

Hemato-Biochemical Changes of Layer Birds during Egg Production Reared in Sylhet Region of Bangladesh

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Abstract – A total of sixty (60) layer birds ISA Brown Strain divided in three cages were selected for study. The birds were maintained in Battery cage system in experimental unit of Sylhet Agricultural University, Bangladesh to investigate the effects of hematobiochemical changes during egg production of layer birds. The design of the experiment was RBD with five replications and four different layer birds of age of 24-28wks, 29-33wks, 34-38wks and 39-43wks. The highest value of TEC, TLC, Hb and PCV, SGOT, SGPT and Ca were 2.833 ± 0.04 million/ mm^3 , 21.7 ± 0.10 thousand/ mm^3 , 8.883 ± 0.03 gm/dl and 28.58 ± 0.02 (%), 14.2 ± 0.2 iu/l, 23.03 ± 0.23 iu/l and 9.013 ± 0.10 mg/l of blood respectively, obtained during 39-43wks of egg production and lowest value was in 24-28 weeks of age. There was significantly ($p < 0.01$) lower in 24-28 weeks of age than the 39-43 weeks of age. The number of TEC, TLC and concentration Hb, PCV were increasing according to age of birds. The SGOT/AST, SGPT/ALT and Calcium (Ca) were statistically significant ($p < 0.01$) in different age and groups of layer birds during egg production. The concentration of SGOT/AST, SGPT/ALT and Calcium (Ca) were increasing according to the age of birds. The present results revealed that 39-43wks of age of layer birds found the maximum volume of hematobiochemical parameter.

Keywords – Layer Bird, Hematobiochemical Parameters, Total Erythrocyte Count, Total Leukocyte Count, Hemoglobin, Packed Cell Volume.

I. INTRODUCTION

Poultry sector is an emerging sector of Bangladesh from last two decades [5]. Now a day's the farmers are getting to step to start large scale poultry farm in Sylhet region. Sylhet is the northeast part of Bangladesh and the environment is slight difference geo climatic condition from other region of Bangladesh. But poultry farmers faced many constraints such as out breaks of different diseases. Analysis of normal hematological parameters of chickens is essential for the diagnosis of various pathological and metabolic disorders [5]. Hematological changes are commonly used to determine the health status of an individual and to assess the impact of environmental, nutritional and/or pathological stresses. Hematological parameters provide valuable information on the immune status of animals such information, apart from being useful for diagnostic and management purposes, could equally be incorporated into breeding program for the genetic improvement of chickens. It is desirable to know the normal physiological values under local conditions for proper management, feeding, breeding, prevention and treatment of diseases. Details information about birds and their characterization are available in the literature but no reliable data for hematobiochemical changes on the different stages of egg production.

Hematological parameters like Total Erythrocytes, Total Leukocytes, Differential Leukocytes, Platelets, Hemoglobin concentration, Packed Cell Volume, Erythrocyte Sedimentation Rate mostly depend on physiological status of animal. On behalf of nutrition these parameters are also variable. Blood sera biochemical Serum Glutamic Oxaloacetic Transaminase (SGOT) or Aspartate Aminotransferase (AST) and Serum Glutamic Pyruvic Transaminase (SGPT) or Alanine Aminotransferase (ALT) indicate toxicity. SGOT/AST is high in acute and chronic liver injury [15]. Elevation in the AST can also be associated with cell necrosis of many tissues. Pathology involving the skeletal or cardiac muscle and/or the hepatic parenchyma, allows the leakage of large amount of this enzyme into the blood. The elevation in AST is produced by the acetamidiprid as an indication of wide spread tissue damage. SGPT or ALT is a key cytoplasmic enzyme present in liver and other cells. It is particularly useful in measuring hepatic necrosis, especially in small animals. ALT and AST is employed as a marker of hepatocellular damage [16] and in general ALT is considered a more sensitive indicator of liver cell injury than AST [2]. Though AST and ALT are not known yet to have any function in the plasma, but their increased levels in the blood indicate cellular damage and increased membrane permeability [16] and their altered metabolism. The present experiment was conducted to determine hematological and biochemical changes during egg production and to know the causes of low egg production.

II. MATERIALS AND METHODS

A total of sixty (60) chickens of ISA Brown strain layer birds of different ages were used in this experiment. The experiment was conducted from June to November, 2012.

Experimental Design:

Sixty (60) ISA Brown strain healthy birds of different ages were distributed in 3 groups (Group-1, Group-2, and Group-3) in separate pen of battery cage. The chickens were again divided in four groups on the basis of age, 24-28wks (M1), 29-33wks (M2), 34-38wks (M3) and 39-43wks (M4) of old.

