

# Concurrent Changes of Biochemical Parameters with Various Laying Stages of Japanese Quail

Md. Abdullah-Al-Mahmud, Md. Abdul Awal, Shonkor Kumar Das

**Abstract**— Quail has great prospects for sustainable development of the economy of poultry industries in Bangladesh as well as a standard model of laboratory bird. Biochemical components of blood have intimate relationship with reproduction and normal health condition of birds. As a model laboratory birds, it is crucially important to know the biochemical parameters for the researchers to identify the healthy quail. The current research was designed to investigate the biochemical profile of Japanese quail (*Coturnix coturnix japonica*) at pre-laying (35 days), laying (65 days) and post-laying (270 days) stages which was carried out at the Department of Anatomy and Histology, Bangladesh Agricultural University, Mymensingh. The collected experimental quails were apparently good health and devoid of any external deformities. The quails were divided into three (3) categories: pre-laying, laying and post-laying stage having 10 quails in each group. The blood was collected for biochemical studies. Then biochemical tests such as, blood glucose (mg/dl), cholesterol (mg/dl), total protein (mg/dl) and calcium level (mg/dl) were estimated for further study. The UV-visible Spectrophotometer was used to determine the biochemical profile. The laboratory findings revealed that the serum glucose level was higher in young pre-laying stage ( $p < 0.01$ ) which was gradually decreased at increased age. The increased serum calcium level was found at laying stage. The calcium level was lower in pre-laying stage than post-laying stage. The serum cholesterol and total protein were significantly ( $p < 0.05$ ) higher at post-laying stage. The present research indicates that the biochemical parameters have direct relationship with the different stages of production in Japanese quail as well as the information also will be an asset for the researchers in this realm.

**Index Terms**— Biochemical profile, Japanese quail, Productive stage

## 1 INTRODUCTION

THE poultry industry in Bangladesh is developing rapidly due to fulfil the increasing demand of protein supplement to the people. At present, there are about 0.15 million poultry farmers and 6 million livelihoods directly depend on poultry industry [1]. In recent years, the Japanese quail gets more popularity among the poultry farmers due to its high production, mostly eggs which are the vehicle of procreation and reasoning for breeders' interest. On the other hand, the total egg production in quails is ten times higher than female's body weight, whereas in chicken such a relation is reached only by the production gathered from 12 months [2]. Quails possess an excellent diseases resistance capacity and wide range of adaptability in adverse condition than those of chicken which make it more economical viability in farming [3]. In near future, it may be an important segments in expanding the poultry industry in Bangladesh.

For the development of this sectors, basic research and profiling of biochemical parameters are essential. Because the blood biochemical analysis is a valuable tool for evaluating the health of animal and helps both in diagnosis and clinical monitoring of disease [4]. The biochemical parameters also varies in different stages of production.

Recently, the biochemical profiling has been used in several species of domestic livestock to monitor herd health and to detect production level but this practice is uncommon in poultry industry of Bangladesh. The reason behind this scenario is the lack of suitable reference range for most of the parameters which have been tested on specific individual parameters. And, the biochemical profiling at pre-laying, laying and post-laying stages not yet done before in Japanese quail in Bangladesh. Concerning this situation, the present study was undertaken to evaluate the serum biochemical profile of Japanese quails at different stages of production.

## 2 METHODOLOGY

The experimental quails (*Coturnix coturnix japonica*) were collected from M. A. Hatchery and Quail Farm in Netrokona district having apparently good health and devoid of any external deformities. The quail was reared in intensive farming under close supervision of veterinarian. The age and health condition of the quails were determined by farm record books and farm manager and verified by veterinarian. Total thirty (30) quails at different ages were used to perform this research. Ten (10) quails were in each group. The groups were selected based on age and laying stage of quails which were pre-laying (35 days) stage, laying (65 days) stage and post-laying (270 days) stage.

