

**PATHOLOGICAL INVESTIGATION OF POULTRY DISEASES  
WITH EMPHASIS ON IBD IN SHONALI BREED AT  
JOYPURHAT DISTRICT**

**A THESIS**

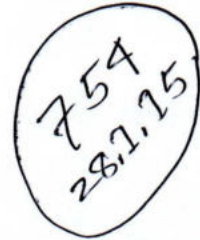
**BY**

**MD. MAHABUB HASAN**

**SEMESTER: JANUARY-JUNE/ 2013**

**REGISTRATION NO.: 1205028**

**SESSION: 2012-2013**



**MASTER OF SCIENCE (M. S.)**

**IN**

**PATHOLOGY**



**DEPARTMENT OF PATHOLOGY AND PARASITOLOGY  
HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY  
UNIVERSITY, DINAJPUR-5200**

**JUNE, 2013**

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**Submitted to the  
Department of Pathology and Parasitology  
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Hajee Mohammad Danesh Science and Technology University  
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*Approved as to style and contents by*



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**(Dr. S. M. Harun-ur-Rashid)  
Supervisor**



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**(Dr. Md. Nazrul Islam)  
Co-Supervisor**



---

**(Dr. Md. Nazrul Islam)  
Chairman  
Examination Committee**

**DEPARTMENT OF PATHOLOGY AND PARASITOLOGY  
HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY  
UNIVERSITY, DINAJPUR-5200**

**JUNE, 2013**

DEDICATED TO ALL MARTYRS OF LIBERATION WAR, 1971



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## ABSTRACTS

The purpose of the study was to find out the incidence of different diseases of Sonali breed at Joypurhat of Bangladesh. The investigation was carried out in the different commercial Sonali farms. The diagnosis of different disease conditions was done based on history, clinical signs, characteristic gross morbid lesions and histopathological study. In the present investigation, total of 294 dead birds were collected for necropsy from different Sonali farms. The highest proportional incidence of the disease in Sonali was recorded (25.51%) for infectious bursal disease (IBD) followed by Coccidiosis (21.09%), Newcastle Disease (19.39%), Colibacillosis (14.29%), Salmonellosis (8.5%), Fowl pox (6.12%), miscellaneous disease conditions (2.04%), Deficiency Disorders (1.36%), Aspergillosis (1.02%) and Alfatoxicosis (0.68%). The findings indicate that Infectious bursal disease (IBD) is the major disease problem in Sonali farming at Joypurhat.

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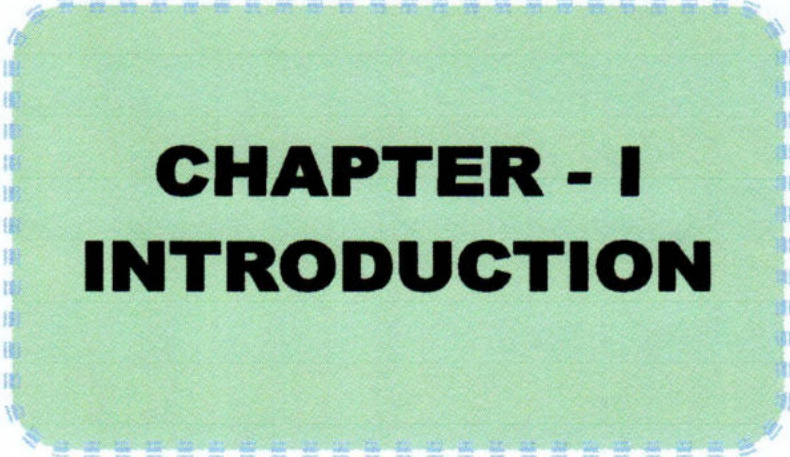
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## LIST OF ABBREVIATIONS AND SYMBOLS

$^{\circ}\text{C}$	:	Degree Celcius
$\mu\text{m}$	:	Micrometer
ml	:	Millimeter
As	:	Ascites syndrome
Cg	:	Control Group
cfu	:	Colony forming unit
cg	:	Experimental group
<i>et al.</i>	:	and his associates
etc.	:	Etcetera
ed.	:	Edition
F.F.Y.P.	:	Fifth Five Year Plan
Hps.	:	Hydropericardium syndrome
Hrs.	:	Hours
H & E stain	:	Hematoxylin and Eosin stain
IBD	:	Infectious Bursal Disease
MC	:	Mycoplasma-Colibacillosis
No.	:	Number
NCD	:	Newcastle Disease
P.i.	:	Post Infection
Vsmc	:	Vascular Smooth Muscle Cell
HSTU	:	Hajee Mohammad Danesh science and technology university
min	:	Minute
sec	:	Second
g	:	Gram
spp	:	Species
vv	:	Very Virulent
$\mu\text{l}$	:	Micro Liter
lb	:	Pound
FCR	:	Feed Conversation ratio



**CHAPTER - I**  
**INTRODUCTION**

## CHAPTER I INTRODUCTION

Sonali, the F1 cross-bred of RIR ♂ × Fayoumi ♀ has been taking place besides the indigenous hens due to their adaptability and acceptability in the climatic conditions of Bangladesh (Anisuzzaman, 1988). Such cross-bred chicken has already been proved worth in production performances in semi-scavenging system under village condition of Bangladesh (Amber *et al*, 1999). Considering the environmental factors e.g., rainfall, housing and economic traits as survivability, rapid growth of male chicks as well as female's egg production, this cross-bred was recommended to rear for small-holder poultry farming in Bangladesh (Amber, 2000). Cross-bred progenies were superior to purebred in terms of growth rate, meat quality, body weight and feed conversion (Masic and Khalifah, 1965). Sonali is suggested for rearing at village levels because of its low cost, small size, suitability for rearing under Bangladesh environment particularly in rural areas. Therefore, farming with this cross-bred chicken by the smallholder village poultry farmers in Bangladesh may ensure sustainable poultry production in the country as well as to improve the economic and nutritional status of the people.

In Bangladesh, 89% of rural households have backyard poultry, and many households keep chickens and ducks on the same premise. In absence of fences or other barriers, backyard chickens roam freely from one premise to another. Because backyard chickens are reared in such free-range systems, they are more vulnerable to the HPAI (H5N1) virus infection; and, if they become infected, they can transmit the virus to domestic ducks, in which the virus can perpetuate and infect more backyard chickens (Ahmed *et al*, 1997).

Recent studies indicated that the egg production at smallholder level could be doubled in the existing production system through intervention of crossbreeding in the semi-scavenging poultry model (Rahman *et al* 1997). The semi-scavenging poultry rearing model has been developed in Bangladesh by the Department of Livestock Services (DLS) and the Bangladesh Rural Advancement Committee (BRAC) for rural smallholder farmers (BRAC, 1994). The model comprises small units of breeders, mini hatcheries, chick rearing units and the smallholder farmers as end-producers with small flocks of 10 Sonali (RIR x Fayoumi) crossbreed hens (Jensen, 1996; Jensen, 1997; Saleque and Mustafa, 1997). It has been shown that RIR and Fayoumi are successful parent breeds in the government farms. (Ambar *et al*, 1999) named the cross between RIR male and Fayoumi female as "SONALI" (golden colour in Bengali). In the semi-scavenging poultry model, the Sonali chicks are reared in confinement during the first 8 weeks of age in the chick rearing unit after which they scavenge part-time for some days in the smallholder farmer's yard and are gradually shifted to the existing scavenging system. Sonali performed best among eight exotic breed combinations with highest egg production (156 eggs/hen/ year), lowest mortality and highest profit per hen (Rahman *et al*, 1997). In another study, the productivity of Sonali was found to be higher and more profitable compared to RIR and Fayoumi under smallholder hill farming condition with feed supplementation (Rahman *et al*, 1998). The government's DLS have been maintaining RIR and Fayoumi breeds in their farms and producing Sonali chicks for rural smallholder farmers. To establish the semi-scavenging poultry model in Bangladesh, DLS have been executing the Participatory Livestock Development Programme (Nazir Ahmed, 2000; PLDP, 2001) involving leading NGO's like BRAC (Bangladesh Rural Advancement Committee), PROSHIKA and TMSS (Thengamara Mohila Sabuj Sangha).

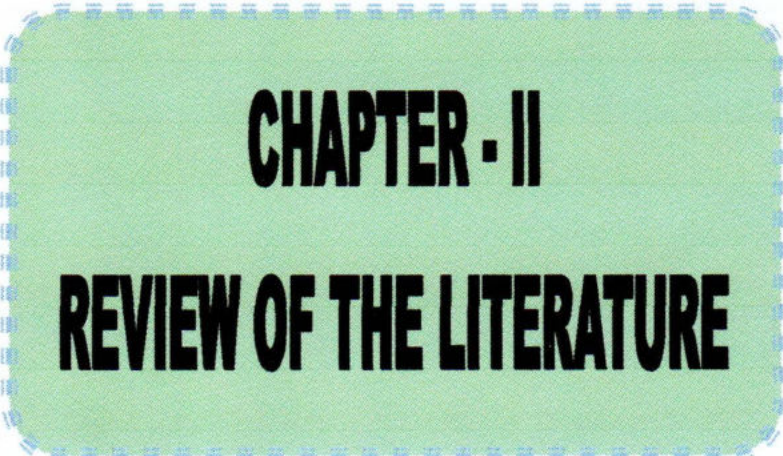
However, one report showed that the crossbreed of Fayoumi male and RIR female produced significantly more eggs than the reverse cross (Sonali) with two different

diets (Abou-el-Kassem Abd-el-Latif *et al*, 1987). Poultry production in Bangladesh is dominated by indigenous chickens. Indigenous chickens constitute nearly 80% of the total chicken population of the country. About 89% of the rural livestock-holders rear chickens and the average number per household is 6.8. Very little is known however about the indigenous chicken flocks their genetic makeup management bird performance disease resistance and adaptation to local conditions. Therefore the aim of this study is to summarize the current status of the indigenous chicken genetic resources of Bangladesh and thereafter to suggest how they could be improved under the existing village conditions of the country (DLS, 1998).

In rural area Sonali production is more suitable than other type of poultry rearing. It is efficient for both egg and meat production. It is also suitable for back yard poultry rearing. So it is best replaces of indigenous back yard chickens as semi-scavenging system under village condition. The outbreaks of various diseases are directly or indirectly related to the management status or biosecurity of the farms. So, emphasis should be given to improve the management or biosecurity of the farm to check the mortality of chickens. Among the various diagnostic procedures, necropsy undoubtedly remains in the key role of the detection of diseases needed for taking instant therapeutic measures that can be the effective attempt for saving from a devastating condition.

### **Objectives**

- I. To study the incidences of diseases in Sonali chickens encountered at Joypurhat district of Bangladesh
- II. To study the necropsy and histopathology of different organs in diseases of Sonali encountered at present study



**CHAPTER - II**  
**REVIEW OF THE LITERATURE**

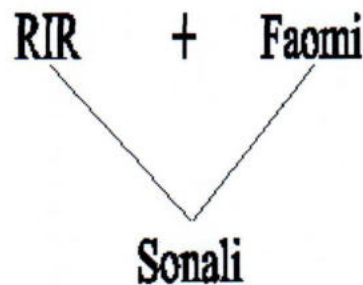


## CHAPTER-II REVIEW OF THE LITERATURE

In this part of the thesis an attempt is made to review available literature on the history, Systematic Position, geographical distribution, body shape and condition, feed and management, Slaughtering and evisceration, problems of farming and FCR, egg production performances and quality of meat, and economical impact about Sonali breed.

### 2.1. History and Background of Sonali layer in Bangladesh

This breed is originated from crossing of two breed RIR (Rhode Island Red) and Fayoumi. Origin of RIR is America and Fayoumi is Misor (Egypt). Fayoumi is like Bangladeshi hen. It is imported from Pakistan in 1980. So it is familiar with 'Pakistani breed'. RIR (male) and Fayoumi (female) are used for the production of this breed (Sonali). It was first crossed and introduced at Central Poultry Farm Mirpur, Dhaka in 1983. First generation (F1) crossing is called Sonali. Jamalgonj Poultry Farm, Joypurhat first started with this breed in 1998. First generation birds are 50% white-black spotted (Fayoumi) and rest 50% are red-black (alike to our indigenous breed). But the first generation white black spotted was not popular at the consumer level. Then First generation birds were used to back cross with RIR in 2000. This back cross had become popular at consumer level in 2000. Production depends on the sound management of water, hygiene, food, medicine, liter etc (source upazilla livestock office Panchbibi).



**Fig. Cross breeds of the farm**

## **2.2. Systematic Position of Chicken**

Phylum: Chordata

Class : Aves

Order : Galliformes

Family : *Phasianidae*

Genus: *Gallus*

Species : *Gallus domesticus*

## **2.3. Geographical distribution in Bangladesh**

The Sonali variety of chicken is currently available mostly from the government poultry farms in Bangladesh. Especially central poultry farm Mirpur (Dhaka); Government poultry Farms, Bogra, Rangpur, Pabna, Tangail, Chittagong, Jessore, Savar, Joypurhat, Dinajpur, Comilla, Sitakundo, Sylhet, Kishoregonj, Rajbari, Faridpur, Rangamati, Noakhali, Sirajgoj, Barishal, Madaripur, Bagherhat, Kustia, Gopalganj, Kurigram, Patuakhali, Thakurgoan, Manikgonj, Jamalpur, Shatkhira, Chouadanga etc. It has also rearing in private sector. Private industry Sonali farming is available mainly at Gazipur and Joypurhat district in small and large scale (Source Upazilla livestock office Panchbibi & Jamalgonj govt. poultry farm, Jouypurhat).

## **2.4. Body shape and condition**

The external features of the Sonali variety are most similar to local variety of chickens. Sonali variety of chicken is highly attractive for deep brown color, colour of body feather is reddish, and Colour of feather near the neck is pinkish, good body shape and size and high rate of production. The ratio of hen and cock is 9:1 (Kumar *et al*, 1994).

**Table-1 : Differential points between cock and hen**

Serial no.	Cock	Hen
1.	Sickle feather present	Sickle feather absent
2.	Hackle feather	Neck feather
3.	Spur is prominent	Spur is rudimentary
4.	Comb, wattles and ear lobes are prominent	Comb, wattles and ear lobes are not prominent
5.	Main tail feather is absent	Main tail feather is present
6.	Voice a cock-crows	Voice a hen cackle
7.	Comparatively larger in size in same age	Comparatively smaller in size in same age

## 2.5. Birds, feeds and management

This variety of chicken could easily be reared in semi-intensive and even backward scavenging system. That means, it can be also reared in farm or in free range. All birds were fed *ad libitum* commercial layer grower mash, a diet containing nutrients (manufacturer supplied information): Metabolizable energy 11.9-12.1 (MJ/kg), moisture 11% (max), crude protein 16% (min), crude fiber 5.0% (max), crude fat 4.5% (min), crude ash 6.0% (max), lysine 0.9% (min), methionine 0.3% (min), calcium 1.2% (min) and available phosphorous 0.45% (min). The feed and water was supplied twice a day. A vitamin mineral premix was supplemented with water twice a week. Supplied feed and residuals were recorded daily. The body weight of each bird was recorded weekly. Rice husk (8 cm thick) was used as a litter on a floor, made of bamboo, elevated 45 cm from the ground. Floor space per bird was 984 cm<sup>2</sup> (Siddque *et al*, 1995).

### 2.5.1. List of foods of a fowl

**Table-2** : A hen needs 120g foods per day. The percentages of different food items supplied to fowl of different ages are listed as follows-

Serial no.	Food items	Percentages for adult and moderate sized of fowl	Percentages for chicks
1.	Corn	45%	60%
2.	Powdered rice	15%	12%
3.	Soybean cake	15%	15%
4.	Fish meal (protein)	10.5%	12%
5.	Slime stone	12%	Very few
6.	Salt	2%	As for need
7.	Vitamin	0.5%	1%

### 2.5.2. Growing management at different farms level

Farmers manage their growers (28-60 days) providing floor space on average 0.75 square ft./birds, floor space required in growing stage of Sonali bird was 63 square ft. The average feed and water intake was 1.33 kg/bird and 3.85 lit/bird respectively. The mortality rate was 3.5 % and highest in small farms. They did not follow any lighting schedule, provided light over night. The overall management condition in small farms was very low (Moni *et al*, 1992).

### 2.5.3. Incubation

Incubation is a process by which eggs are hatched for offspring.

Advantage of artificial incubation

- 1) Large number of eggs can be hatched at a time.
- 2) Due to human control, eggs can be hatched at any time throughout the year.

- 3) Temperature, humidity and ventilation could be controlled as per requirement of the incubation process.
- 4) An incubator can be used for longer time.
- 5) The percent of hatchability is high.
- 6) Prevention and control of diseases is easier.

Disadvantage of artificial incubation:

- 1) Skilled manpower is not always available to handle the incubator.
- 2) Irregular supply of electricity cause low hatchability.
- 3) Constant supervision by man is needed until hatching.

Factors affecting artificial incubation

There are four factors of major importance in incubating eggs artificially-

1. Temperature: Maintenance of proper temperature is of prime importance for good hatchability of fertile eggs. Depending on the type of incubation, optimum temperature ranges from 99°-103°F.
2. Humidity: Humidity is of great importance for normal development of chicken embryo. Although a variation of 5-10 percent is acceptable, the relative humidity of the air within an incubator for the first 187 days should be about 60%. During the last 3 days of the hatching period, it should be nearer 70%. Lower humidity causes excess evaporation of water while high humidity prevents the evaporation of sufficient amounts of water from the eggs.

3. Egg turning: The embryo head must occupy a position in the large end of the egg for proper hatching. Eggs should be turned from three to five times a day between the second and eighteenth day. Turning the eggs prevents an adhesion between the cushion and shell membrane.

4. Oxygen utilization: As the embryo develops, it uses oxygen and gives off carbon dioxide. Thus sufficient ventilation within the incubator is required to assure an adequate supply of oxygen and the proper removal of carbon dioxide. The best hatching results are obtained with 21% oxygen in the air- the normal oxygen level in the atmosphere. The embryo will tolerate a carbon dioxide level of 0.5%, but it will die if this level reaches 5%.

#### Selection and care of hatching eggs

The factors affecting the selection and care of hatching eggs are as follows:

1. Egg size: The size of the eggs used for hatching is important because there is a high correlation between the size of eggs used and the size of the chicks hatched. Neither small sized egg nor very big sized should be selected. It is always desirable to select eggs approximately 58 gm each. Eggs in which the portion of white to yolk is about 2:1 usually hatch better than eggs having wider or narrow ratios. Abnormal shaped eggs should always be discarded.