Blood Collection:

Blood samples were collected aseptically with sterile syringe and needle from the right basilic vein of different groups of chicken on the basis of age. Instantly collected blood was transferred to clean, sterile test tube anticoagulant (EDTA) at a ratio of 1:10 for the hematological studies and were performed within five hours after collection of blood. The haematological and haematobiochemical studies were done in the Physiology

Laboratory of Sylhet Agricultural University, Sylhet, Bangladesh.

Statistical Analysis:

The data generated from this experiment were entered in Microsoft Excel worksheet, organized and processed for further analysis and the treatments mean were compared by Duncan's Multiple Range Test by [4].

III. RESULTS AND DISCUSSION

Effects of hematological parameter:

Total Erythrocyte Count (TEC): The present study indicates that erythrocyte number increase with the advancement of age (Table I). Lower erythrocyte count at 24-28 weeks and increase with the advancement of the age (39-43 weeks) in this study consistent with the findings of [6]. Statistical analysis showed that there were significant differences ($P < 0.01$) among the age of layer bird and different groups of birds. Nutrient supply in diet influences the total erythrocyte count [1].

Table I: TEC-million/ mm^3 of different groups

Month of Egg Production	Mean \pm SD in different groups			
	Group1	Group2	Group3	Group value (overall)
M1	2.57c ± 0.02	2.52d ± 0.02	2.52d ± 0.01	2.53d ± 0.03
M2	2.62c ± 0.01	2.65c ± 0.02	2.63c ± 0.03	2.63c ± 0.02
M3	2.71b ± 0.01	2.72b ± 0.02	2.72b ± 0.02	2.72b ± 0.01
M4	2.79a ± 0.07	2.87a ± 0.01	2.83a ± 0.08	2.83a ± 0.04
LSD	0.058	0.018	0.082	0.595
CV%	1.39	0.63	1.66	0.99

In a column, means followed by common letters are not significantly different from each other at 1% level of probability by DMRT

Total Leukocyte Count (TLC): Highest value of TLC was found in birds' group1, group2, and group3 farm in the age of 39-43 weeks (Table II). It may be due to the nutrition, age, breed and environmental effect. However, the finding of [5] was analogous to the findings of this study.

Table II: TLC-thousand/ mm^3 of different groups

Month of Egg Production	Mean \pm SD in different groups			
	Group1	Group2	Group3	Group value (overall)
M1	21.07c ± 0.05	21.11c ± 0.01	21.16c ± 0.10	21.11c ± 0.05
M2	21.25b ± 0.08	21.45b ± 0.22	21.37b ± 0.13	21.36b ± 0.01
M3	21.35b ± 0.08	21.64a ± 0.03	21.50b ± 0.22	21.56b ± 0.15
M4	21.6a ± 0.14	21.71a ± 0.01	21.70a ± 0.09	21.70a ± 0.10
LSD	0.127	0.146	0.189	0.197
CV%	0.44	0.52	0.69	0.48

In a column, means followed by common letters are not significantly different from each other at 1% level of probability by DMRT

Hemoglobin: It is evident from the present findings that hemoglobin concentration also increases with the advancement of age being lowest in 24-28 weeks and highest in 39-43 weeks of laying age (Table III). Hemoglobin concentration may vary due to the effect of nutrient, ambient temperature [1] age breed etc.

Table III: Hemoglobin-gm/dl of different groups

Month of egg Production	Mean \pm SD in different groups			
	Group1	Group2	Group3	Group value (overall)
M1	8.52d ± 0.04	8.53c ± 0.02	8.59b ± 0.14	8.55d ± 0.04
M2	8.6c ± 0.03	8.68b ± 0.06	8.63b ± 0.01	8.64c ± 0.04
M3	8.73b ± 0.03	8.776a ± 0.01	8.756ab ± 0.05	8.75b ± 0.03
M4	8.84a ± 0.01	8.798a ± 0.02	8.85a ± 0.09	8.833a ± 0.03
LSD	0.058	0.058	0.165	0.059
CV%	0.32	0.38	1.00	0.4

In a column, means followed by common letters are not significantly different from each other at 1% level of probability by DMRT

Packed Cell Volume (PCV): Lower PCV was detected at 24-28 weeks age of birds and highest was observed in 39-43 weeks of age respectively (Table IV). Lower PCV at early age and it increases with the advancement of age in this study is similar to the [5], [14]. Variation of PCV due to age, sex, breeds and present status has been reported by [7].