The healthy quails were killed by transecting the jugular vein for collecting the blood samples. The blood samples (without anti-coagulant) for biochemical analysis were allowed to clot and serum was separated within 2 h of collection after centrifugation at 5000 rpm for 15 min in a centrifuge machine in the laboratory. The clear plasma samples were carefully drawn and transferred to epindorf tubes and stored at -

- Md. Abdullah-AL-Mahmud, Department of Anatomy & Histology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Bangladesh, PH-+8801722056410. E-mail: maamtuhin@yahoo.com
- Md. Abdul Awal, Department of Anatomy and Histology, Bangladesh Agricultural University, Bangladesh, PH-+8801711130640. E-mail: professor.awal.bau@gmail.com
- Shonkor Kumar Das, Department of Anatomy and Histology, Bangladesh Agricultural University, Bangladesh, PH-+8801716855186. E-mail: skdas76@yahoo.com

20°C in the deep freezer until the time of biochemical analysis.

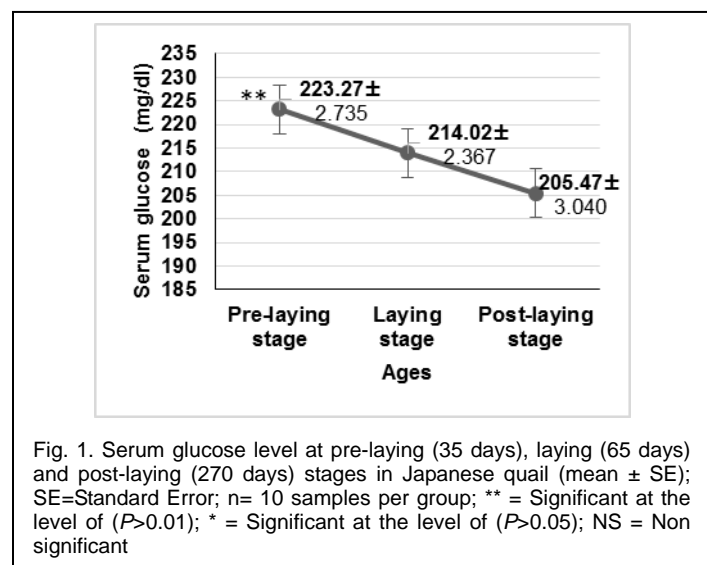
Then biochemical tests such as, blood glucose (mg/dl), cholesterol (mg/dl), total protein (mg/dl) and calcium level (mg/dl) were estimated for further study. The UV-visible Spectrophotometer was used to determine the biochemical profile. The glucose was determined by the glucose oxidase reaction method, whereas the cholesterol was determined enzymatically and included the free and esterified forms. The total protein were determined with biuret and bromocresol green reagents respectively. The calcium level was estimated based upon a colour product formed when calcium reacts with o-cresolphthalein complexone in an alkaline medium. The data were analysed using Statistical Package for the Social Sciences (SPSS® version 21) software.

### 3 RESULTS

The blood biochemical profile of Japanese Quails were estimated at different stages of growth and production. The result of biochemical estimation was given in figure 1, 2, 3 & 4.

#### 3.1 Serum Glucose

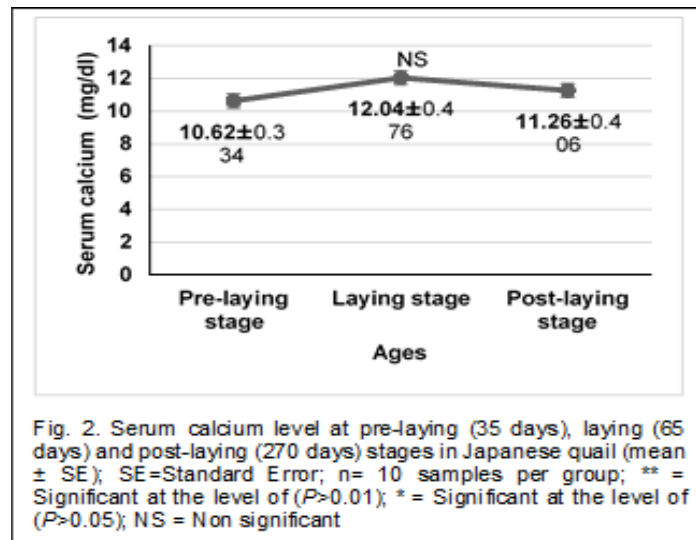
The serum glucose level at pre-laying (35 days) stage was significant difference ( $p < 0.05$ ) with other groups of different ages. The observed serum glucose level was highest on pre-laying (35 days) stage ( $223.27 \pm 2.735$  mg/dl) and the content decreased with age. The observed value were  $214.02 \pm 2.367$  mg/dl and  $205.47 \pm 3.040$  mg/dl at laying (65 days) and post-laying (270 days) stages respectively. The change in the glucose level with respect to the age was given in figure 1. Analysis of variance of the results revealed that the differences in the changes of serum glucose level in Japanese quails among their different age group was highly significant ( $p < 0.01$ ) (Figure 1).