2. Shell texture: When shell texture is poor due to deficiency of calcium or vitamin D the result, of course, is associated with low hatchability, otherwise the mottled appearance of the egg shell as observed by candling does not appear to be related to hatching results.

3. Cracked shells: All eggs should be tested for cracked shells, and this can be done quite readily by trapping two eggs together. If there is resonant sound, both

eggs are sound in shell; but if there is dull sound, one of the eggs is cracked and should not be used for incubation.

4. Tremulous air cells: Care should be taken in delivering eggs to a hatchery to avoid excessive shaking which sometimes results in a condition known as 'tremulous air cells' a condition that tends to lower hatchability.

5. Soiled egg: Soiled eggs should not be washed in water before setting, as washing with water opens up the pores and this interferes with the hatching results. If the dirt is excessive, it should be removed with a knife. Highly soiled eggs should not be set (Siddique *et al*, 1995).

#### **2.5.4. Disinfection**

The farm strictly maintains bio-security. The authority restricts entrance of general mass to the farm and the staffs enter into the farm only after washing their legs with disinfectants. Last year 44 farms of our country were affected by bird's flu and most of the farms of our country including the Savar Farm were also affected by this disease in the current year (Kabir *et al*, 1991).

#### **2.5.6. Waste management**

Excrement of fowl is a kind of fish feed. So it has a great use in fishery. In some cases feces is also used as fertilizer. The farm collects and sells these waste materials at a price of Tk. 140/= per quintal (Kumar *et al*, 1997).

### **2.6. Food conversion Ratio (FCR)**

Feed conversion ratio of Sonali is 20:7 which is usually found in commercial Sonali farm at an average. That means feed intake is 2000 gram and body wt gain is 700gm (according to upazilla livestock office, Panchbibi). Feed intake and feed conversion efficiency are affected by the rate of growth of birds, metabolizable

energy content of the ration, nutrient adequacy of the ration, environmental temperature and health condition of the birds. Wu and Han 1983 observed that age and sex of the bird and quality of diet significantly affected the feed efficiency. Labdan *et al*, 1962 found that feed utilization in crossbred chickens were superior to that of purebreds. Kamar *et al*, 1963 carried out an experiment with a total of 263 chicks of 3 pure breeds (RIR, Fayoumi, and WLH) and the reciprocal crosses of the Fayoumi with each of other breeds, to estimate growth rate and efficiency of feed utilization. They concluded that RIR were the most efficient breed with respect to feed conversion and for economic broiler production and cross between RIR and Fayoumi gave a higher growth rate and efficiency of utilization. Amer *et al*, 1974 obtained data on 1885 day-old Fayoumi, RIR, 4 White Plymouth Rock and Dokki-4 (commercial strain) fowls and progeny of all possible crosses among them. They reported that crossbreeding improved growth rate from 4 to 12 weeks of age but not from birth to 4 weeks or from 12 to 16 weeks of age of the crossbred chicks. Ahmed and Das 1991 carried out an experiment with Fayoumi, Australorps and Sonali (RIR x Fayoumi), Starcross, Rupali and RIR and they observed that growth rate were 3.57,6.92, 5.92, 4.08,3.61 and 8.21 g/day respectively. Merat *et al*, 1983 reported that Fayoumi had significantly poor feed conversion efficiency than RIR male x Fayoumi female up to 42 weeks.

## **2.7. Production performances**

It has been recognized as dual purpose breed for both egg and meat production.

### **2.7.1 Egg production**

A Sonali layer produces 180 to 185 eggs, whereas local hen produces only 50 to 60 and Fayoumi hen produces 150 to 160 eggs per year. There were no differences between the two crossbreeds (Fayoumi male x RIR female and RIR male x Fayoumi female) in age at first egg and egg weight; however, egg production is higher for the cross of Fayoumi male and RIR female. It is found that 3% higher



egg production in Fayoumi x RIR than in RIR x Fayoumi up to the age of 39 weeks. The RIR x Fayoumi and Fayoumi x RIR crossbreeds under natural lighting pattern in the present study reached peak egg production at 25 and 26 weeks of age, thereafter the egg production pattern was day length dependant. Fayoumi starts laying eggs at five and half months. Hens are stay in the farm more one year from laying eggs time (Hamid *et al*, 1989).

### **2.7.2 Body weight and meat production**

The hen is sold after production rate is below 50%. Akhtaruzzaman 2002 found highest body weight in RIR x Fayoumi at sexual maturity and the bimonthly periods while experiment was conducted with different breed/ breed combinations of chicken in semi-scavenging system. Bardrelin, *et al*, 1961 carried out an experiment with 545 chicks, which were divided into seven groups. They recorded body weight every 2nd week to 12 weeks and compared among them. The groups were purebred Fayoumi, RIR, WLH and crossbreed (Fayoumi x WLH and Fayoumi x RIR and their reverse crosses). At 12 weeks of age, highest body weight was attained by the RIR x Fayoumi cross (569g), followed by reverse cross (521g). Samkari 1962 reported that size of crossbred hens were intermediate between their parents when Fayoumi was crossed with RIR chicken.

### **2.7.3. Quality of meat and egg**

The test of meat and egg of Sonali variety is comparatively better than the indigenous, Fayoumi and RIR (Rhode Island Red). High productivity of eggs is very important feature. Kumar *et al*, 1976 observed egg weight to be  $44.9 \pm 0.6g$ ,  $48.5 \pm 0.4g$  and  $47.9 \pm 0.4g$  in Deshi, RIR male x Deshi male and Deshi male x RIR female respectively. Merat *et al*, 1983 reported that the egg size of Fayoumi was smaller than RIR male x Fayoumi female crossbred and lower egg weight than Fayoumi male x RIR female crossbred. Madkour *et al*, 1982 observed that the average egg weight of RIR and Fayoumi pullets were 56.9 and 45.9g. Rahman *et*

*al*, 1998 found that egg weight of Sonali hens of different treatment groups (ad libitum, 75g supplementation and 25g supplementation) were 58.2, 53.3 and 53.2 respectively. They also found significant differences in egg weight between RIR, Fayoumi and RIR x Fayoumi. Sazzad 1992 observed the egg weight of Fayoumi, RIR and Fayoumi male x RIR female was 41.3g, 60.7g and 48.4g respectively under farm management. Aktaruzzaman 2000 found the egg weight RIR male x Fayoumi female to be 44.5g. Eggs laid by birds given farm-mixed feed had significantly thicker shells than the birds given commercial feed (Mootrthy *et al*, 2000). Akbas *et al*, 1996 found that yolk index and Haugh unit varied due to variation in age and it was dependant on egg size and nutrition.

## **2.8. Slaughtering and evisceration**

At the end of the 14 weeks, thirty birds representing equal numbers of both breeds from each replication were randomly slaughtered for meat yield characteristics. Prior to slaughter, they were given only water for 12 hours to facilitate evisceration and also to know their actual live weight. Different parameters of meat yield were recorded. Blood weight was calculated as the difference between live weight prior to slaughter and the completely bled bird. Feather and skin weight were calculated as the difference between weight after bleeding and weight after de-feathering and skinning. Bone was not separated from the breast, legs and wings meat (Hossen *et al*, 2002).

## **2.9. Problems of Sonali Farming**

The farmers suffer many acute problems to sustain their farm profitably. These are disease out break, lack of day old chicks, lack of quality feeds, high price of feed, lack of vaccine, insufficient bank loan, and disorganized market were the major problems facing the farmers in the study area. Pruthi and Grewal 1992 identified inadequate training (88%), sub standard broiler chicks from

suppliers (66%), poor quality feed supply (78%), lack of expert advice (88%), and are some of the problems in poultry enterprise.

### **2.9.1. Disease Outbreak**

#### **➤ Avian flu/Bird flu**

A viral disease caused by Type A influenza viruses. Avian influenza viruses exist in wild populations of seabirds, shorebirds, and other wildfowl, but do not usually cause illness in wild bird species. In winter when these wild birds come in our country and contaminate ponds and fields with fecal droppings containing the virus, however, domesticated birds can be infected. For these species, avian influenza is often fatal, afflicting the respiratory system and nervous system, and opening the way for dangerous bacterial infections. With their nasal and fecal secretions, sick individuals can rapidly spread illness to other poultry in the close confines of a farm enclosure or live animal market (Fattah, 1999).

#### **➤ Fowlpox**

Fowl Pox is the worldwide disease of poultry caused by viruses of the family *Poxviridae* and the genus *Avipoxvirus*. The viruses causing fowlpox are distinct from one another but antigenically similar, possible hosts including chickens, turkeys, quail, canaries, pigeons, and many other species of birds. There are two forms of the disease. The first is spread by biting insects (especially mosquitoes) and wound contamination and causes lesions on the comb, wattles, and beak. Birds affected by this form usually recover within a few weeks. The second form is spread by inhalation of the virus and causes a diphtheritic membrane to form in the mouth, pharynx, larynx, and sometimes the trachea. The prognosis for this form is poor (Kreior, 1973).

➤ **Coccidiosis**

This disease is caused by obligate intracellular protozoa of the genus *Eimeria*. The birds' droop, cease feeding, and blood appears in the feces 3-4 days after infection (Chapman, 1986).

➤ **Fowl typhoid/ Salmonellosis**

A septicemic disease of domestic birds is caused by *Bacillus* (= *Salmonella*) *gallinarum*. The natural mode of infection is through food and water contaminated by feces of diseased and carrier birds (Snoeyenbos, 1989).

➤ **Newcastle disease (Ranikhet)**

This is characterized by sneezing, coughing, and nervous behaviour. Affected birds may show tremors, circling, falling, and twisting of the head and neck or complete paralysis. Mortality may range from 80 to 100%. The principal symptom is yellowish white, lime-like evil-smelling diarrhoea. A long, gasping inhalation through the opened beak is also a characteristic symptom (Lindeman, 1952).

➤ **IBD**

**Infectious bursal disease** (also known as IBD, Gumboro Disease, Infectious Bursitis and Infectious Avian Nephrosis) is a highly contagious disease of young chickens caused by infectious bursal disease virus (IBDV), characterized by immunosuppression and mortality generally at 3 to 6 weeks of age. The disease was first discovered in Gumboro, Delaware in 1962. It is economically important to the poultry industry worldwide due to increased susceptibility to other diseases and negative interference with effective vaccination. In recent years, very virulent strains of IBDV (vvIBDV), causing severe mortality in chicken, have emerged in Europe, Latin America, South-East Asia, Africa and the Middle East. Infection is via the oro-fecal route, with affected bird excreting high levels of the virus for approximately 2 weeks after infection.

### ➤ Fowl Cholera

Fowl cholera is also called avian cholera, avian pasteurellosis, and avian hemorrhagic septicemia. It is the most common pasteurellosis of poultry. As the causative agent is *Pasteurella multocida*, it is considered as a zoonosis. Adult birds and old chickens are more susceptible. In parental flocks, cocks are far more susceptible than hens. Besides chickens, the disease also concerns turkeys, ducks, geese, raptors, and canaries. Turkeys are particularly sensitive; with mortality ranging to 65%. The recognition of this pathological condition is of ever increasing importance for differential diagnosis with avian influenza (Botzler, 1991).

### ➤ Aspergillosis

*Aspergillus* is a ubiquitous environmental mold that grows in organic matter in the soil. The organism grows as a soil mycelium (filamentous form) and forms aerial hyphal stalks. The conidia (spores) are about 2 to 10 micrometers in diameter. They are formed at the tips of the stalks (conidiophores) by asexual reproduction. Their hydrophobic nature aids in aerosolization. Humans routinely inhale the aerosolized conidia. The conidia are promptly eliminated from the respiratory tract, or may lead to colonization or infection dependent on the underlying local and general immune status of the host. Approximately 34 of 180 *Aspergillus* species are known to cause disease in humans. *Aspergillus fumigatus* is the most common pathogenic species, accounting for 50% to 70% of the aspergillosis syndromes. Increasingly, however, aspergillosis is caused by nonfumigatus species, including *A. flavus*, *A. terreus*, *A. niger*, and *A. versicolor*. *A. niger* is less pathogenic, perhaps due to its large conidia failing to reach the pulmonary alveoli. *A. terreus*, unlike the other species, is resistant to amphotericin B. Because of this, aspergillosis caused by *A. terreus* has a poor prognosis, and occasionally is associated with positive blood cultures. Rarely, the organism gains entry via direct cutaneous inoculation, particularly after trauma. In aspergilloma, *A. fumigatus* remains the most common species (Ravin, 1979).

➤ **Aflatoxicosis**

Occurrence: Worldwide; Species affected: All species; Age affected: All, young most susceptible; Causes: Consumption of high moisture grains containing aflatoxins produced by *Aspergillus flavus*, *A. parasiticus*, and *Penicillium puberulum*. Effects: Sleepiness, depression, paleness, reduced egg production, fertility and hatchability. Depressed growth, feed conversion, increased bruising and downgrading can occur (Luna, 1968).

➤ **Worm**

When the bird is attacked by worm it loses its weight and stools white. Its egg production power is lessened. To control worm Nemosol powder is applied.

➤ **Colibacillosis**

Bangladesh livestock population statistics indicates poultry as the most important species of birds in this country. A total of 98.15% of poultry are kept in rural area and they are scavengers (BBS, 1987). For the last several years, poultry rearing has been developed as an industry in Bangladesh. With great expansion of the poultry rearing and farming, colibacillosis has become wide spread problem in Bangladesh like other areas of the world (Talha *et al*, 2001; Islam *et al.*, 2003 and Rahman *et al.*, 2004). Heavy economic loss occurs in both broiler and layer due to morbidity, mortality, reduced production and chick quality. Mortality may reach up to 94% in severe outbreak of colibacillosis ( McPeake *et al*, 2005 and Biswas *et al.*, 2006). The organisms of *E. coli* are divided into pathogenic and nonpathogenic based on their ability to cause diseases. Pathogenically, *E. coli* strains are due to the presence of one or more virulence factors including invasiveness factors invasins, heat labile, heat stable enterotoxins, verotoxins and colonization factors or adhesins (Smith and Haibs, 1967). It is not known whether the pathogenic activity is determined entirely or in part by the host. If the host plays the dominant

part, then any normal or wild strain of *E. coli* will be able to assume a pathogenic role. Therefore, it urges for the separation of pathogenic strains from the nonpathogenic one (Levine, 1984).

➤ **Non Infectious disease of poultry**

**Disorder of the egg tract:**

During peak production, a hen can lay one egg every 23-26 hours. To make an egg, the yolk is shed into the Oviduct; then, as the yolk travels down, the other parts are added. When the shell is complete, the egg is laid (Morton, 2010).

**(a) Prolapse**

When a hen lays an egg, the lower part of the oviduct is momentarily everted through the cloaca. Normally, the hen can retract the oviduct after laying. Prolapse occurs when the hen cannot retract the oviduct and a part of it remains outside the body. This condition is most common in overweight, older hens and in early laying pullets of low body weight. Other birds will peck at the red protrusion and cannibalism usually follows. It is unlikely that a bird with prolapse will recover and it should be destroyed (Morton, 2010).

**(b) Egg peritonitis**

The egg yolk provides a good medium for bacterial growth and may sometimes become infected while it is still inside the bird. Infection may occur while the yolk is moving down the egg tract or when a yolk fails to enter the oviduct and is shed into the body cavity. Prolific layers may die without warning, or may gradually become ill when affected by egg peritonitis. There is no viable commercial treatment for this disorder. However, valuable birds may be treated with antibiotics (Morton, 2010).

### **(c) Cannibalism**

It is a natural part of poultry behaviour for birds to establish a social hierarchy by pecking one another. Sometimes, an injured or weak bird or a stranger bird may be excessively attacked by all the other birds. A bird exhibiting a bleeding area is particularly likely to attract an attack. It may be pecked to death if it is not rescued. Such cannibalism is often aggravated by overcrowding. It is therefore important to provide adequate space to the flock. Nutritional deficiencies have also been implicated in cannibalism, along with boredom and irritation from external parasites. Lights that are too bright may make birds nervous or highlight a bleeding or red area, leading to more frequent pecking. Cannibalism may be prevented to some extent by providing birds with a distraction, such as a cabbage or carrot hung from the ceiling. If the problem becomes out of control, the only solution is de-beaking, which involves cutting off a part of the beak to prevent birds from causing injury to one another (Morton, 2010).

### **(d) Egg eating**

Egg eating usually begins when birds eat already broken eggs. Once a few birds acquire the habit, it spreads rapidly through the flock. Factors which lead to egg breakage encourage egg eating, such as inadequate nesting facilities, failure to collect eggs frequently, insufficient nesting material and inadequate diet resulting in soft and thin shelled eggs. Correcting these problems will reduce the number of broken eggs. However, it is difficult to break the habit of birds and it is best to cull those that begin to eat eggs. De-beaking may be the last resort (Morton, 2010).

### **➤ Nutritional Disorders:**

A well-balanced diet is essential for maximum growth, production and health of a poultry flock. The components of a diet are energy, protein, vitamins and minerals. They must be present in the correct proportions. Nutritional problems occur when



the overall dietary amount is inadequate, or when the components of the diet are not balanced. Feed is used by the bird first for maintenance (normal body functions) and second for growth and/or production (i.e. meat or eggs). An inadequate diet will lead to a decline in growth of young birds or a drop in egg production in laying hens. Dietary requirements vary with age, sex and laying status. For instance, a six-week-old chick requires 1% calcium and 20% protein whereas a layer requires 3.6% calcium and 16% protein (Fitzpatrick, 2010).

**(a) Protein**

The protein component in a diet can come from an animal source, such as meat meal or fish meal, or a plant source, such as soybean meal. Dietary protein is used by the bird to build its own protein (muscle) and/or egg protein. A protein-deficient diet will lead to poor growth and low egg production (Fitzpatrick, 2010).

**(c) Energy**

The most common sources of energy in poultry diets are cereal grains, such as maize, wheat or sorghum, which are high energy foods. An energy-deficient diet will result in depressed production and a loss of condition. A diet excessively high in energy will cause birds to become fat and will reduce their feed intake. When feed intake decreases, birds may suffer from a deficiency of protein and vitamins, which complicates the problem (Fitzpatrick, 2010).

