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Effect of Sex and Strain on Serum Biochemical Parameters in Two Strains of Japanese Quail (*Coturnix coturnix japonica*)

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Abstract

The study evaluated the effect of sex and strain on blood serum biochemical analysis in two strains of Japanese quail viz; Cinnamon Brown (CBS) and Panda White (PWS). Total of 500 chicks, of 250 per strain and 125 per sex in each strain were used in this study. Each strain was considered a treatment. Twenty chicks per strain of equal sexes (forty birds) at 13 weeks of age were randomly selected for blood samples collection for blood biochemical analysis. The parameters were: Total Protein (TP), Albumin (ALB), Globulin (GLOB) and Cholesterol (CHOL). Data collected were analyzed using General Linear Model of SAS statistical software package version 9.2. The results showed that sex significantly ($p < 0.05$) influenced serum biochemical parameters in this study. Female quails had mean values of 10.40 ± 0.30 g/dl and 8.64 ± 1.47 g/dl for TP and GLOB significantly ($p < 0.05$) higher than males with 7.60 ± 0.60 g/dl and 6.02 ± 0.55 g/dl while males were significantly ($p < 0.05$) higher in CHOL (142.07 ± 4.65 mmol/L) than females (135.11 ± 7.15 mmol/L) for the same parameters. Strain had significant ($p < 0.05$) influence on blood biochemical parameters with mean values of 10.79 ± 1.76 g/dl, 2.27 ± 0.22 g/dl, 8.53 ± 1.55 mmol/L recorded for TP, ALB, GLOB in PWS being higher than CBS with 7.21 ± 0.23 g/dl, 1.07 ± 0.16 g/dl, 6.13 ± 1.47 g/dl. Males recorded 146.14 ± 6.06 mmol/L for CHOL higher than females with 131.03 ± 5.60 mmol/L. In conclusion, female Japanese quails and PWS had higher values in important blood biochemical parameters (TP, ALB and GLOB) and should be bred for production purposes for human utilization.

Keywords: Japanese quail, Strain, serum biochemical parameters, sex

Introduction

Blood plays an important role in the transportation of nutrients, metabolic waste products and gases around the body and represents a means of assessing clinical and nutritional health status of animals. The biochemical profiles are most commonly used in nutritional studies for Japanese quail (Arora, 2010) and was established that biochemical testing focuses on the chemical constituents of the blood of the animal considered. Existence of any significant relationship between blood biochemical features with animal performance is needed for the design of breeding programs aimed to improve the balance between production and health traits. Japanese quails (*Coturnix coturnix japonica*) are maintained for egg, meat production and as laboratory animals (Kayang *et al.*, 2004). However, very little information is available on the blood biochemical profile of Japanese quails. Blood parameters of healthy birds can be influenced by several factors including physiological, environmental condition, dietary contents, age, anti-aflatoxin treatment and continuous supplementation of vitamins. According to Elizabeth *et al.* (2010), factors such as age, nutrition, health of animal, degree of physical activity, sex and environmental factors affect blood values of animals. The need for more and location specific research on strains and their underlying blood biochemistry in Japanese quail is crucial and has necessitated the need for this research.

The aim of this study is to determine both the effects of sex and strain on Blood biochemical parameters in two strains of Japanese quail (Cinnamon Brown (CBS) and Panda White (PWS)).

Materials and Methods

Total of 500 chicks of 250 per strain of 125 per sex in each strain were used for the study and each strain was considered a treatment. Twenty chicks per strain of equal sexes at 13 weeks of age were randomly selected from the birds' population for blood samples collection for blood biochemical analysis. Blood samples were collected from the wing vein of the birds into sterile blood collection bottles and were taken to the laboratory of the Department of Biochemistry for blood serum biochemical analysis. The parameters were: Total Protein (TP), Albumin (ALB), Globulin (GLOB) and Cholesterol (CHOL). From each bird 5 ml of blood sample was collected in sterile blood collection bottles from wing vein of each of the 20 randomly selected quails from each strain. The blood samples were allowed to clot and serum was separated within 2 hours of collection after centrifugation at 5000 rpm for 30 minutes in a table top centrifuge machine, then stored at -20°C for determining

total cholesterol, total protein, albumin and globulin by spectrophotometry, using appropriate reagents kits by Randox, in the Department of Biochemistry Laboratory, Faculty of Basic Medical of the University of Uyo.

Data collected were subjected to analysis of variance (ANOVA) using the General Linear Model of SAS 9.2 version (2010) statistical software package. Means were separated using Duncan Multiple Range Test. The statistical model used is as follows: $Y_{ijk} = \mu + G_i + S_j + (AB)_{ij} + \varepsilon_{ijk}$

Y_{ijk} = the blood biochemical parameter of Japanese quails

μ = overall mean for the blood biochemical parameter of quails

G_i = Fixed effect of i^{th} strain ($i=1-2$)

S_j = Fixed effect of j^{th} sex ($j=1-2$)

$(AB)_{ij}$ = Interaction effect of i^{th} strain and j^{th} sex

ε_{ijk} = random error associated with each record.