Table IV: PCV-percentage of different groups

Month of egg Production	Mean \pm SD in different groups			
	Group1	Group2	Group3	Group value (overall)
M1	28.05d ± 0.05	28.17b ± 0.09	28.04c ± 0.04	28.09d ± 0.07
M2	28.17c ± 0.04	28.22b ± 0.02	28.29b ± 0.17	28.23c ± 0.06
M3	28.34b ± 0.02	28.3b ± 0.02	28.44ab ± 0.08	28.36b ± 0.07
M4	28.56a ± 0.11	28.58a ± 0.16	28.6a ± 0.04	28.58a ± 0.02
LSD	0.116	0.154	0.175	0.119
CV%	0.23	0.29	0.34	0.21

In a column, means followed by common letters are not significantly different from each other at 1% level of probability by DMRT

Haematological parameters in birds have been mainly influenced by various factors such as age, sex, season and nutrition. In general haematological parameters are affected by diurnal fluctuations or changes in daily physical and metabolic activities [8], [9], [12]. The mean values of TEC, TLC, Hb and ESR of birds vary among species. Other factors, which affect the RBC counts, include breed, sex and the nutrition supplied to the bird [13].

Effects on Biochemical parameter:

The biochemical values of SGOT, SGPT and Ca at different age of egg production of layer farm were shown

in Table V, VI, and VII. Statistical analysis showed that there were significant differences ($p < 0.01$) among the age of birds and different groups of birds. It was observed that the value of SGOT, SGPT and Ca were increased significantly ($p < 0.01$) in the group1 group2, group3. The value of SGOT, SGPT and Ca at 34-38 weeks and 39-43 weeks of age of egg production of group1, group2 and group3 were significantly ($p < 0.01$) increased than that of 24-28 weeks and 29-33 weeks of age respectively. In the experiment the value of SGOT, SGPT and Ca were found under normal range 0-36iu/l, 0-42iu/l and 8-12mg/dl respectively. AST and ALT are not known to have any function in the plasma, but their increased levels in the blood indicate cellular damage and increased membrane permeability [11] and their altered metabolism [3]. The Ca value of the present study is in agreement with the finding of [10]. It might be due to the nutritional factor.

Table V: SGOT/AST-IU/L of different groups

Month of egg Production	Mean±SD in different groups			
	Group1	Group2	Group3	Group value (overall)
M1	10.60c ±0.55	11.2b ±1.3	11.2b ±1.3	11.0c ±0.35
M2	12.4b ±0.89	13.0a ±0.71	13.4a ±0.55	12.9b ±0.46
M3	13.0ab ±0.71	13.0a ±0.45	13.8a ±0.45	13.27b ±0.46
M4	14.2a ±0.45	14.0a ±0.00	14.4a ±0.55	14.2a ±0.2
LSD	1.239	1.431	1.46	0.719
CV%	5.35	5.96	5.99	2.97

In a column, means followed by common letters are not significantly different from each other at 1% level of probability by DMRT

Table VI: SGPT/ALT-IU/L of different groups

Month of egg Production	Mean±SD in different groups			
	Group1	Group2	Group3	Group value (overall)
M1	19.4c ±0.55	20.4b ±0.55	20.8b ±0.84	20.2c ±0.72
M2	20.2bc ±0.84	21.0b ±0.71	21.8ab ±0.84	20.53c ±0.42
M3	21.0b ±0.71	22.2a ±0.45	22.4a ±0.55	21.87b ±0.76
M4	22.8a ±0.84	23.2a ±0.45	23.2a ±0.84	23.03a ±0.23
LSD	3.56	2.52	3.51	1.082
CV%	3.56	2.52	3.51	2.68

In a column, means followed by common letters are not significantly different from each other at 1% level of probability by DMRT

Table VII: Calcium (Ca)-mg/L of different groups

Month of egg Production	Mean±SD in different groups			
	Group 1	Group 2	Group 3	Group value (over all)
M1	8.56b ±0.05	8.56c ±0.05	8.56c ±0.05	8.56c ±0.00
M2	8.64b ±0.05	8.64bc ±0.05	8.72bc ±0.11	8.667c ±0.05

M3	8.7ab ±0.07	8.82b ±0.08	8.88b ±0.04	8.8b ±0.09
M4	8.9a ±0.23	9.04a ±0.19	9.1a ±0.19	9.013a ±0.10
LSD	0.240	0.210	0.210	0.133
CV%	1.46	1.29	1.29	0.83

In a column, means followed by common letters are not significantly different from each other at 1% level of probability by DMRT.

IV. CONCLUSION

The study was the preliminary work. Increase the age of birds (39-43 weeks) indicate the increase of haematological and haematobiochemical parameters. Higher value of different biochemical parameters such as SGOT, SGPT than the normal range indicates the pathological condition of birds but it was within normal range. Age, sex, breed and nutritional factors influence the haematological parameters. A country wide study is needed to have a definite conclusion in this aspect. Moreover, the results of this research work will certainly help the future researchers to have a guideline in carrying out further detail study on effects of hematobiological changes during egg production of layer birds in Bangladesh and abroad.

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