**(d) Vitamin deficiencies**

Vitamins are required only in small amounts but are essential for growth and production. All good quality commercial feeds will contain the required amount of vitamins and this will be stated on the label. However, vitamins can be destroyed by the action of heat and water, and may break down during prolonged storage. Feed should, therefore, be stored in a cool, dry shed and bought in small amounts to avoid long storage. Soluble vitamin supplements are available, which can be

added to the drinking water to correct deficiencies. Alternatively, food rich in a particular vitamin can be provided. In tropical climates, where birds tend to eat less, it may be necessary to increase the vitamin content of the diet (Fitzpatrick, 2010).

#### **(e) Minerals**

A wide range of minerals are required by poultry. They are available in good quality commercial feeds. Calcium and phosphorus, in particular, must be supplied in balanced proportions. Young birds require a ratio of calcium to phosphorus of 1:1; however, laying birds require a ratio of 5:1. Commercial layer diets have calcium incorporated in the mix; otherwise, extra calcium can be supplied by using shell grit or limestone. If young chickens are given layer feed, the high calcium content can reduce the growth rate and delay sexual maturity. A deficiency of calcium in the diet can also cause a reduction in the growth rate, as well as rickets in young chickens. In layers, it can cause fragile bones or thin-shelled eggs. A phosphorus deficiency can also cause rickets in chickens (Fitzpatrick, 2010).

#### **2.9.2. Lack of day old chicks**

This is the most important problems of poultry farmers. They should not get enough best quality economically viable chicks for farming. For this reasons they used low quality chicks resulting loss the business. It is evident that there was a problematic crisis of chicks in marginal to large farm categories (Hossen, 2012).

#### **2.9.3. Lack of quality feeds**

It is another major problem for poultry farming of all categories farm holders. All of the poultry farmers depend on commercial feed mill for feed. It scored 19%. It is highest in large farms categories 22% and lowest in medium categories farm

holders 17%. In marginal and small farms holders it was 20% and 18% respectively (Miah, 1990).

#### **2.9.4. High price of feed but low price of meat**

The entire respondent agreed with this point. This point scored 16%, of them highest in marginal farm holders it is 22% and lowest in large farm holders it is 11%. In medium and small farm holders it is 17% and 15% respectively (Miah 1992).

#### **2.9.5. Marketing problem**

It is the fourth problem of that study area and scored 14%. It is the highest in marginal farm holders and lowest in large farm holders. In small and medium farms it is 14% and 12% respectively. This finding agrees with Miah (1992). Farmers have to market their products through the channel (bepari, paiker, forea) for which they are not getting fair returns.

#### **2.9.6. Lack of quality vaccine**

Some important diseases can be preventing by vaccination. Disease out break is one of the major constraints for the development of Sonali farms in Joypurhat. High price of vaccine, improper storage and unavailable supply hamper the prevention of diseases prevalence in this area. It scored 10% of them highest in marginal farm holders 13%, medium, small and large farms holder were. The quantity and quality of vaccines available against the major diseases were not up to the desired standard. However, the potency declined from the district livestock office to the Upazila livestock office and finally falls to between 45-80% potency at the user's level (Kryger *et al*, 1990).



### **2.9.7. Insufficient bank loan**

This point scored 11%. In large categories farm holders it was highest 14% and lowest in marginal farms. In medium and small farms it was 12% and 10% respectively (Siddque *et al*, 1995).

### **2.9.8. National policy**

Our national policy so weak that hamper the development of Sonali farming. This problem scored lowest 8%. In small farms holders it was highest 14% and lowest in medium farms holder 10%. In large farms it is 13% but marginal categories farmers did not respond in this point (Seeberg *et al*, 1998).

## **2.10. Economical Importance**

In Bangladesh majority people prefer Sonali chicks for met their demand. Sonali in fact require shorter life cycle and require less capital and land than other meat producing animal. As a result in Bangladesh many people have started commercial Sonali farms. Sonali farm has also been recognized as a major enterprise under self-employment scheme. However Sonali farms require great deal of knowledge and experience in relation to poultry rearing. An effective poultry farming policy urgently needed for the great interest of society. Government is also encouraging people to be self employed in poultry farming and also taken a financial policy through bank loan to finance the people who want to establish a Sonali farm. This study is an attempt to find out the problem and prospect of Sonali farming in different village under Bangladesh condition (Riise *et al*, 1991). The following reasons were the main that the farmers inclined to Sonali farming-

### **2.10.1. Additional income**

A study was shown that 22% farmers respond that poultry farming is an additional income within existing homestead of them small farm holder respond most 35% while large farms holder did not respond to this point. It is evident that all of the

marginal and small farm holders regarded farming as an additional income. (Miah, 1990).

#### **2.10.2. Profitable business**

All of the farm holders respond in this point well. It scored 32% and highest in medium farm holders 44% and lowest in marginal farm holders 22%. It is evident that Sonali farming is profitable business for all categories of farm. This finding agreed with Miah 1990 and Mohd-Shoriff-Saleh 1985.

#### **2.10.2. As a profession**

Every categories of the farms holder responded to this point. It is highest in large farm holders 24% and lowest in marginal farm holders 19%. While small and medium farm holders are 21% and 19% respectively ( Pandrey *et al*,1985). Pandey and Tewary, (1985) declare that poultry as a profession and a lot of people involve in this sector.

#### **2.10.3. Sonali as industry**

Only a few of marginal farmers agreed with this point it is 08%. In marginal farm holders it is lowest but maximum large farm holders responded to this point it was 25%. In small and medium farms it is 10%. Average 11% farmers agree in this point (Majumder *et al*,1989).

#### **2.10.4. Need less capital**

The average score is 15% to this point and it is highest in large farms holder 22%. It is lowest in small and medium farms 13% (Majumder, 1989).

**CHAPTER -III**  
**MATERIALS & METHODS**

## **CHAPTER-III**

### **MATERIALS AND METHODS**

The present Studies were conducted during the time period of January, 2013 to July, 2013 in the Pathology laboratory of the Department of Pathology and Parasitology, Faculty of Veterinary and Animal Science, Hajee Mohammad Danesh Science and Technology University, Dinajpur. The detailed outline about the Materials and Methods used are given below.

#### **3.1. Research Area & Experimental chickens**

In this study, a total of 294 birds of various age group from four different upazilla (Panchbibi, Jouypurhat, Akkelpur, khetlal and Kalai ) were suspected for the disease and considered as experimental birds. From those farms all dead as well as live sick chickens were collected with detailed particular of the outbreaks of diseases including farm location, history, age, breed, total number of birds and affected birds in farm, intervals between the batches, vaccine schedule, daily mortality and total mortality and clinical signs of affected birds were also recorded. In each case sampling was done following standard sampling methods and send to the laboratory. All the diagnostic works were carried under the Laboratory of Department of Pathology & Parasitology, Hajee Mohammad Danesh Science and Technology University (HSTU). Clinical diagnosis and in some cases necropsy examinations were carried out at the place of sampling where as histopathology of all samples were done in the laboratory.

### **3.2. Tentative and Final diagnosis of diseases**

The diagnoses of different disease condition were based on history, clinical signs and characteristics gross as well as histopathological alterations.

#### **3.2.1. Clinical examination**

The general health condition and age of the chicken were recorded. The chickens were observed to detect clinical signs. The clinical signs were observed from the visual examination. The clinical signs were recorded during the physical visit of the affected flocks and the farmer's complaints about the affected birds were also considered.

#### **3.2.2. Necropsy Findings**

##### **Gross pathology**

The pathological study was carried out in the Department of Pathology and parasitology, Faculty of Veterinary and Animal Science, Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur. The postmortem examination in all the cases was performed as soon as the dead birds were collected. At necropsy, gross tissue changes were observed and recorded carefully. The representative tissue samples containing lesions were fixed in 10 percent formalin for histopathological studies.

##### **Histopathological study**

During necropsy, various organs having gross lesions were collected, preserved at 10% formalin, processed, sectioned and stained for histopathological studies following a standard procedure (Luna, 1968).



### **3.3. Equipment and appliances**

- Samples: Liver, Heart, thigh muscle, bursa of Fabricius, intestine etc.
- 10% formalin
- Chloroform
- Paraffin
- Alcohol
- Tape water
- Xylene
- H & E stain
- Water bath
- Microtome
- Microscope
- Distilled water
- Clean slides
- Cover slips
- Mounting media (DPX)

### **3.4. Cleaning & sterilization of required glassware**

Test tubes, glass tubes, glass slides, cover slips, beakers, pipettes, reagent bottles, glass bottle, spirit lamp, measuring cylinders etc. were used in this study. The conical flask, measuring cylinder, beakers, glass slides, cover slip, for slide preparation for histopathological study and staining of organisms after smear and pipettes, reagent bottle, glass tubes for different biochemical tests. New and previously used glassware were collected and dipped in 2% sodium hypochlorite solution and left there until cleaned. After overnight soaking in a household dishwashing detergent solution, the glassware were cleaned by brushing and washed thoroughly in running tap water and rinsed three times in distilled water.

The cleaned glass wares were then dried on a bench at room temperature or in an oven at 50-70<sup>0</sup>C.

### **3.5. Tissue processing**

#### **3.5.1. Collection of Tissue**

During tissue collection, the following points were taken into consideration-

- The tissues were collected in condition as fresh as possible.
- Normal and diseased tissues were collected side by side.
- The thickness of the tissue were as less as possible (5-7  $\mu$ m approximately).

The following tissues were collected from the sonali in the Histopathology Laboratory of Department of Pathology and Parasitology, HSTU, Dinajpur, for histopathological examination.

- Liver
- Spleen
- Intestine
- Lungs
- Thigh muscle
- Trachea
- Pronventriculous
- Bursa of Fabricius
- Heart etc.

#### **3.5.2. Fixation**

Fixative (10% formalin) was added by 10 folds of the tissue size and weight. It is important to consider that a fixative should not be too toxic to its handler, and it should not damage the tissue being preserved.

### **3.5.3. Washing**

The tissues were trimmed into a thin section and washed over night in running tap water to remove formalin.

### **3.5.4. Dehydration**

Dehydration by ascending ethanol series to prevent shrinkage of cells as per following schedule-

- ⇒ 50% alcohol- 1 hour
- ⇒ 70% alcohol- 1 hour
- ⇒ 80% alcohol- 1 hour
- ⇒ 95% alcohol- 1 hour
- ⇒ Absolute alcohol- three changes (one hour for each change)

### **3.5.5. Cleaning**

Cleaning by chloroform for 3 hours to remove ethanol (1 and half hour in each of 2 chloroform jar)

### **3.5.6. Impregnation**

Impregnation was done in melted paraffin (56-60°C) for 3 hours.

### **3.5.7. Embedding**

Paraffin blocks containing tissue pieces were made using templates and melted paraffin.

### **3.5.8. Sectioning**

Then the tissues were sectioned with a microtome at 5-6µm thickness. The section were allowed to spread on luke warm water bath (40-45°C) and taken on a glass slide. A small amount of gelatin was added to water bath for better adhesion of the

section to the slide. The slides containing section were air dried and stored in cool place until staining.

### 3.6. Routine Hematoxylin and Eosin staining

#### 3.6.1. Preparation of Ehrlich's Hematoxylin solution

Hematoxylin crystal	4.0gm
Alcohol, 95%	200ml
Ammonium or potassium alum	6gm
Distilled water	200ml
Glycerine	200ml
Glacial acetic acid	20ml

Hematoxylin is dissolved in the alcohol and the alum is dissolve in distilled water and mixed thoroughly. After these are in complete solution the glycerin and acetic acid are added.

#### 3.6.2. Preparation of eosin solution

Eosin Y, water soluble	1.0gm
Distilled water	20 ml
Dissolved and added 95% alcohol	80 ml

Eosin was dissolved in water and then 80 ml of 95% alcohol was added.

#### 3.6.3. Working eosin solution

Eosin stock solution	1 part
Alcohol, 80%	3 parts

0.5ml of glacial acetic acid was added to 100ml of working eosin solution just before use.

### **3.7. Procedure of Routine Hematoxylin and Eosin Staining**

#### 1. Deparaffinization in Xylene

The sectioned tissue were deparaffinized in three changes of xylene (three minutes in each change)

#### 2. Rehydration in descending grades of alcohol

Absolute alcohol – three changes (three minutes for each change)

95% alcohol - two minutes

80% alcohol - two minutes

70% alcohol - two minutes

#### 3. Dipping with distilled water for 10 minutes.

#### 4. The tissue were stained with Ehrlich's Hematoxylin for 2 – 10 minutes.

#### 5. Washing in running tap water (10-15 min)

#### 6. Dipping in lithium carbonate (few dips)

#### 7. Staining in Eosin solution for 1 min.

#### 8. Dehydration in ascending grades of alcohol as following:

95% alcohol – three changes (2-4 dips for each change)

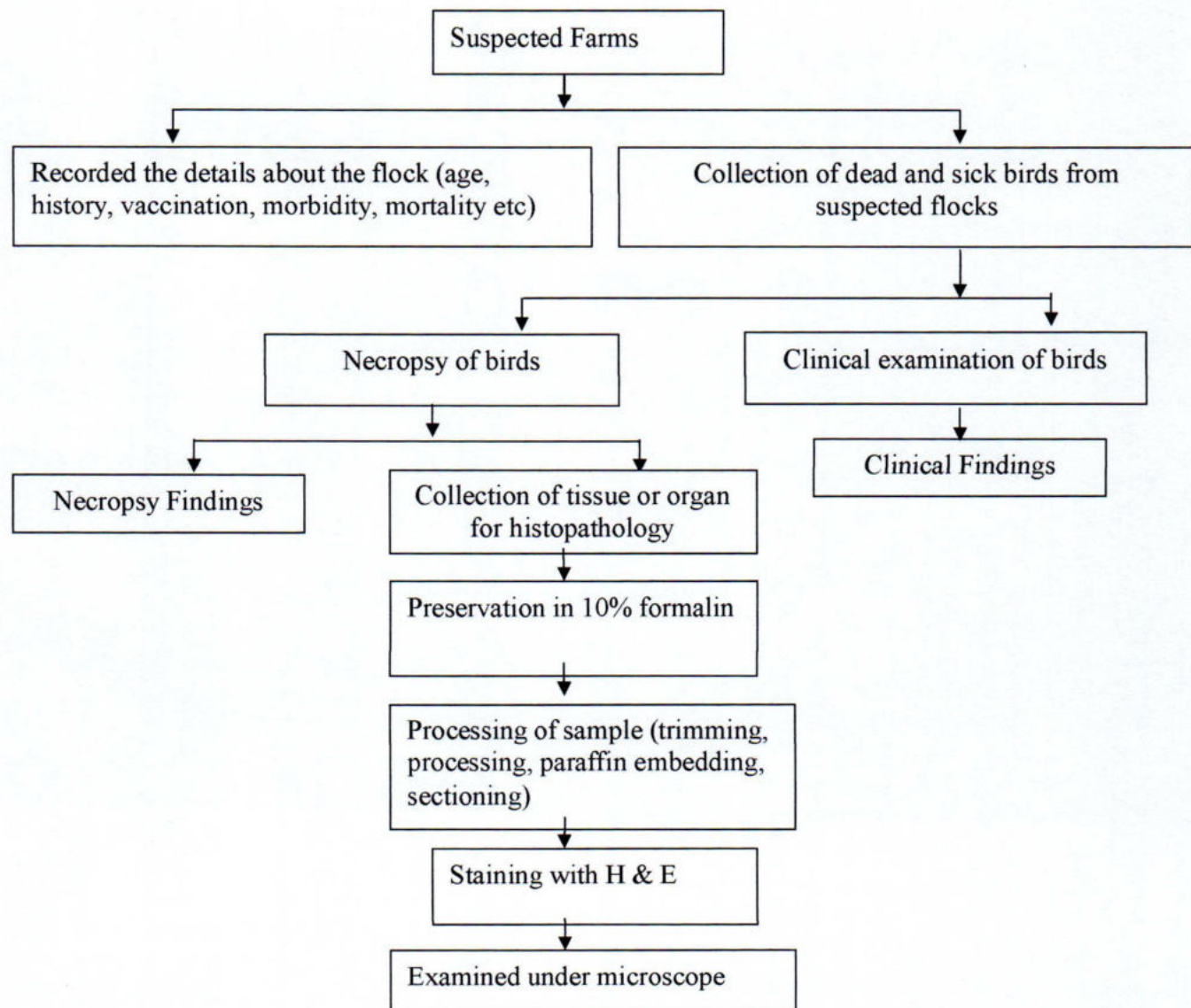
Absolute alcohol – three changes (2-3 minutes for each change)

#### 9. Cleaned in Xylene: three changes (five minutes for each change).

#### 10. Tissues are mounted with cover slip by using suitable mounting media (DPX) or Canada Balsum.

#### 11. Observation of the tissues under microscope using low and high magnification.

### 3.8. Experimental Layout





**CHAPTER - IV**  
**RESULTS**

## CHAPTER – IV RESULTS

Recent study on pathological investigation of diseases in Sonali encountered at Joypurhat district detected a number of maladies responsible for morbidity and mortality of Sonali chicken in different Sonali farms during the period from January to June, 2013. Proportional incidences of those disease conditions are shown in table-1 and Chart-1 & 2.

