B. & Hall (N. 2013). The impact of animal source food products on human nutrition and health. *South African Journal of Animal Science*, 41 (no. 3).

Shivappa Nayaka H.B., Umakantha B., Wilfred Ruban S., Murthy H.N.N. and Narayanaswamy H.D. (2013): Performance and hematological parameters of broilers fed neem, turmeric, vitamin e and their combinations. *Emir. J. Food Agric. 2013. 25 (6): 483-487.*

Shyma K. Latheef, K. Dhama, M.Y. Wani, H.A. Samad, R. Tiwari and S.D. Singh (2013): meliorative effects of *Withania somnifera, Azadirachta indica, Tino-spora cordifolia* and E care Se herbal preparations on chicken infectious anaemia virus induced haematological changes in chicks and their live body weights. *South Asian J Exp Biol; 3 (4): 172-182; 2013.*

Siddiqui S.A, Mondal M.A. S. (1996) Economics of Japanese quail farming in *Dhaka Metropolitan City. Bang. J. Agric. Econ. 1996;19 (1-2):71–84.*

Singh M.K., Singh S.K., Sharma R.K., Singh B., Kumar Sh., Joshi S.K., Kumar S. and Sathapathy S. (2015): Performance and carcass characteristics of guinea fowl fed on dietary Neem (*Azadirachta indica*) leaf powder as a growth promoter. *Iran J Vet Res. 2015 Winter; 16(1): 78–82.*

SK Sarker, M Mostofa, F Akter, MM Rahman, MR Sultana (2014): Effects of aqueous extract of Neem (*Azadirachta indica*) leaves as growth promoter and anti-colibacillosis in broilers. *Sarker et al., (2014) Bangl. J. Anim. Sci. 43 (2): 138- 141.*

Subbarao V. Ravva, and Anna Korn (2015): Effect of Neem (*Azadirachta indica*) on the Survival of *Escherichia coli* O157:H7 in Dairy Manure. *Int. J. Environ Res. Public Health. 2015 Jul; 12(7): 7794–7803.*

Sultan A.J, Waheed A.S, Akram M, Javed K, Hussain J, Mehmood S, Hayat M.J. (2013) Hatching traits as influenced by different body weight categories in four close-bred flocks of Japanese quails (*Coturnix coturnix japonica*) *Pak. J. Zool. 2013;45(5):1215 1220.*

Unigwe1 C.R., Balogun1 F.A, Okorafor U.P., Odah1 I.S., Abonyi F.O. and Olona1 J.F. (2014): Effect of neem leaf (*Azadirachta indica*) meal on growth performance and haematology of rabbits. *World Scientific News 55 (2016) 51-62.*