#### 3.2 Serum Calcium

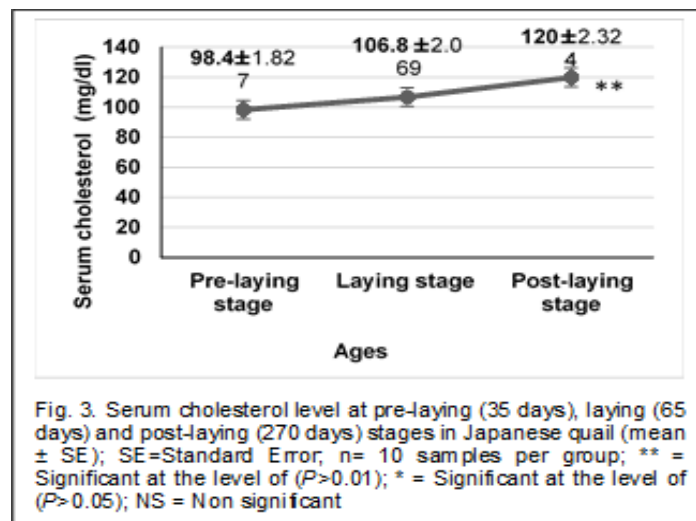
The serum calcium level in the present investigation increased significantly at laying (65 days) stage. The value at pre-laying (35 days) stage was  $10.62 \pm 0.334$  mg/dl which increased to  $12.04 \pm 0.476$  mg/dl at laying (65 days) stage. The serum cal-

cium level was higher in whole production period. Then it decreased to  $11.26 \pm 0.406$  mg/dl at post-laying (270 days) stage. The change in the serum calcium level with respect to the age was given in figure 2. Analysis of variance of the results revealed that the differences in the changes of serum calcium level in Japanese quails among their different age group was non-significant ( $p < 0.05$ ) (Figure 2).



#### 3.3 Serum Cholesterol

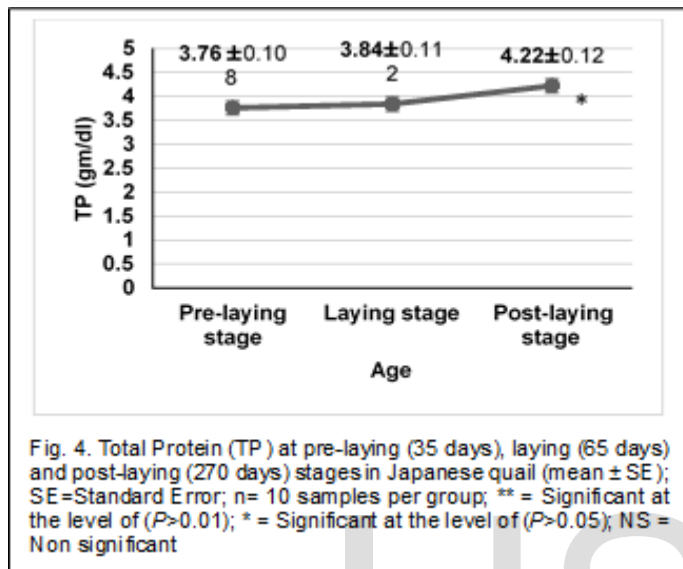
The serum cholesterol content increased significantly with age ( $p < 0.01$ ) in Japanese Quails. At pre-laying (35 days) stage, the amount of cholesterol observed was  $98.4 \pm 1.827$  mg/dl and the level increased to  $106.8 \pm 2.069$  mg/dl and  $120 \pm 2.324$  mg/dl at laying (65 days) and post-laying (270 days) stages respectively. The change in the cholesterol content with respect to the age was given in figure 3. Analysis of variance of the results revealed that the differences in the changes of serum cholesterol level in Japanese quails among their different age group was highly significant ( $p < 0.01$ ) (Figure 3).