For the convenience of description, the recorded disease conditions were classified as follows-

- Viral diseases
- Bacterial diseases
- Mycoplasmal diseases
- Fungal diseases
- Protozoal diseases
- Deficiency disorders
- Miscellaneous diseased conditions



**Table-3: Prevalence of diseases in Sonali at Joypurhat district and their proportional incidences (%)**

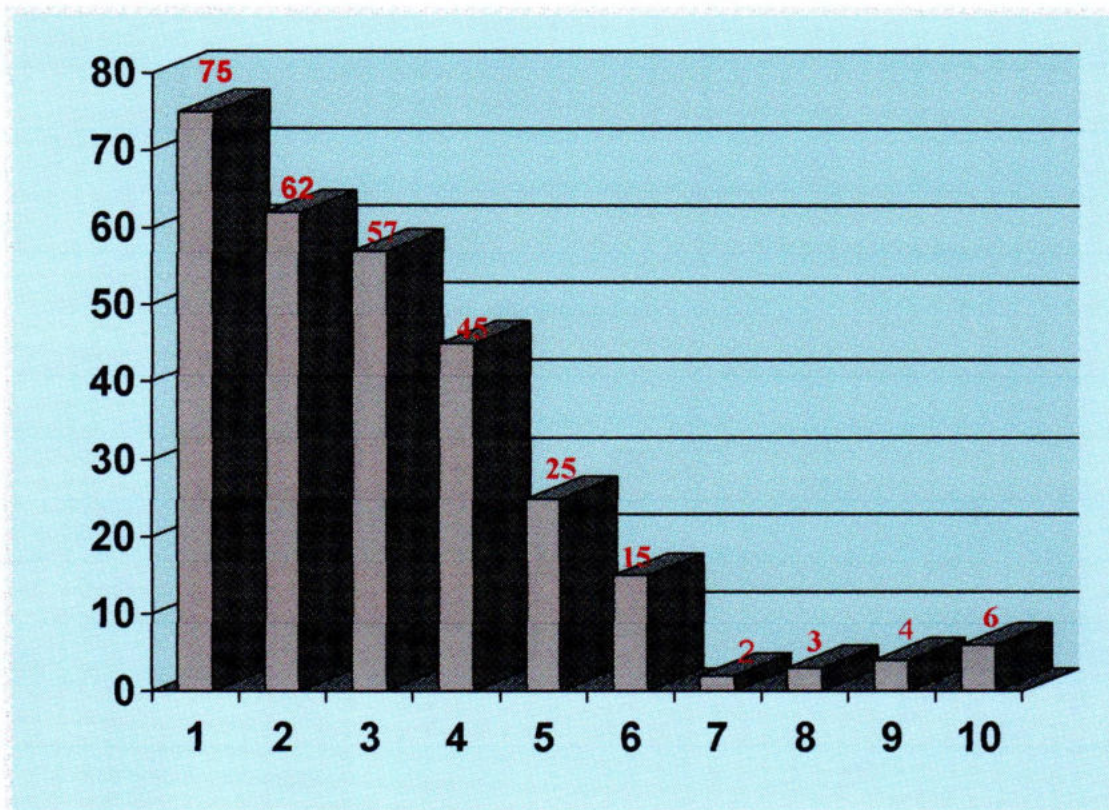
<b>Serial number</b>	<b>Tentative and /or final diagnosis</b>	<b>Number of dead birds for necropsy</b>	<b>Proportional incidences (%)</b>
1	Infectious bursal disease	75	25.51
2	Coccidiosis	62	21.09
3	Newcastle disease	57	19.39
4	Colibacillosis	45	15.31
5	salmonella	25	8.5
6	Fowl pox	15	5.10
7	Aflatoxicosis	2	0.68
8	Aspergillosis	3	1.02
9	Deficiency disorder	4	1.36
10	Miscellaneous diseased conditions	6	2.04
<b>Total</b>		294	100%

**Table-4: Statistical analysis of this diseases (by CRD method)**

Disease	No. of dead birds for necropsy (Mean $\pm$ SE mean)	Proportional incidences (%) (Mean $\pm$ SE mean)
Infectious bursal diseases	75.00 a $\pm$ 1.73	25.51 a $\pm$ 1.73
Coccidiosis	62.00 b $\pm$ 2.89	21.09 b $\pm$ 1.73
Newcastle diseases	57.00 b $\pm$ 4.04	19.39 b $\pm$ 1.73
Colibacillosis	45.00 c $\pm$ 1.73	15.31 c $\pm$ 1.15
Salmonella	25.00 d $\pm$ 2.89	8.50 d $\pm$ 1.15
Fowl pox	15.00 e $\pm$ 1.73	5.10 de $\pm$ 0.58
Aflatoxicosis	2.00 f $\pm$ 0.58	0.68 f $\pm$ 0.04
Aspergillosis	3.00 f $\pm$ 0.58	1.02 f $\pm$ 0.03
Deficiency disorder	4.00 f $\pm$ 0.58	1.36 f $\pm$ 0.15
Miscellaneous diseased condition	6.00 f $\pm$ 1.15	2.04 ef $\pm$ 0.05
Level of significance value	6.532	3.431
Probability/Percentiles value	0.00	0.00
Coefficient of variance	12.95	20.00

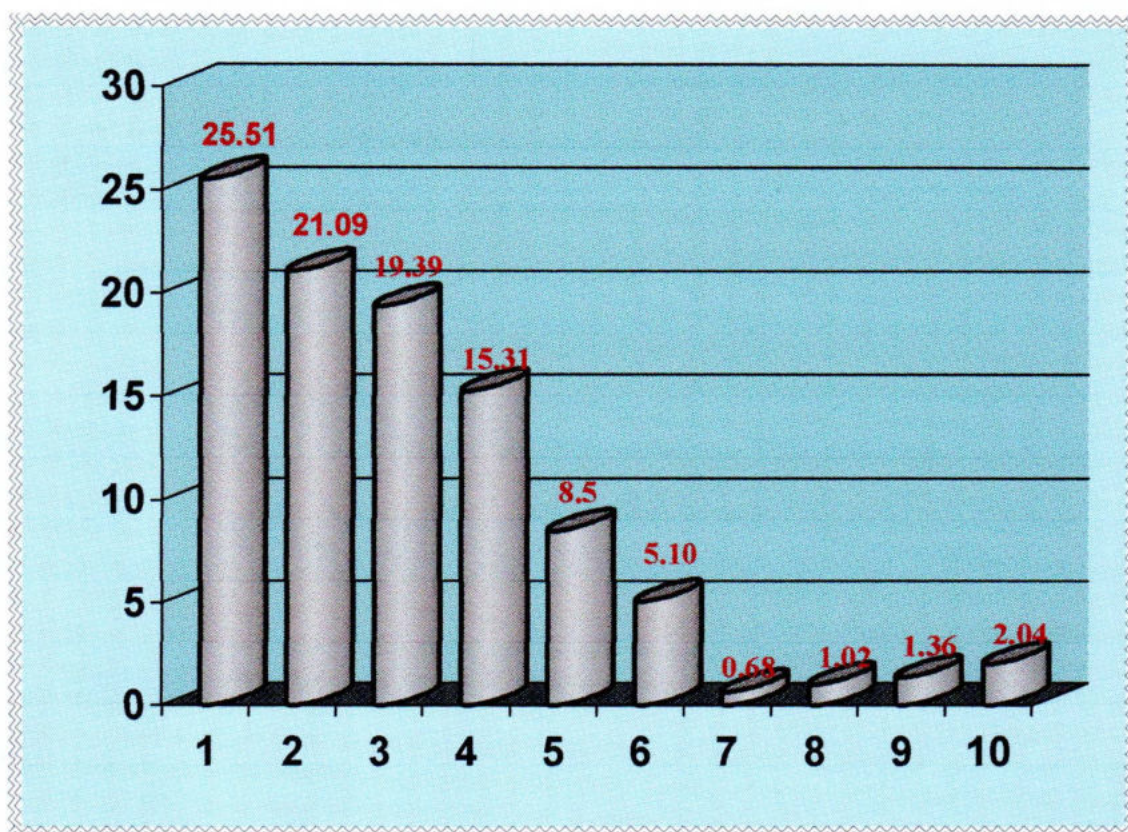
**\*\*Significant (p<0.01)**

**Note:** CRD (Complete Randomized Design) was done through DMRT (Duncan Multiple Range Test) under MSTATC program.



**Figure-1: Prevalence of diseases in Sonali at Joypurhat district**

1. Infectious bursal disease
2. Coccidiosis
3. Newcastle disease
4. Colibacillosis
5. Salmonellosis
6. Fowl Pox
7. Alfatoxicosis
8. Aspergillosis
9. Deficiency disorder
10. Miscellaneous disease conditions



**Figure-2: Proportional incidences (%) of diseases in Sonali at Joypurhat district**

1. Infectious bursal disease
2. Coccidiosis
3. Newcastle disease
4. Colibacillosis
5. Salmonellosis
6. Fowl Pox
7. Aflatoxicosis
8. Aspergillosis
9. Deficiency disorder
10. Miscellaneous disease conditions

## **4.1. Viral Diseases**

### **4.1.1. Infectious Bursal Disease (IBD)**

The present investigation detected a total of 75 (25.51 %) followed by Mean  $\pm$  SE mean ( $25.51 \pm 1.73$ ) cases of infectious bursal disease of Sonali birds from 294 dead Sonali birds. The clinical signs were recorded during the physical visit of Sonali flocks and the farmers complaints were also emphasized, and these were whitish or watery diarrhoea, sometimes bloody droppings, soiled vent feathers, vent picking, anorexia, trembling, severe prostration, and sudden death.

**Gross Lesions:** The affected birds exhibited haemorrhage in thigh muscle, breast muscle and edematous swelling of bursa of fabricious with or without haemorrhage. Slight swelling was present in kidney in some case. Figure-1, 2, 3, 4 & 5.

### **Microscopic lesions**

Microscopically, the section of the bursa showed moderate depletion of lymphoid cells (figure-18) with huge infiltration of reactive cells (figure-21) and oedema in the inter follicular space (figure-19). Severe haemorrhage was found in muscle septa (figure-20).

### **4.1.2. Newcastle Disease (Ranikhet)**

A total of 57 (19.39 %) followed by Mean  $\pm$  SE mean ( $19.39 \pm 1.73$ ) cases of Newcastle Disease of which 294 dead Sonali birds. The affected birds exhibited respiratory distress, coughing, gasping and anorexia. In some cases, paralysis of the legs and /or wings and torticollis were found. Greenish or greenish-whitish diarrhoea often blood stained was also observed.

**Gross Lesions**

Grossly, dark red or purple red hemorrhage lesions associated with necrosis were found in the intestinal wall especially in the posterior half of the duodenum and the jejunum, ileum and caecal tonsils (figure-5). Hemorrhages were also found in the glandular surface of the proventriculus and sometime in the gizzard (figure-6). Congestion was found in the lung.

**4.1.3. Fowl Pox Disease**

The recent investigation found a total of 18 of (5.10 %) followed by Mean  $\pm$  SE mean ( $5.10 \pm 0.58$ ) cases of fowl pox disease of Sonali birds from 294 dead birds. The clinical signs were recorded during the physical visit of Sonali flocks and the farmer's complaints were also emphasized. Clinical signs were observed with avian pox were weakness, emaciation, difficulty in swallowing and breathing, vision problems, a reduction in egg production, soiled facial feathers, conjunctivitis, edema of the eyelids and the presence of the characteristic wart-like growths on the unfeathered portions of the skin and/or formation of a diphtheritic membrane on the upper portion of the digestive tract.

**Gross lesions**

The affected birds exhibited gross lesions in 2 forms, cutaneous (dry) and diphtheritic (wet). The cutaneous form was the most commonly observed with the lesions regressing and forming scars. This form of pox appeared as a small white, pink or yellow vesicle (blister) on unfeathered parts of the skin (feet, legs, base of the beak, eye margins and head). Scabs were also formed. The surfaces of the nodules were rough and dry and the color was dark brown or black. The size and number of nodules were different and varying degree of sizes. The diphtheritic showed in the mouth, throat, trachea and lungs and consists of yellow or white, moderately raised, moist cheese-like necrotic areas.

## **4.2. Bacterial Disease**

### **4.2.1. Salmonellosis**

The investigation recorded a total of 25 (8.5 %) followed by Mean $\pm$ SE mean (8.50 $\pm$ 1.15) cases of Salmonellosis of which 294 dead birds. The affected chicks exhibited weakness, poor growth and inappetance. Chalky white excreta sometimes stained with greenish brown adhered to the vent. Labored breathing and gasping were observed. The adult affected birds showed depression, anorexia, diarrhea and dehydration. There was drop in feed consumption.

#### **Gross lesions**

The liver was fragile, enlarged & congested. Necrotic foci in liver, green colored liver & bronze colored liver were found (figure-8, 9 & 10).

### **4.2.2. Colibacillosis**

This study revealed a total of 42 (15.31 %) followed by Mean $\pm$ SE mean (15.31 $\pm$ 1.15) cases of Colibacillosis of which 294 dead Sonali birds (table-1&2). In most cases, chicks were found dead without showing significant clinical signs. However, few birds were reported to be dullness, depression, reduced intake of food and water, huddling at the corner of the shed, loss of body weight, brown color dropping,s lethargic, dehydrated and found depressed with poor growth performance.

#### **Gross lesions**

Thickened unabsorbed yolk sac was found which often haemorrhagic. Whitish fibrinous covering was also found heart (Figure-17 & 18).

### **4.3. Fungal diseases**

#### **4.3.1. Aspergillosis**

The present investigation detected 3 (1.2%) followed by Mean±SE mean (1.02±0.03) of cases Aspergillosis from 294 Investigated dead Sonali birds. Affected birds showed dyspnea, gasping and accelerated breathing. Most of these birds showed emaciation, ruffled feathers and depression.

#### **Gross lesions**

Most of the birds were found emaciated and cachectic at necropsy. Whitish nodules of different sizes and shapes were found mainly in the lungs (figure-20).

#### **4.3.2. Aflatoxicosis**

This study revealed a total of 2 (0.68%) followed by Mean±SE mean (0.68±0.04) cases of Aflatoxicosis from 294 investigated dead Sonali birds. Affected birds exhibited anorexia, ruffled feathers, listlessness, lethargy, lameness and death.

#### **Gross lesions**

Liver was enlarged, Fatty or grayish and friable (Figure-19).

### **4.4. Protozoal Diseases**

#### **4.4.1. Coccidiosis**

This study revealed a total of 62 (21.09 %) followed by Mean±SE mean (21.09±1.73) cases of Coccidiosis from 294 investigated birds. In most cases, the birds exhibited droopiness, depression, ruffled fathers and bloody diarrhoea.

#### **Gross lesions**

All the birds died due to caecal Coccidiosis showed characteristics lesions in the caeca. The affected caeca were swollen and haemorrhagic, the walls appeared



thickened and firmer in consistency; the lumen filled with blood tinged exudates (Figure-11, 12 & 13).

#### **4.5. Deficiency disorder**

The present investigation recorded a total of 4 (1.36 %) followed by Mean $\pm$ SE mean (1.36 $\pm$ 0.15) cases in which birds were died due to vitamins deficiency and / or mineral and nutritional deficiency disorders. In severe cases, affected birds showed a marked oedema of the subcutaneous tissue. The oedema, fluid which was greenish-blue, viscous materials accumulated under the skin and could easily see through the skin. This condition was selected as exudative diathesis and was due to vitamin E deficiency. In two cases affected birds showed paralysis of the muscles evidenced by their characteristics star grazing position. Retraction of the head was due to paralysis of muscles of the neck. At necropsy no significant gross lesions were observed. The affected birds respond to oral administration of thiamine within a few hours and so the condition was detected as thiamine deficiency disorder.

In One case, affected chicks did not walk except when forced to Necropsy of he affected sacrificed birds showed no marked abnormalities. Supplementation of riboflavin to the affected chicks resulted the marked improvement of the disorders and the condition was detected as thiamine deficiency disorder.

In One case, the affected birds showed anaemia and marked hemorrhage on the breast, legs, and wings and in the abdominal cavity. The whole lengths of the intestine were hemorrhagic and congested. In some bird, accumulation of oedematous fluid in abdominal cavity occurred. This condition was suspected as vitamin K deficiency disorder.

#### **4.6. Miscellaneous Diseased conditions**

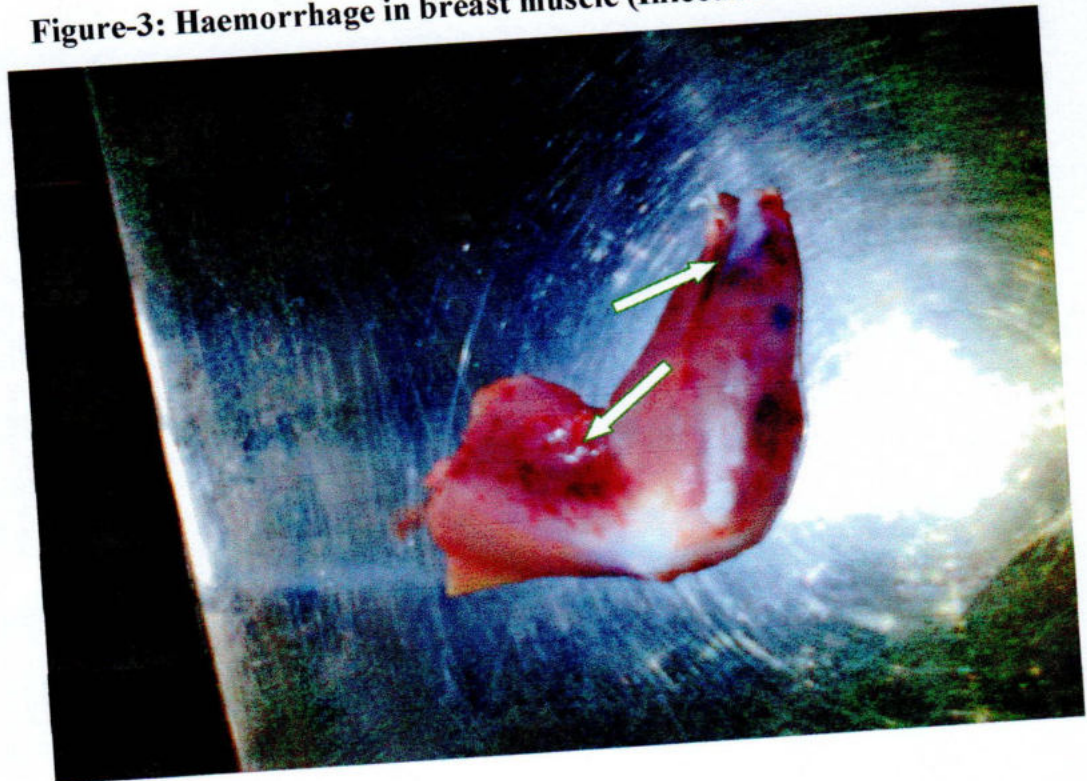
The present investigation detected a total of 6 (2.04 %) followed by Mean±SE mean (2.04±0.05) cases in which birds were died due to miscellaneous causes. Out of 294 cases, birds of 3 cases died due to environmental stresses induced by extreme hot or cold. At necropsy, there was no apparently gross lesion except history of the stress recorded from the owner.

In One cases birds died due to ammonia intoxication. There was history of extensive ammonia production in the poultry shed and lack of sufficient ventilation.

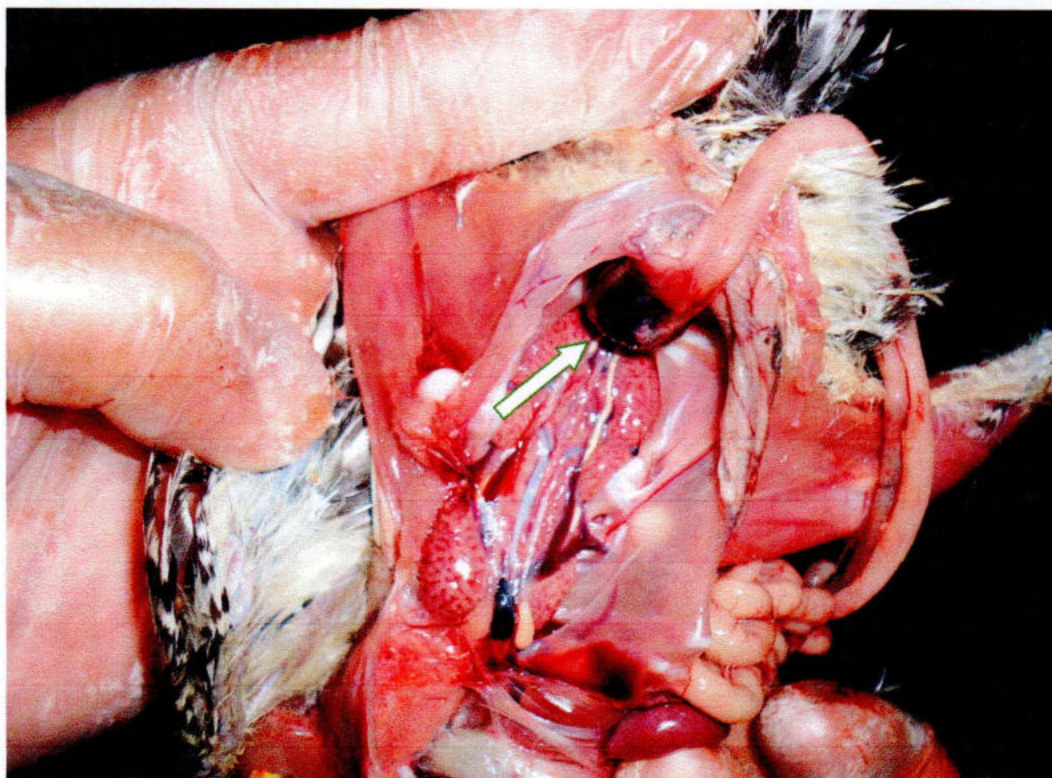
**Postmortem lesions of different diseases in Sonali**



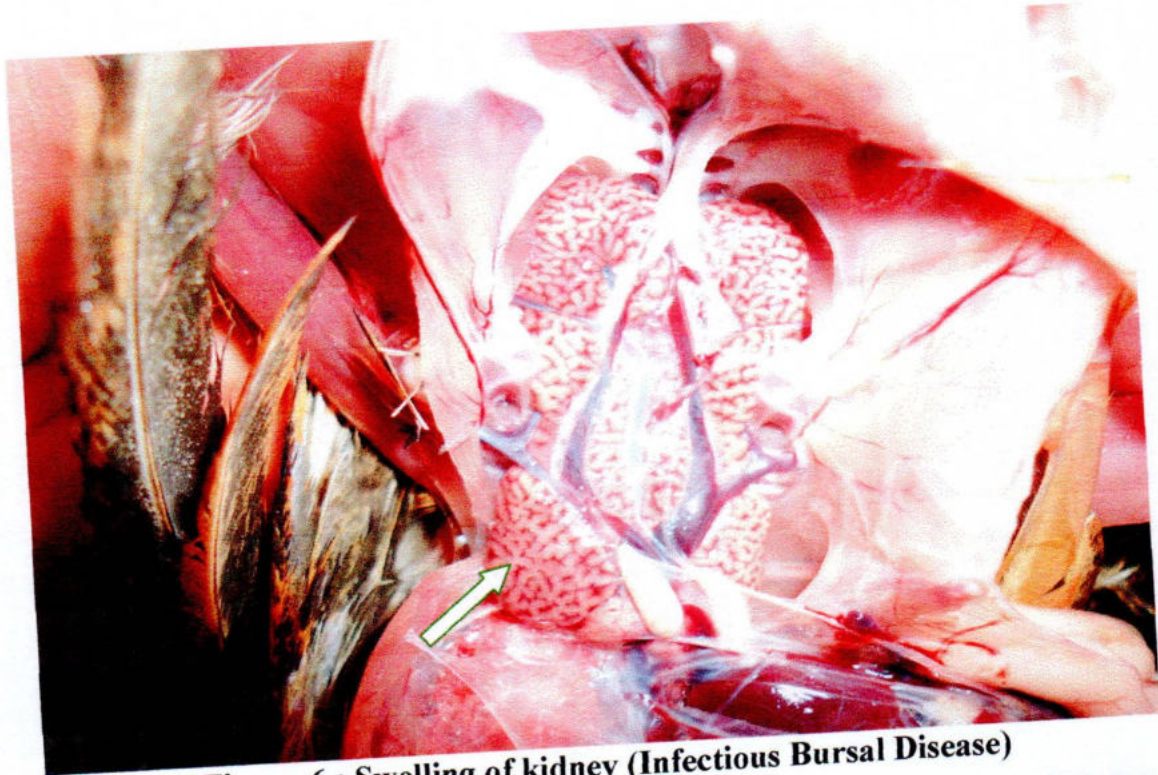
**Figure-3: Haemorrhage in breast muscle (Infectious Bursal Disease)**



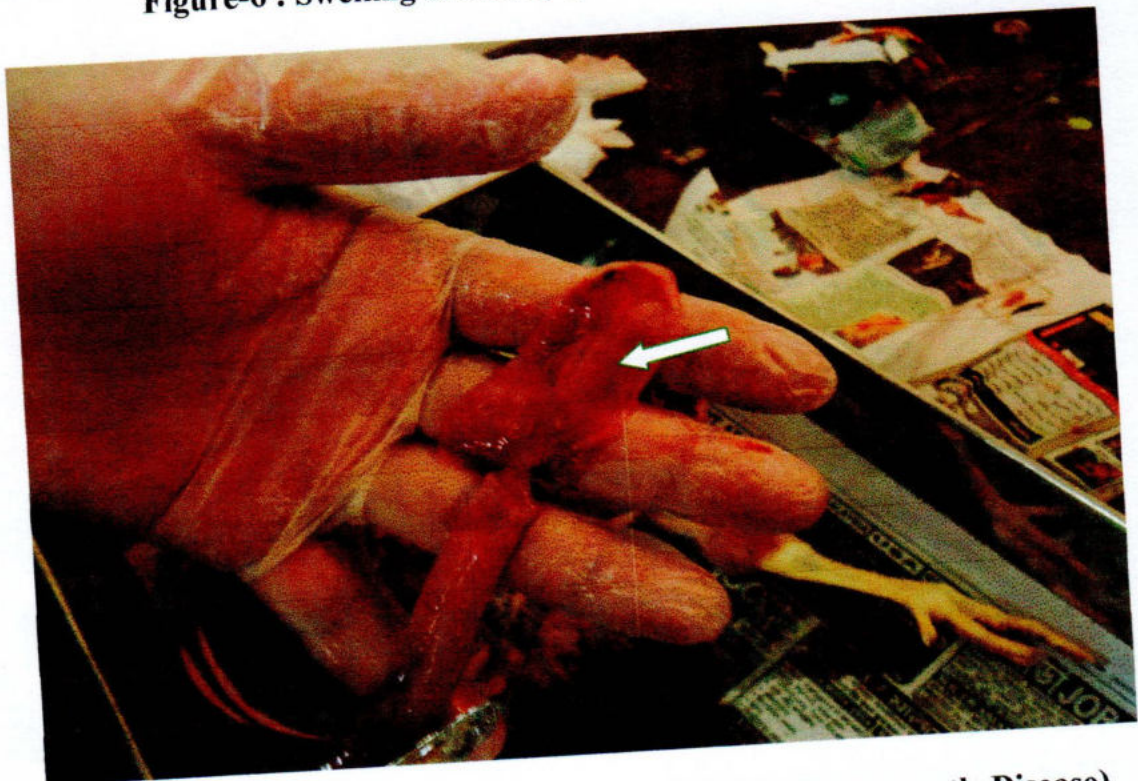
**Figure-4: haemorrhage in thigh muscle (Infectious Disease)**



**Figure-5: Haemorrhagic swollen bursa (Infectious Bursal Disease)**



**Figure-6 : Swelling of kidney (Infectious Bursal Disease)**



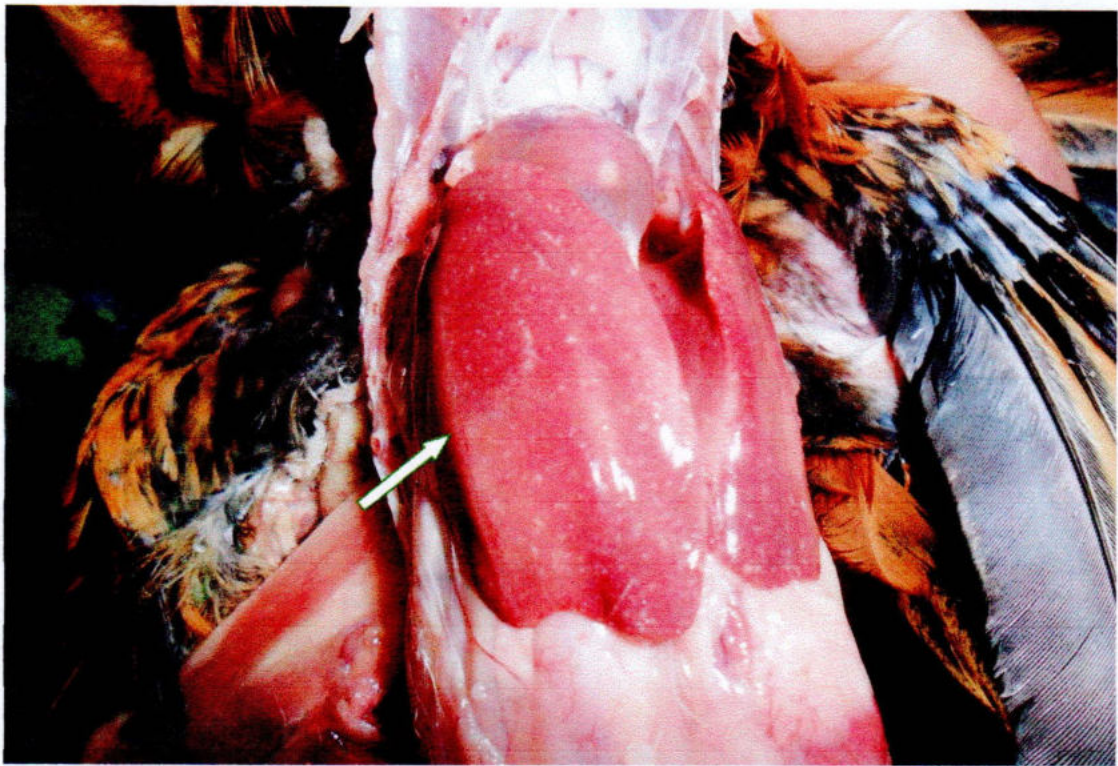
**Figure-7 : Haemorrhage and ulceration in intestine (Newcastle Disease)**



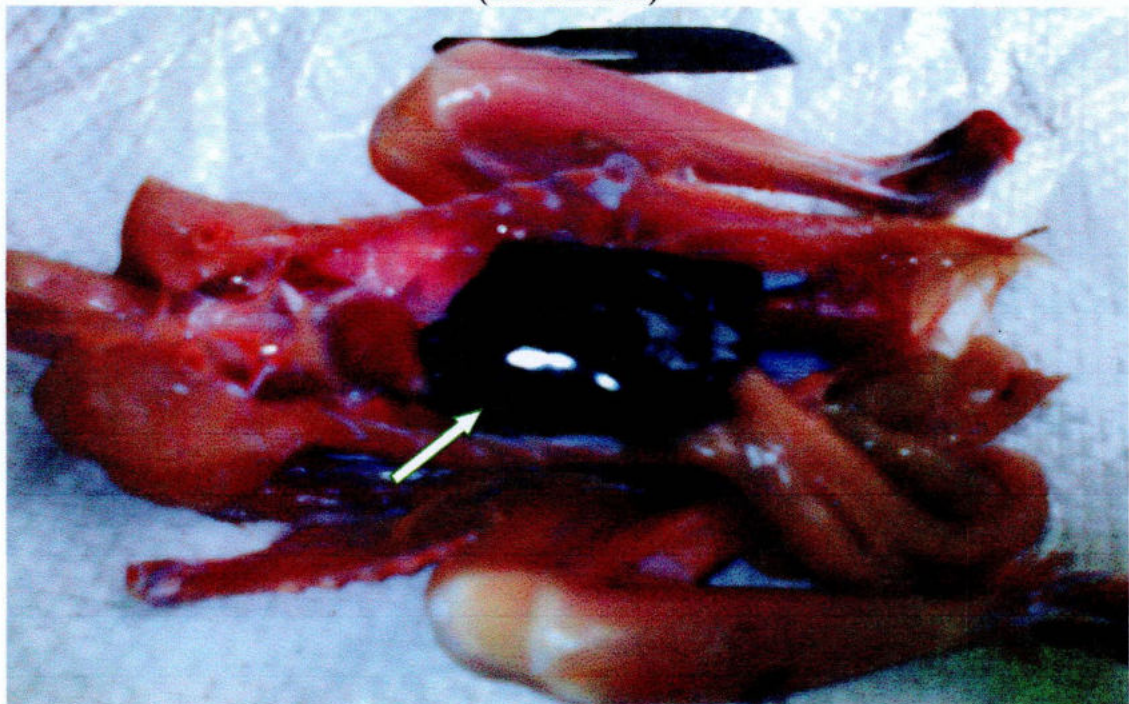
**Figure-8 : Haemorrhage in proventriculosis (Newcastle Disease)**



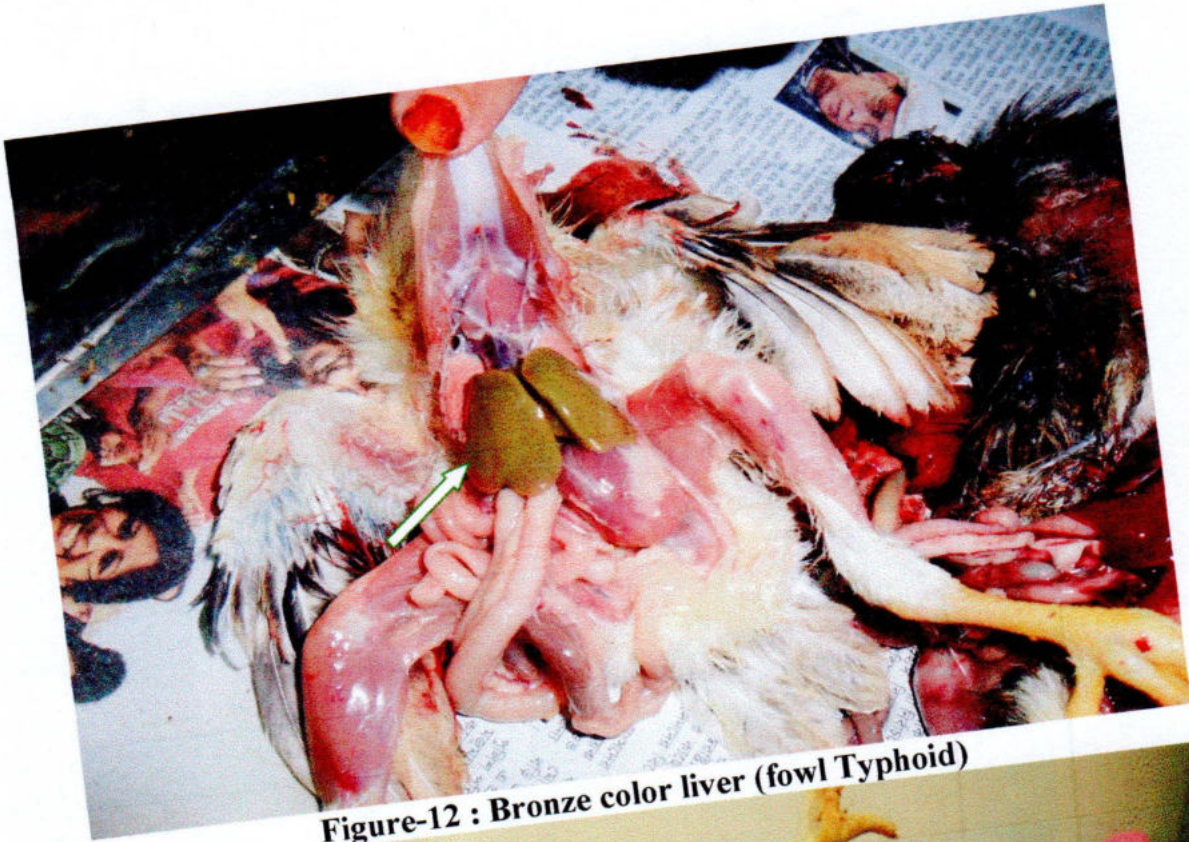
**Figure-9 : whitish-greenish diarrhoea (Newcastle Disease)**