#### 3.4 Total Protein

The total protein content in the serum increased significantly

with age similar to change in the content of the serum cholesterol. The total protein content at pre-laying (35 days) stage was  $3.76 \pm 0.108$  gm/dl and the level increased to  $3.84 \pm 0.112$  gm/dl and  $4.22 \pm 0.12$  gm/dl at laying (65 days) and post-laying (270 days) stages respectively. The change in the cholesterol content with respect to the age was given in figure 4. Analysis of variance of the results revealed that the differences in the changes of total protein in Japanese quails among their different age group was significant ( $p < 0.05$ ) (Figure 4).



## 4 DISCUSSIONS

### 4.1 Serum Glucose

The recent work revealed that the value of serum glucose level were  $223.27 \pm 2.735$  mg/dl,  $214.02 \pm 2.367$  mg/dl and  $205.47 \pm 3.040$  mg/dl at pre-laying (35 days), laying (65 days) and post laying (270 days) stages, respectively. Arora and Vatsalya [5]; El-Deen *et al.* [6] reported the similar results in case of Japanese quail. The reduction of serum glucose level at increasing age was also observed by Kalamah [7]. According to Sturkie [8], age and state of egg production affect the blood glucose.

### 4.2 Serum Calcium

The serum calcium level in the present investigation were  $10.62 \pm 0.334$  mg/dl,  $12.04 \pm 0.476$  mg/dl and  $11.26 \pm 0.406$  mg/dl at pre-laying (35 days), laying (65 days) and post laying (270 days) stages, respectively. These results have the close similarity as described by the Bar *et al.* [9] and El-Ghalid [10]. They also reported that the calcium concentration decreased with increasing of age significantly ( $p < 0.01$ ). But the results were disagree with finding by El-Sebai *et al.* [11]. Alm El-Dein *et al.* [12] reported that blood calcium concentration ranged from 8.78 to 10.59 mg/dl for Dokki-4. A wide range has been reported in Japanese quail for calcium concentration from 7.08 to 18.51 mg/dl also approve the current results [13], [14].

### 4.3 Serum Calcium

The current work revealed that the serum cholesterol level were  $98.4 \pm 1.827$  mg/dl,  $106.8 \pm 2.069$  mg/dl and  $120 \pm 2.324$

mg/dl at pre-laying (35 days), laying (65 days) and post laying (270 days) stages, respectively. These results have the close similarity as described by [15], [10], [13], [14]. They reported the cholesterol concentration ranged from 110.77 to 414.18 mg/dl in Japanese quail. The change in the cholesterol content with respect to the age. The present finding is in agreement with the findings of Hassan [16].

### 4.4 Total Protein

The current investigation revealed that the total protein content in the serum were  $3.76 \pm 0.108$  gm/dl,  $3.84 \pm 0.112$  gm/dl and  $4.22 \pm 0.12$  gm/dl at pre-laying (35 days), laying (65 days) and post laying (270 days) stages, respectively. These results in agreement with Poyraz [17]; El-Sebai *et al.* [11] and El-Ghalid [10] in Japanese quail. The increased total protein was related with increasing age significantly ( $p < 0.05$ ) reported by Hassan [16].

## 5. CONCLUSION

The current research was designed to study of the biochemical profile of Japanese quails at pre-laying, laying and post-laying stages. The essential techniques were used to determine the level of glucose, calcium, cholesterol and total protein changes at different stages of age. The serum glucose level was higher in young pre-laying stage ( $p < 0.01$ ). The increased serum calcium level was found at laying stage. The serum cholesterol and total protein were significantly ( $p < 0.05$ ) higher at post-laying stage. The changes of biochemical parameters indicate that there have significant relationship between the stage of production or ages and biochemical parameters in Japanese quail.