**Figure-10 : Liver is swollen, enlarged and presence of necrotic foci (Salmonella)**



**Figure-11 : Bright Green color liver (Fowl Typhoid)**



**Figure-12 : Bronze color liver (fowl Typhoid)**

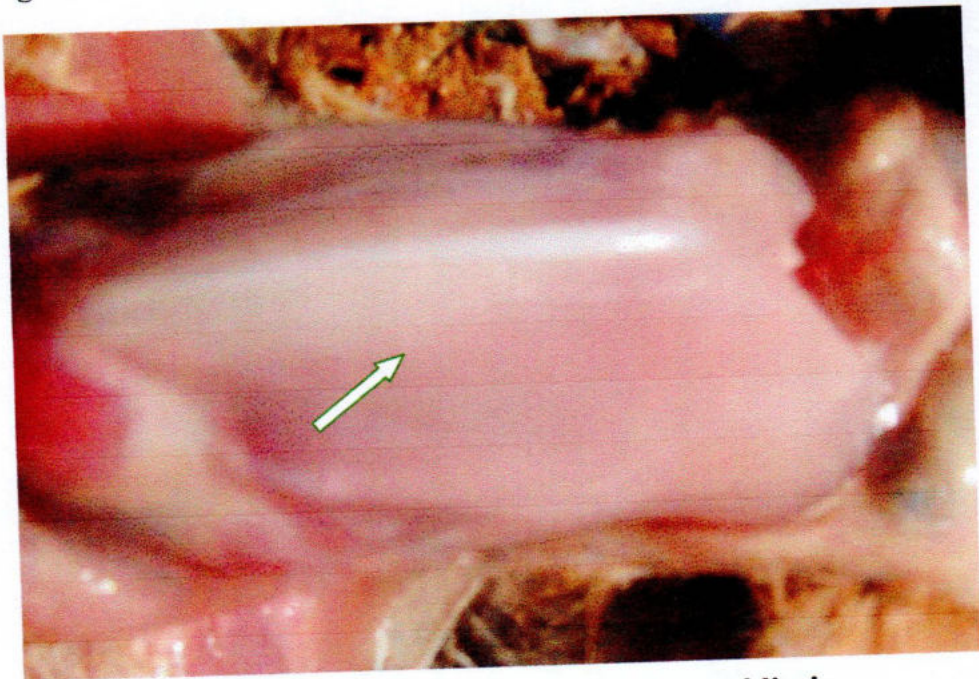


**Figure-13 : Haemorrhage in caeca (Coccidiosis)**





**Figure-14 : Caecal core formation / blood mixed faces (Coccidiosis)**



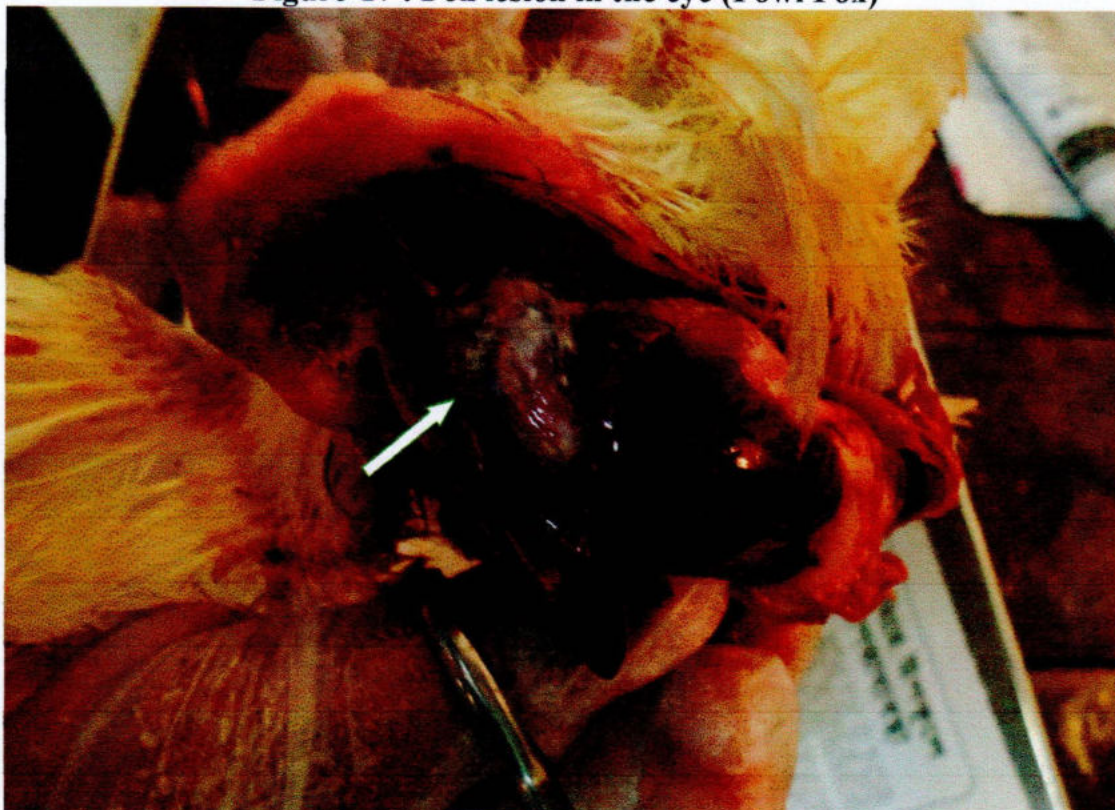
**Figure-15 : Anemic condition due to coccidiosis**



**Figure-16 : Pox lesion in the Eye (Fowl pox disease)**



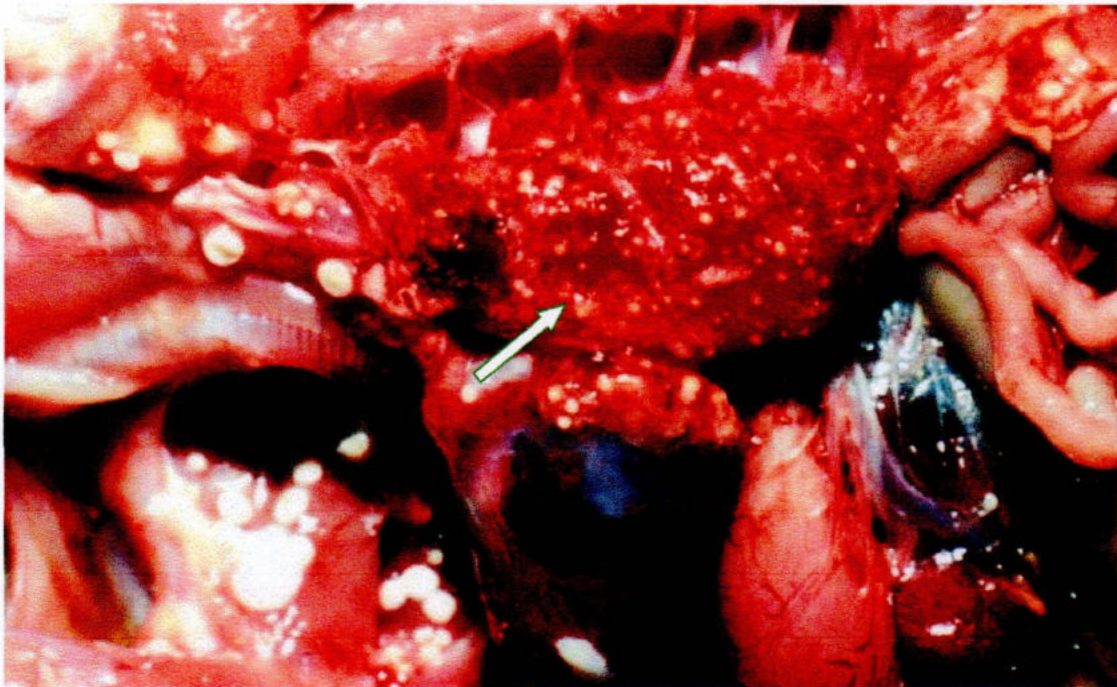
**Figure-17 : Pox lesion in the eye (Fowl Pox)**



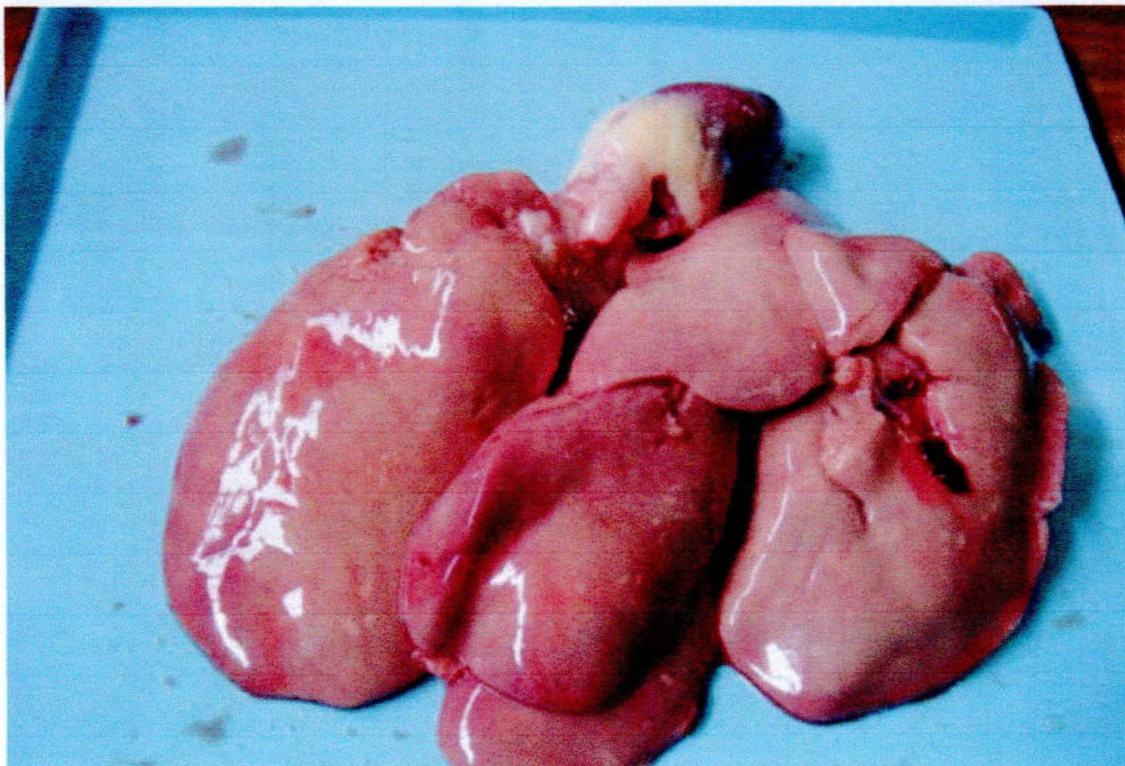
**Figure-18 : Whitish fibrinous covering of heart (Colibacillosis)**



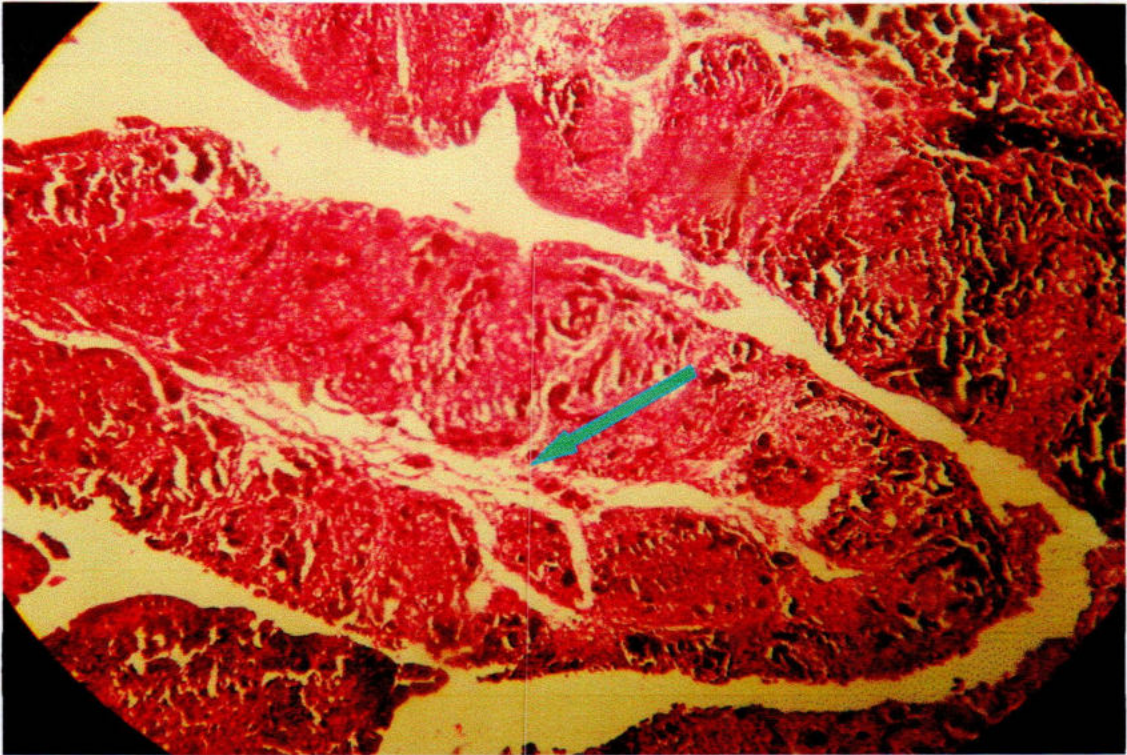
**Figure-19 : Unabsorbed egg of Sonali chick (Colibacillosis)**



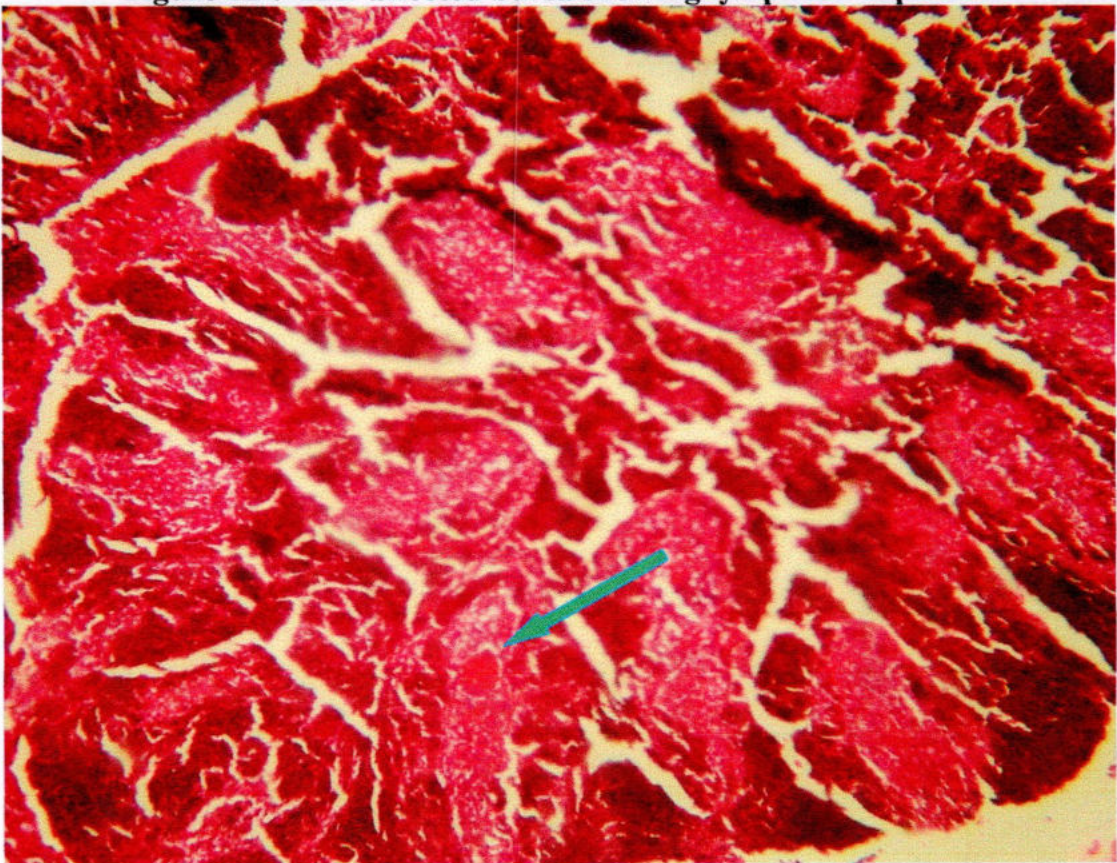
**Figure-20 : Image shows granuloma in lungs (Aspergillosis)**



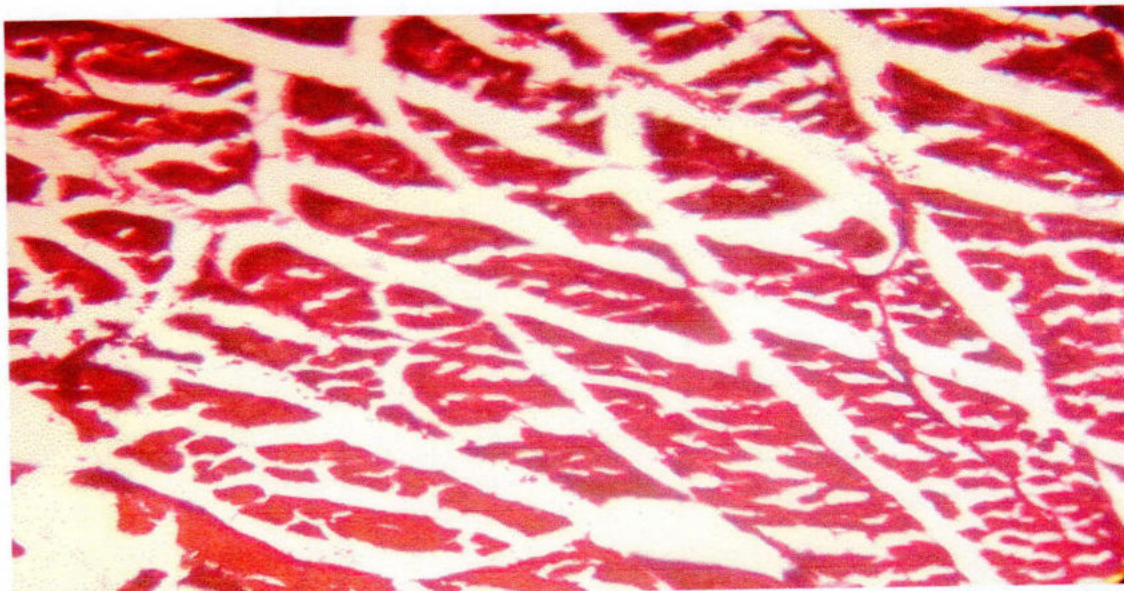
**Figure-21 : Enlarged and Fatty liver (Aflatoxicosis)**