## REFERENCES

- [1] M.A. Rahman, "Development of Convenient composting method using broiler litter," MS Thesis, Department of Animal Science, Bangladesh Agricultural University, Mymensingh, 2007. (MS Thesis)
- [2] A. Richtrova, "Influence of male presence in cages with female on the parameters of egg production of Japanese quail (*Coturnix japonica*)," *Zeszyty Naukowe Przegł du Hodowlanego*, vol. 45, pp. 189-199, 1999. (Journal citation)
- [3] K. Deka, and J. Borah, "Haematological and biochemical changes in Japanese Quails *Coturnix coturnix Japonica* and chickens due to *Ascaridia galli* infection," *International Journal of Poultry Science*, vol. 7, pp 704-710, 2008. DOI: 10.3923/ijps.2008.704.710
- [4] W.B. Karesh, A.D. Campo, E. Braselton, H. Puche and A. Cook, "Health evaluation of free ranging and hand reared macaws (*Ara spp.*) in Peru," *Journal of Zoo and Wild Life Medicine*, vol. 28, pp. 368-377, 1997. (Journal citation)
- [5] K.L. Arora and V. Vatsalya, "Deleterious effects of molting on morpho-physiology of Japanese quail layers (*Coturnix japonica*)," *International Journal Poultry Science*, vol. 10, pp. 120-124, 2011. doi: 10.3923/ijps.2011.120.124
- [6] M. Bahie El-Deen, M.A. Kosba and A.S.A. Soliman, "Studies of some performance and blood constituents traits in Japanese quail," *Egyptian Poultry Science*, vol. 29, pp. 1187-1208, 2009. (Journal or magazine citation)

- [7] M.A. Kalamah, "Changes in blood profile of Norfa and Fayoumi chickens associated with sexual maturity and egg production," *First Egypt-Hungarian Poultry Conference*, pp. 339-357, 17-19 September 1995. (Conference proceedings)
- [8] P.D. Sturkie, "Avian physiology," *Springer Verlag*, Heidelberg, Berlin. 1976. (Book style)
- [9] A. Bar, A. Cohen, U. Eisner, G. Risenfeld and S. Hurwitz, "Differential response of calcium transport system in laying hens to exogenous and endogenous changes in vitamin D status," *Journal of Nutrition*, vol. 108, pp. 13-22, 1978. (Journal citation)
- [10] O.A. El-Ghalid, "Estradiol effects on blood profile and performance of Japanese quail at different stages of production," *PhD Thesis*, Faculty of Agriculture, Alexandria University, Egypt, 2005. (PhD Thesis)
- [11] A. EL-Sebai, M. Abaza, A. Samar and Elnagar, "Relationship between thyroid gland and some reproductive and physiological traits of Japanese quail reared under "short day" photoperiod exposure to ethynyl oestradiol," *Reproduction*, vol. 121, pp. 155-165, 2002. (Journal citation)
- [12] A.K. Alam El-Dein, F.A. Abdel-Ghany, N.B. Awaden and M.M. Soliman, "Prediction of productive performance of laying hens by measurement of some blood constituents," *Egyptian Poultry Science*, vol. 28, pp. 849-866, 2008. (Journal or magazine citation)
- [13] M.H. Abd El-Fattah, "Selection for increased body weight and growth rate in Japanese quail," *PhD Thesis*, Faculty of Agriculture, Fayoum University, Egypt, 2006. (PhD Thesis)
- [14] M. Avci, N. Denek and O. Kaplan, "Effects of humic acid at different levels on growth performance, carcass yields and some biochemical parameters of quails," *Journal of Animal and Veterinary Advances*, vol. 6, pp. 01-04, 2007. URL: <http://medwelljournals.com/abstract/?doi=javaa.2007.1.4>
- [15] O. Özbey, N. Yildiz, M.H. Aysondu and Ö. Özmen, "The effects of high temperature on blood serum parameters and the egg productivity characteristics of Japanese quails (*Coturnix coturnix Japonica*)," *International Journal of Poultry Sciences*, vol. 7, pp. 485-489, 2004. (Journal citation)
- [16] H.A. Hassan, "Variation in egg performance and plasma constituents at different ages of female Japanese quail," *Egyptian Poultry Science*, vol. 30, pp. 565-581, 2010. (Journal citation)
- [17] O. Poyraz, "A study on the levels of plasma glucose, cholesterol and protein in chicken, quail and their hybrid," *Journal of Lalahan Livestock Research Institute*, vol. 28, pp-24-41, 1988. (Journal citation)