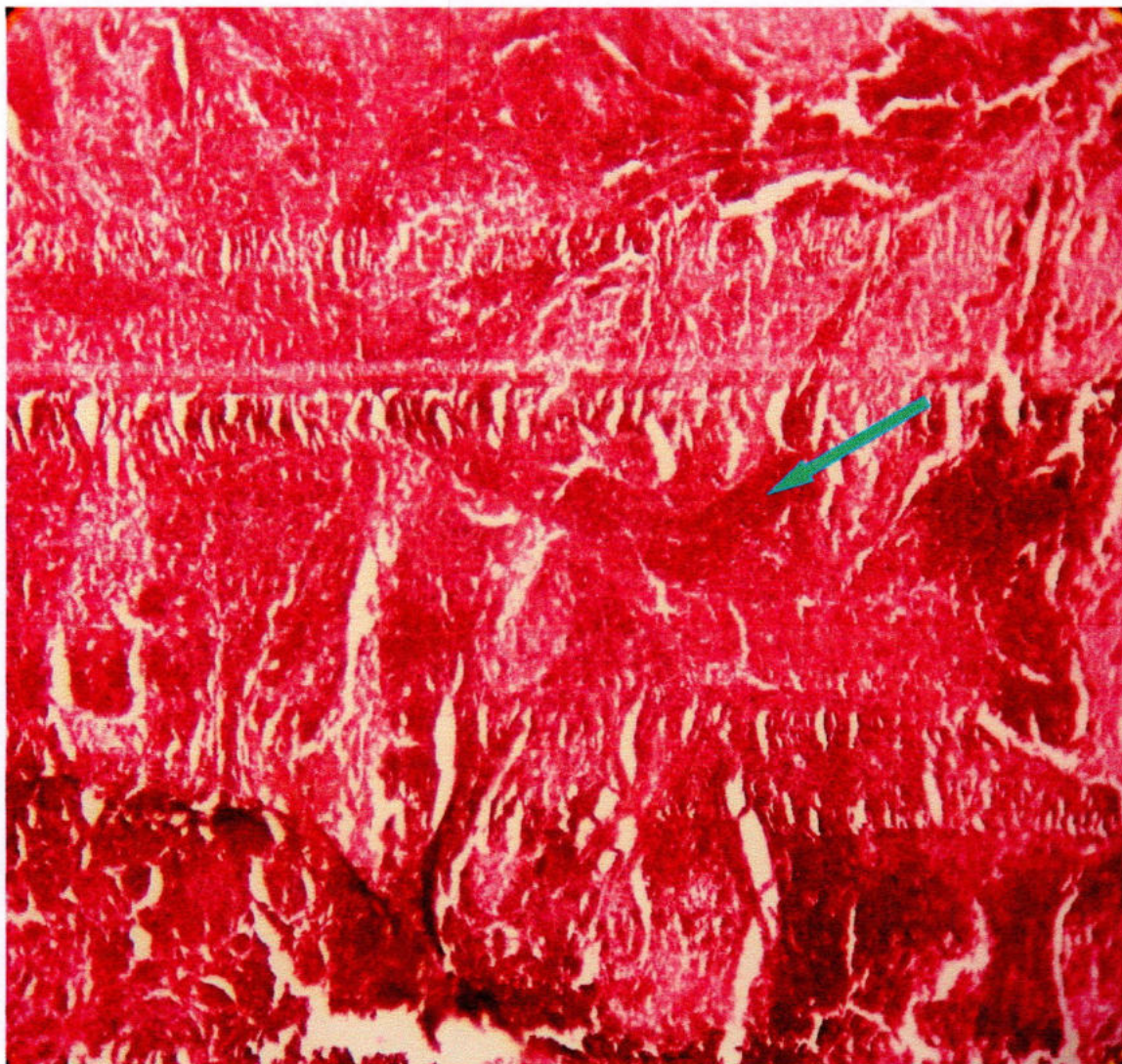
**Figure-22 : IBD affected bursa showing lymphoid depletion**



**Figure-23 : IBD affected bursa showing interfollicular oedema**



**Figure-24 : IBD affected thigh muscle showing hemorrhages in between the muscle fiber**



**Figure- 25** : Huge reactive cell infiltration

# **CHAPTER - V**

# **DISCUSSION**



## CHAPTER – V DISCUSSION

During recent observation from January to June, 2013 this study found a group of viral, bacterial, fungal, mycoplasmal, protozoal, deficiency disorder and miscellaneous disease conditions. A pathological investigation was performed on those diseases.

Major constrains in the development of poultry industry in Bangladesh is the outbreaks of various diseases which cause about 30% mortality of chickens in every year (Ali, 1994). So, to render the Sonali industry sustainable emphasis should be given to check the mortality of chickens. The prevalence of diseases in a particular area depends on various factors like geo-climatic condition, biological barriers, immunization status, social awareness etc. A thorough knowledge about the prevalent of diseases in an area, their epidemiology including morbidity and mortality patterns, pathogenesis and pathology of the disease is the requisite in proper diagnosis of the maladies as well as in the prevention and control strategies of the diseases. Mass immunization against a particular disease without knowing about the prevalence of that disease in the area cause not only economic loss in term of vaccination cost but also stress the bird, making them more susceptible to other diseases. Moreover emphasis should be given first in the prevention and control of those maladies that cause heavy mortality and / or reduce production performance of the chickens. On the other hand, incidence of a malady may be reduced in a particular area in course of time and another disease may appear.

In recent study, a total of 294 dead birds as well as sick birds were collected for necropsy from different Sonali farms of Joypurhat. This study found highest proportional incidence rate (25.51%) is Infectious Bursal Disease and lowest proportional incidence rate in Aflatoxicosis (0.68%). Statistical analysis showed

significant result of this study (table-2). Although the total number of birds necropsized were 294 but it did not only reflect the similar number of birds affected, because in a flock more than one bird could be affected and / or died but only few of them were collected. So, the values obtained in the present investigation reflect the total impression of the Sonali diseases of Joypurhat district.

### **5.1 Incidences of diseases in Sonali**

The highest proportional incidence of the diseases in Sonali in the recent study was recorded 25.51% which was the infectious bursal disease (IBD-Table: 1). This was followed by Coccidiosis 21.09%, Newcastle Disease (ND) 19.39%, Colibacillosis 14.29%, Salmonellosis 8.5%, Fowl pox 6.12%, miscellaneous disease conditions 2.04%, Deficiency Disorders 1.36%, Aspergillosis 1.02 % and Alfatoxicosis 0.68 %.

#### **5.1.1 Infectious Bursal Disease (IBD)**

The present study showed that prevalence of IBD was 25.51%. In this case Islam (2003) recorded 24.26% diagnosed at the Central Disease Investigation laboratory Dhaka. Ahmed *et al* recorded 11.06 in 2009 in Gazipur District. Prevalence of Gumboro disease also reported by (Anjum, 1990) and (Kim *et al*, 1996) as 3.1% and 27.3%, respectively. In present study, the clinical sign of IBD as whitish or watery diarrhoea which was similar to those described by (Cosgrove,1962). In this observation, the gross pathological lesions were hemorrhages in the thigh and breast muscles; enlarged, edematous, hyperemic and haemorrhagic bursa of fabricious and haemorrhage in the junction between gizzard and proventriculus. In some cases kidneys were found swollen. These findings support earlier observation of (Khan *et.al*, 2009), who reported that at necropsy the gross pathological lesions were dehydrated and darkened carcass, hemorrhages were

present on pectoral, leg and thigh muscles. Histopathological study revealed the finding as severe lymphoid depletion, heterophilic infiltration and oedema in the interfollicular space. These lesions were in agreement with those described by Hoque *et al*, 2001 and Burrah *et al* in 1998.

### **5.1.2 Coccidiosis**

The proportion incidence of Coccidiosis in present study was recorded in 21.09%. Islam *et al* (2003), Bhattacharjee, 1996 and Kutubuddin, 1973 recorded 9.46%, 9.40%, and 14.66% respectively. M .A salam, 2010 recorded 8.71% at Dinajpur District. Nematollahi *et al*, 2009 reported overall prevalence in layer chickens 55.96%. During this investigation the common clinical manifestations in the chicks suffering from natural Coccidiosis were found as bloody diarrhoea, anaemia, reduction of feed, body weight loss and water intake, impaired feed conversion. These findings are also supported by Reid and Pitoais, 1965 and Williams, 1996. Thickening of intestinal wall than normal, reddish to yellowish blood mixed intestinal contents in the lumen of intestine. In necropsy This study found haemorrhage and extravasations of blood within the intestinal lumen, profuse congestion and pin point hemorrhage on intestinal mucosa, hemorrhagic enteritis, mucoid to blood-tinged exudates and profuse mucosal bleeding in the caeca. This observation is similar to those reported by Jagadeesh *et al.*, 1976, Levine, 1983, Arakawa *et al.*, 1981; Baba *et al*, 1998; Helmbolt and Bryant, 1971.

### **5.1.3 Newcastle Disease (NCD)**

In present study, the proportional incidence of New castle Disease NCD was 19.39% where as Islam *et al*, 2003 Rahman and Samad 2003, Islam *et al*, 1998, Bhattacharjee *et al* (1996) and kamal (1989) recoded NCD as 6.73%, 10.34, 17.20%, 4.80%% and Kamal 18.65% respectively. Salam and Rashid recorded in 2010 as 17.72%. The present finding would indicate that NCD in commercial flocks is still a major threat to the poultry industry in spite of availability and the

use of ND Vaccine. In the recent study, the clinical sign of NCD as paralysis of legs and wings recorded which were similar to those described by Ressay 1961. At present study, the gross morbid lesion of NCD as haemorrhage in caecal tonsil which was similar to those described by Banerjee *et al*, 1994, Jungherr 1964 and Crawford 1930. Kutubuddin 1973 and Sarkar 1976) did not observe NCD in birds of Bangladesh Agricultural university poultry farm. These findings indicate that the prevalence and incidence of this disease may vary from time to time. Immunization procedure, if not adopted properly, may influence the incidence rate of the malady. It is usually said that NCD is under control now a days in an organized broiler farms but the present findings do not indicate this.

#### 5.1.4 Colibacillosis

The proportional incidence rate of Colibacillosis was recorded as 15.31 at the present study whereas Salam *et al*, 2010 recorded 14.01% at Dinajpur District. Rahman and Samad (2003), Islam *et al* 2003 and Bhattacharjee *et al*, 1996 recorded in 8.40%, 5.71% and 10.61% respectively. Islam *et al*, recorded Colibacillosis in 2002 as 5.17% at Sylhet District. Ahmed *et al*, recorded Colibacillosis in 52.26% at Gazipur district. The clinical signs showed that sick birds were dullness, depression, reduced intake of food and water, huddling at the corner of the shed, loss of body weight, brown color droppings etc. Post-mortem examination revealed pericarditis, unabsorbed egg, petechial haemorrhages and formation of the fibrinous layer on the heart, air sac infection, enteritis, dilation of the last part of the intestine. These lesions are similar to Gross 1988 and North and Bell 1990 pathological investigation.

#### 5.1.5 Salmonellosis

At present study showed 8.5% proportional incidence rate of Salmonellosis whereas M B Uddin *et al*, 2010 recorded as 7.68% at Narsigdi District. Islam *et al*, 2003, Bhattacharjee *et al*, 1996, Kamal 1989 and Kutubuddin 1973 recorded

Salmonellosis as 6.73%, 9.28%, 4.82%, and 12.0% respectively from the poultry of Bangladesh. The present finding would indicate that Salmonellosis is a threat to the Sonali farms. In the present study, the gross changes of liver as necrosis in liver which was similar to those described by Cishti *et al*, 1985. At present study grossly found fragile, enlarged & congested liver, Necrotic foci in liver, green colored liver & bronze colored liver.

#### **5.1.6 Fowl Pox**

Presently Fowl pox was recorded in 5.10% where as Uddin 2011 recorded in 0.81%. The clinical signs were recorded during the physical visit of Sonali flocks and the farmer's complaints were also emphasized. Clinical signs were observed with avian pox were weakness, emaciation, difficulty in swallowing and breathing, vision problems, a reduction in egg production, soiled facial feathers, conjunctivitis, edema of the eyelids and the presence of the characteristic wart-like growths on the unfeathered portions of the skin. The affected birds exhibited gross lesions in 2 forms, cutaneous (dry) and diphtheritic (wet). The cutaneous form was the most commonly observed with the lesions regressing and forming scars. This form of pox appeared as a small white, pink or yellow vesicle (blister) on unfeathered parts of the skin (feet, legs, base of the beak, eye margins and head). Scabs were also formed. The surfaces of the nodules were rough and dry and the color was dark brown or black. The size and number of nodules were different and varying degree of sizes. This observation agreed with the work of Jorge Orios *et al*, 1997.

#### **5.1.7 Aspergillosis and Alfatoxicosis**

At this present study, Aspergillosis and Alfatoxicosis were recorded 1.02% and 0.68% respectively. Islam *et al*, 1998, Kamal 1989 and Kutubuddin 1973 recorded in case of Aspergillosis 4.03%, 10.61% and 9.33% respectively. The gross morbid

lesion of Alfatoxicosis as enlarged fatty liver in present study recorded which was similar to those described by Smith *et al*, 1970.

#### **5.1.8 Deficiency disorders**

Deficiency disorders in present investigation were recorded in 4 (1.36%) in which Rahman and Samad 2003 recorded 3.43%. The deficiency disorders vary from farm to farm depending up on the management system. Moreover, various feed additives are used now-a-days to improve meat & egg qualities. The increasing trend of nutritional deficiency possibly related to indiscriminate use of feed additives or other antibiotics in the organized or rural little Sonali farms.

#### **5.1.9 Miscellaneous disease conditions**

The present study found the proportional incidence of miscellaneous disease conditions was 2.04%. Islam *et al*, 2003 recorded this as similar to me was 2.04%.

# **SUMMARY AND CONCLUSION**

## SUMMARY AND CONCLUSION

The pathological investigation was carried out on the diseases in Sonali occurring in different small scale Sonali farms of various regions of Joypurhat which was conducted during the period from January 2013 to June 2013. A total 294 dead as well as sick birds were collected for necropsy from different poultry farms. The diagnosis of different disease conditions were based on history, clinical sign, postmortem lesion and histopathological study. The diagnosed diseases included Infectious Bursal Disease (25.51%), Newcastle Disease (19.39%), Colibacillosis (14.29 %), Coccidiosis (21.09%), Salmonellosis (8.5%), Fowl pox (6.12%), Aspergillosis (1.02 %), Aflatoxicosis (0.68 %), Deficiency disorders (1.36 %) and miscellaneous disease conditions (2.04 %).

In respect to the proportional incidences, the top four diseases were Infectious Bursal Disease (25.51%), Coccidiosis (21.09 %), Newcastle Disease (19.39 %), and Colibacillosis (14.29%).

From the above facts and findings, it could be concluded that

- Proper immunization procedure against these diseases should be under taken to prevent the mortality of sonali birds. More ever causes of immunization failure against the IBD (infectious Bursal Disease) deserve further investigation.
- Managemental disease like Salmonellosis, Colibacillosis, Alfatoxicosis, deficiency disorders, Coccidiosis, etc. also resulted in high mortality in Sonali of Joypurhat. So, managemental procedures should be emphasized.
- Farmers are to be trained up before set up Sonali farms.



- The incidence rate of diseases in Sonali should be monitored time to time to adopt proper prevention and control strategies, and to treat the flock if required.
- To make social awareness about different diseases in Sonali to recover economic loss.
- This study shows from this discussion that prevalence and incidence pattern of various diseases are changing from time to time as well as from place to place. Recently IBD, Coccidiosis, NCD and Colibacillosis have drawn attention to the specialist to provide more emphasis on prevention and control of these diseases. Most of the recorded diseases are managerial diseases including Salmonellosis, Aflatoxicosis, and Coccidiosis etc. So, it is necessary to improve biosecurity for successful farming. For the above purpose to increase immunity level it is necessary of implementation on proper vaccine and maintenance.

# REFERENCES

## REFERENCES

- Ahmed, Z. 1997.** Semi-scavenging poultry model production chin. Impact of smallholder livestock Development project in some selected Areas of Bangladesh. *Livest.Res. Rural Devel.* 9(4): 23-30.
- Arjona, AA Denbow D.M. and Weaver W.D. 1988.** Effect of heat stress early in Life on Mortality in broilers exposed to high environmental temperatures just prior to marketing. *Poultry Science.* 67(2): 226-231.
- Das, G.B. 2005.** The poultry production 1st edition. Breed description. Dhaka: *Bangla Academy Press* 65 (3):112-145.
- Majumder, A. M. (1989).** Poultry rearing by women: Problems and prospects (in Bangladesh) *Journal of Rural Development (Bangladesh)* Vol. 21(2): 20-25.
- Islam, M. S., Alam, M. R., Rashid, M. A. and Hossen, M. J. 2006.** Effect of balanced supplementary feed and cafeteria feeding on the performance of cross-bred chicken in semi-scavenging system. *Bang. J. Anim. Sci.*, 35(1-2): 36-41.
- Islam, M.A. and Hishibori M. 2009.** Indigenous Naked Neck Chicken: A Valuable Genetic Resource for Bangladesh. *World's Poultry Science Journal*, 65 (1): 125-138.
- Katuli, A.M. 1990.** Crossbreeding as a tool for genetic improvement of chicken in suboptimum environments. *Beitr Trop Landwirtsch Veterinarmed.* 28 (3): 325-335.

- Giasuddin, M., Sil, K., Alam, I. Koike, M.R. Islam and M.M. Rahman 2002.** Prevalence of Poultry Diseases in Bangladesh. *Journal of Biological Sciences*, 2 (4): 212–213.
- Paul, D.C., Huque, M.E and Huque, M.F. 1995.** Growth. Pattern of exotic pullets. Under farmers management. *Bangladesh Journal of Scientific and Industrial Research*. 30(4):15-20.
- Wu, C.k. and Han, Y.W. 1983.** Feeding efficiency and utilization of energy and protein of broiler and different Diets. *Journal of Northeast Agricultural University*. 1983(2): 16571.
- Nelson, C.B., Pomeroy B.S., Schroll, K, Park W.E., Lindeman, R.J. 1952.** An outbreak of conjunctivitis due to Newcastle disease virus (NDV) occurring in poultry workers. *Am J Public Health* 42(6):672–678.
- Vigil, A., Park, M.S., Martinez O., Chua, M. A., Xiao, S., Cros, J. F, Martínez-Sobrido L. and García A. 2007.** Use of reverse genetics to enhance the oncolytic properties of Newcastle Disease Virus. *Cancer Res*. 1(67): 82-85.
- Zamarin, D., Kelly K, Mansour, M., Sheng, G., Vigil. A., Palese, P. and Fong, Y. 2009.** Enhancement of oncolytic properties of recombinant Newcastle Disease Virus through antagonism of cellular innate immune responses. *Mol Ther*. 17(4): 697–706.
- Elankumaran, S., Rockemann, D. and Samal, K. 2006.** Newcastle Disease Virus exerts oncolysis by both intrinsic and extrinsic caspase-dependent pathways f cell death. *J. Virol*. 80(15): 7522–7534.

- Kuruppu, D. and Tana, K.K. 2005.** Viral oncolysis by herpes simplex virus and other viruses. *Cancer Biology & Therapy*, 4(5): 524–531.
- Altomonte, J., Marozin, S., Schmid, R. S. and Ebert, O. 2009.** Engineering Newcastle disease virus as an improved oncolytic agent against Hepatocellular carcinoma. *Mol Ther.* 18(2): 275–284.
- Vigil, A., Martínéz O, and Chua, M. A. 2008.** García-Sastre. Recombinant Newcastle disease virus as a vaccine vector for cancer therapy. *Mol Ther.* 16(11): 1883–1890.
- Zamarin, D., Vigil A., Kelly, K., García, A. and Fong, Y. 2009.** Genetically-engineered Newcastle Disease Virus for malignant melanoma therapy. *Gene Ther.* 16(6) :725-741.
- Bedrink, P., Jurkvoic, P., Kuceraj., Firmanova, A. 1989.** Cross resistance to the ionophorous polyether anticoccidial drugs in *Eimeria tenella* isolates from Czechoslovakia. *Poultry Science* 68(1):89-93.
- Chapman, H.D. 1986.** Isolates of *Eimeria tenella*: studies on resistance to ionophorous anticoccidial drugs. *Research in Veterinary Science* 41(2):281-282. 796-804.
- Chapman, H.D. 1998.** Evaluation of the efficacy of anticoccidial drugs against *Eimeria* species in the fowl. *International Journal of Parasitology* 28(7):1141-1144.

- Khan, M.K.I. 2003.** Crossing Hilly with RIR and Fayoumi for the Deveopment of Layer Chicken Suitable for Semi-scavenging System with Sonali and Nera as Control. An applied research project. *Chittagong: Chittagong Veterinary and Animal Sciences Univ. Press* 43:4573
- Roy, K. R., Chowdhury, S. D., Sultana, N., Moshad, M. A. A. and Hasan, M. N. 2006.** Production potentiality and economics of rearing cockerels from a commercial layer strain. *Bangladesh. vet. J.*, 23(2): 83-87.
- Rahman, M. M., Baqui, M. A. and Howlider, M. A. R. 2004.** Growth performance and meat yield of reciprocal crosses of RIR and Fayoumi chicken under local condition of Bangladesh. *Bangladesh vet. J.*, 21(1): 45-51.
- Chapman, H.D. and Mcfarland J.L. 2003.** Rotation Programs with Diclazuril and a coccidiosis vaccine. *Vaccine Coccidiosis*, 9: 118-120.
- Chapman, H.D. 2005.** Perspectives for the control of coccidiosis in poultry by chemotherapy and vaccination. *Vaccine Coccidiosis* 12: 19-23.
- Chapman, H.D. 2007.** Rotation programmes for coccidiosis control. *International Poultry Production*, 15: 7-9.
- Gussem, M. 2005.** Coccidiosis control in poultry: *Importance of the Quality of Anticoccidial Premixes*. 15: 199-231.
- Elwinger, K., Berendtson, E., Engstrom, O.,Waldenstedt, L. 1998.**Effect of antibiotic growth promoters and anticoccidials on growth of Clostridium perfringens in the caecaand on performance of broiler chickens. *Acta Veterinaria Scandinavica* , 39 : 433-441.

- Fitz, S.H., Edgar, S.A. 1992.** Pathogenicity and control of *Eimeria mitis* infections in broiler chickens. *Avian Diseases*, 36:44–48.
- Gore, T.C., Long, P.L. 1982.** The biology and pathogenicity of a recent field isolate of *Eimeria praecox* Johnson, 1930. *Journal of Protozoology*, 29:82–85.
- Gumila, C., Ancelin, M., Delort, M., Miguel, G. and Vial, H. 1996.** Differential in vitro activities of ionophore compounds against *Plasmodium falciparum* and mammalian cells. *Antimicrobial Agents and Chemotherapy*; 40: 602-608.
- Idris, A.B., Bounous, D.I., Goodwin, M.A., Brown, J., Krushinkie, E.A., 1997.*  
Lack of correlation between microscopic lesion scores and gross lesion scores in commercially grown broilers examined for small intestinal *Eimeria* spp. coccidiosis. *Avian Diseases* 41(2):388-91.
- Johnson, J. and Reid, W.M. 1970.** Anticoccidial drugs: lesion scoring techniques in battery and floor pen experiments with chickens. *Experimental Parasitology* 28: 30-36.
- Mathis, G. F. 2003.** Examination of the restoration of sensitivity to Clinacox by using Coccivac-B. Proceedings of the 13th Congress of the *Worlds Veterinary Poultry Association* 24:26-35.
- Mathis, G.F. 2003.** Vaccine can decrease anticoccidial resistance. *World Poultry, Special Supplement Coccidiosis*, 4:22-23.

- Mathis, G. 2005.** Reasons for field problems with *E. maxima*: *E. acervulina* versus *E. maxima*. Proceedings of the *IXth International Coccidiosis Conference*, 9:19-23.
- Mathis, G.F. and Broussard, C. 2006.** Increased level of *Eimeria* sensitivity to diclazuril after using a live coccidial vaccine. *Avian Diseases* 50 (3):321-324.
- Marien, M., Gussem, M., Fort, G. and Naciri, M. 2007.** Indication of cross-resistance between different monovalent ionophores as determined by an anticoccidial sensitivity test (AST). Accepted for Proceedings *XVIth European Symposium on Poultry Nutrition, August 26-30 2007*, Strasbourg, France.
- Eterradossi, N. and Saif, Y.M. 2008.** Infectious Bursal Disease. In: *Diseases of Poultry, 12th Edition* 42:51-64.
- Caston, et al. 2008.** "Infectious Bursal Disease Virus (IBDV)". Segmented Double-stranded RNA Viruses: Structure and Molecular Biology. *Caister Academic Press*. ISBN 978-1-904455-21-9.
- Büchen, C. 2006.** Infectious bursal disease virus. In: *ICTVdB - The Universal Virus Database, version 4*. 22:43-60.
- Azad, A.A, Brown M.A. & Hudson P.J. 1987.** Deletion mapping and expression in *Escherichia coli* of the large genomic segment of a birnavirus. *Virology*, 161, 145-152.



- Brown, M.D., Green P. and Inner, A. 1994.** VP2 sequences of recent European 'very virulent' isolates of infectious bursal disease virus are closely related to each other but are distinct from those of classical strains. *J. Gen. Virol.*, 75, 675–680.
- Boot, J., Huurne, A., Hoekman A.J. and Elms, L. 2000.** Rescue of very virulent and mosaic infectious bursal disease virus from cloned cDNA: VP2 is not the sole determinant of the very virulent phenotype. *J. Virol.* 74: 6701–6711.
- Cullen, A. 1975.** Quantitation of antibodies to infectious bursal disease. *Vet. Rec.*, 97: 315-320.
- Cullen, A. 1976.** Response of growing chickens to an inactivated IBD antigen in oil emulsion. *Vet Rec.*, 99: 418-421.
- Darteil R., Bublot M., Laplace E., Bouquet J.F., Audonnet J.C. and Vere M. 1995.** Herpes virus of turkey recombinant viruses expressing infectious bursal disease virus (IBDV) VP2 immunogen induces protection against an IBDV virulent challenge in chickens. *Virology*, 211: 4781–4790.
- Davis, 1990.** Random cDNA probes to infectious bursal disease virus. *Avian Dis.* 34: 329–335.
- Etteradossi, Tekaiia, Toquin, Rivallan, Guittet, Domeneh, Van Den Berg and Elder, 1999.** Antigenic and genetic relationships between European very virulent infectious bursal disease viruses and an early West African isolate. *Avian Pathol.*, 28: 36-43.

- Zierenber G K., Raue R., 2001.** Rapid identification of very virulent strains of infectious bursal disease virus by reverse transcription-polymerase chain reaction combined with restriction enzyme analysis. *Avian Pathol.* 30: 55–62.
- Mundt, 1999.** Tissue culture infectivity of different strains of infectious bursal disease virus is determined by distinct amino acids in VP2. *J. Gen. Virol.* 80: 2067–2076.
- Muskett J.C., Hopkins I.G., Edwards K.R. 1979.** Comprison of two infectious bursal disease vaccine strains: Efficacy and potential hazards in susceptible and maternally immune birds. *Vet. Rec.*, 104: 332–334.
- Reed, 1938.** A simple method of estimating fifty percent end points. *Am. J. Hyg.* 27: 493–497.
- Rosenberger, 1986.** Isolation and characterization of variant infectious bursal disease viruses. *J. Am. Vet. Med. Assoc.* 52:189 & 357.
- Rosenberger, Klopp, and Krauss, C. 1975.** The role of the infectious bursal agent and several adenoviruses in the hemorrhagic-aplastic anaemia syndrome and gangrenous dermatitis. *Avian Dis.* 19: 717–729.
- Schniezler, Bernstien, Muller and Becht, 1993.** The genetic basis for the antigenicity of the VP2 protein of the infectious bursal disease virus. *J. Gen. Virol.* 74: 1563–1571.

- Seeles, K., Lukert, D., Fletcher and Leonard, D. 1979.** Immunisation studies with a cell-culture adapted infectious bursal virus. *Avian Dis.*, 23: 456–465.
- Smiley, R., Sommer, and Jacwood, 1999.** Development of a ssRNA internal control reagent for an infectious bursal disease virus reverse transcription / polymerase chain reaction – restriction fragment length polymorphism diagnostic assay. *J. Vet. Diagn. Invest.*, 11: 497–504.
- Snyder, B., Lana, P., Savage P.K., Yancey F.S., Mengel and Marquardt, W. 1988.** Differentiation of infectious bursal disease viruses directly from infected tissues with neutralizing monoclonal antibodies: Evidence for a major antigenic shift in recent field isolates. *Avian Dis.*, 32: 535–539.
- Snyder D.B., Vakharia, and Savage, K. 1992.** Naturally occurring-neutralizing monoclonal antibody escape variants define the epidemiology of infectious bursal disease viruses in the United States. *Arch. Virol.* 127: 89–101.
- Thorton, and Muskett, C. 1982.** Quality control methods for inactivated infectious bursal disease vaccines. *Dev. Biol. Stand.* 51: 235–241.
- Thorton, and Pattison, 1975.** Comparison of vaccines against infectious bursal disease. *J. Comp. Pathol.*, 85: 597–610.
- Vakharia, Ahamed and Snyder, 1994.** Molecular basis of antigenic variation in infectious bursal disease virus. *Virus Re.*, 31: 265–273.
- Van Den Berg, Gonge, Morales and Meuelemanis G. 1996.** Acute infectious bursal disease in poultry: immunological and molecular basis of antigenicity of a highly virulent strain. *Avian Patho.*, 25:751–768.

- Van Den Berg, and Meulemanis, 1991.** Acute infectious bursal disease in poultry: protection afforded by maternally derived antibodies and interference with live vaccination. *Avian Pathol*, 20: 409–421.
- Wu, C., Lin, L., Zhang, G., Davis, S., and Boyle, A. 1992.** Molecular detection of infectious bursal disease virus by polymerase chain reaction. *Avian Dis.*, 36: 221–226.
- Wu, C., Rubinelli and Lin, L. 2007.** Molecular detection and differentiation of infectious bursal disease virus. *Avian Dis*, 51: 515–526.
- Wyeth and Cullen, 1979.** The use of an inactivated infectious bursal disease oil emulsion vaccine in commercial broiler parent chickens. *Vet. Rec.*, 104: 188–193.
- Barrow, 1992.** ELISAs and the serological analysis of salmonella in poultry: a review. *Epidemiol. Infect.*, 109: 361–369.
- Barrow, 1994.** Serological diagnosis of *Salmonella* serotype *enteritidis* infections in poultry by ELISA and other tests. *Int. J. Food Microbiol.*, 21: 55–68.
- Barrow and Freitas Neto, 2011.** Pullorum disease and fowl typhoid new thoughts on old diseases: a review. *Avian Pathol.*, 40 (1):1–13.
- Habib-ur-Rehman, Sirzanin, Hamayun, Saleem K, Nazir, 2003.** Incidence and gross pathology of salmonellosis in chicken in Hyderabad. *Journal of Association of Veterinary Advances* 2 : 581-584.

- Brooks, W., Perry, B., Lutze-Wallace, and Maclean, 2008.** Structural characterization and serological specificities of lipopolysaccharides from salmonella enterica serovar gallinarum biovar pullorum standard, intermediate and variant antigenic type strains. *Vet. Microbiol.*, 126(4): 334–344.
- Cha, Jang, Kim, Park, and Jang, 2008.** Rapid detection and discrimination of the three salmonella serotypes, S. Pullorum, S. Gallinarum and S. Enteritidis by PCR-RFLP of ITS and fl*C* genes. *Korean J. Poult. Sci.*, 35 (1): 9–13.
- Ellis, M., Williams, E., Mallinson, T., Snoyenbos, and Martin, J. 1976.** Culture Methods for the Detection of Animal Salmonellosis and Arizonosis. *Iowa State University Press*, 49: 533-560.
- Eswarappa, M., Janice J., Balasudarram S.V., Dixit N.M. and Dipshiha C. 2009.** Host-specificity of salmonella enterica serovar gallinarum: Insights from comparative genomics. *Infect Genet. Evol.*, 9 (4): 468–473.
- Gast, K. 1997.** Detecting infections of chickens with recent *Salmonella Pullorum* isolates using standard serological methods. *Poult. Sci.*, 76: 17–23.
- Grimont, and Weill, 2007.** Antigenic formulae of the *Salmonella* serovars. WHO Collaborating Centre for reference and research on *Salmonella*. *Institut Pasteur, Paris, France*. 11(4): 334–345.

- Haider, Chowdhury, Das, and Hossain 2003.** Isolation and characterization of enterobacteria associated with health and disease in Sonali chickens. *Bangladesh Journal of Veterinary Medicine* 2: 15-21.
- Habtamu, Rathore, Dhama, and Agarwal, K. 2011.** Epidemiological characterization of *Salmonella gallinarum* Isolates of poultry origin in India, employing two PCR based typing methods of RAPD-PCR and PCR-RFLP. *Asian J. Anim. Vet. Adv.*, 6: 1037–1051.
- Harourine, Willams, Parker and Fincham, 1963.** The prevention of fowl typhoid in the field using a freeze-dried 9R vaccine. *Vet. Rec.*, 75: 858–861.
- Hitchner, 2004.** History of biological control of poultry diseases in the U.S.A. *Avian Dis.*, 48: 1–8.
- Holt, and Chaubl, H., 1997.** Detection of motility and putative synthesis of flagellar proteins in *Salmonellapullorum* cultures. *J. Clin. Microbiol.*, 35: 1016–1020.
- Khan, M.K.I., Khatun, M.J., Bhuiyan, and Sharmin, R. 2006.** Production performance of Fayoumi chicken under intensive management. *Pak. J. Biol. Sci.*, 9(2): 179-181.
- Khan, A.G. 1983.** Improvement of Deshi Birds (part-2) *Poultry Adviser*. 16 : 67-78.
- Kang, S. 2005.** Safety and efficacy of *Salmonella gallinarum* 9R vaccine in young laying chickens. *Avian Pathol.*, 34: 362–366.

- Rhoades and Rimler, 2000.** Avian pasteurellosis, in "Diseases of poultry", ed. by M.S. Hofstad, Iowa State University Press, Ames, Iowa, USA ISBN 0-8138-0430-2, p. 141.
- Hassan Iraqui, 2007.** Observation on an outbreak of fowl cholera in a parental broiler flock, Azrou, Morocco,, unpublished data.
- Botzler, 1991.** Epizootiology of Avian Cholera in Wildfowl. *Journal of Wildlife Diseases*. 27:367-395 <http://www.cbc.ca/technology/story/2011/01/20/north-avian-cholera-eider-ducks.html> (CBC)
- Blanchong et al., 2006.** Persistence of *Pasteurella multocida* in Wetlands Following Avian Cholera Outbreaks. *Journal of Wildlife Disease*. 42: 33-39.
- Samuel et al, 2005.** Avian Cholera in Waterfowl: The role of Lesser Snow Geese and Ross's Geese Carriers in the Playa Lakes Region. *Journal of Wildlife Diseases* 21(1)-39.
- Blanchong et al., 2006.** Multi-species patterns of avian cholera mortality in Nebraska's rainwater basin. *Journal of Wildlife Diseases*. 42: 81-91.
- Rhoades and Rimler, 2000.** Avian pasteurellosis, in "Diseases of poultry", ed. by M.S. Hofstad, Iowa State University Press, Ames, Iowa, USA ISBN 0-8138-0430-2, p. 141
- Islam, M. S., Alam, M. R., Rashid, M. A. and Hossen, M. J., 2006.** Effect of balanced supplementary feed and cafeteria feeding on the performance of cross-bred chicken in semi-scavenging system. *Bang. J. Anim. Sci.*, 35(1-2): 36-41.
- Barua, A. and Howlider, M.A.R., 1990.** Prospect of native chickens of Bangladesh. *Poultry Adviser*. 23 : 57-61.

- Kabir, S. S. K., 2005.** Poultry in Bangladesh; Awaiting the awakening. Proceedings of the Seminar, *4th International Poultry Show and Seminar. 10-12 March, 2005. Dhaka, Bangladesh. pp. 8-15.*
- Mamun, F. A., 2003.** A comparative study on the performance of cockerels of two different laying strains under farm condition. M. S. Thesis, Dept. of Poult. Sci. Faculty of Animal Husbandry, *Bangladesh Agricultural University, Mymensingh. 23 : 49-11.*
- Rahman, M. M., Baqui, M. A. and Howlider, M. A. R., 2004.** Growth performance and meat yield of reciprocal crosses of RIR and Fayoumi chicken under local condition of Bangladesh. *Bangladesh vet. J., 21(1): 45-51.*
- Rahman, Mahfuzar, N. Islam, Sarker and M.M. Islam, 1996.** Effect of Supplementary Feeding on Production Performance of RIR, Fayoumi and their Cross-bred Chicken in Rural Bangladesh. *Bangladesh Journal of Livestock Research, Volume 5: 19-98.*
- Faruque, S., Siddiquee, N.U., Afroz, M.A. & Islam, M.S., 2010.** Phenotypic characterization of native chicken reared under intensive management system. *J. Bangladesh Agric. Univ. 8(1): 79-82.*