Results and Discussions

Effect of sex on the blood biochemical parameters of Japanese quails: The result shows that sex significantly ($p<0.05$) influenced blood biochemical parameters at 13 weeks of age measured in this study (Table 1). Female quails had mean values of 10.40 ± 0.30 g/dl and 8.64 ± 1.47 g/dl for TP and GLOB which are significantly ($p<0.05$) higher than those of Males 7.60 ± 0.60 g/dl and 6.02 ± 0.55 g/dl respectively. Males were significantly ($p<0.05$) higher in CHOL (142.07 ± 4.65 mmol/L) than females (135.11 ± 7.15 mmol/L) for the same parameters at 13 weeks of age in this study. The results obtained in this study is in agreement with the observation of Bahie *et al.* (2009) who observed significantly higher estimates for total protein (3.96 g/dl) in heavy size quails than the medium and low body weight groups. This study also agrees with the findings of Mary *et al.* (2008) and Elizabeth *et al.* (2010) on serum biochemical parameters of female bronze turkey, who observed that female bronze turkey performed better than males on serum biochemical parameters.

Table 1: Body weights (g) per strain per sex of the Japanese quail

Strain	♂	♀
Cinnamon Brown	132.30 -158.50 g	156.20 -172.30 g
Panda White	147.80 -158.50 g	158.20 -172.30 g

♂ - male, ♀ - female

The result obtained in this study in Albumin concentrations is in agreement with the findings of Scholtz *et al.* (2009) that adult female Japanese quails were found to be higher ($p<0.01$) than males of its counterparts. The result of this study is in accordance with the work of Ojedapo (2013) who observed that total protein, albumin and globulin were highly significant ($p<0.05$) in female quails than males in this study. The results obtained in this study is in accordance with the result obtained by Scholtz *et al.* (2009) who found that the cholesterol concentration was higher ($p<0.05$) in adult female Japanese quails than males. This could be due to depression in serum cholesterol during high egg production period on account of cholesterol shift from the blood to the ovarian tissue for egg yolk formation seems to be a metabolic phenomenon for meeting a continued serum cholesterol demand to replenish losses during egg formation production (Mady, 1990).

Table 2: Effect of sex on the blood biochemical parameters of Japanese quail (LSM $\pm$ SE)

Sex	N	TP (g/dl)	ALB (g/dl)	GLOB (g/dl)	CHOL (mmol/L)
Male	20	7.60 ± 0.60^b	1.76 ± 0.30^a	6.02 ± 0.55^b	142.07 ± 4.65^a
Female	20	10.40 ± 0.30^a	1.58 ± 0.15^a	8.64 ± 1.47^a	135.11 ± 7.15^b

a, b = Means with different superscripts within the same column are significantly different ($P<0.05$)

N=Number of observations, TP= Total Protein, ALB= Albumin, GLOB= Globulin, CHOL= Cholesterol

Effect of strain on the blood biochemical parameters of Japanese quails: The result shows that strain significantly ($p<0.05$) influenced all the blood biochemical parameters of both Cinnamon Brown and Panda White strains of Japanese quail at 13 weeks of age as measured in this study.

Table 3: Effect of Strain on the Blood Biochemical Parameters of Japanese quail (LSM $\pm$ SE)

Strain	N	TP (g/dl)	ALB (g/dl)	GLOB (g/dl)	CHOL (mmol/L)
Cinnamon Brown	20	7.21 ± 0.23^b	1.07 ± 0.36^b	6.13 ± 8.40^b	146.14 ± 6.06^a
Panda White	20	10.79 ± 1.76^a	2.27 ± 0.26^a	8.53 ± 1.55^a	131.03 ± 5.60^b

a, b = Means with different superscripts within the same column are significantly different ($P < 0.05$), N = Number of observations, TP = Total Protein, ALB = Albumin, GLOB = Globulin, CHOL = Cholesterol.

The mean values of 10.79 ± 1.76 g/dl, 2.27 ± 0.22 g/dl, 8.53 ± 1.55 mmol/L were recorded for TP, ALB, GLOB in PWS were significantly ($p < 0.05$) higher than CBS with 7.21 ± 0.23 g/dl, 1.07 ± 0.16 g/dl, 6.13 ± 1.47 g/dl for the same parameters. CBS recorded 146.14 ± 6.06 mmol/L for CHOL significantly ($P < 0.05$) higher than PWS with 131.03 ± 5.60 mmol/L at 13 weeks in this study.

Conclusion and Recommendation

The knowledge of the serum biochemical parameters could be useful when there is existence of any significant relationship between blood biochemical features with animal performance for the designing of breeding programs aimed to improve the balance between production and health traits. Having determined the effect of sex and strain on serum biochemical parameters in two strains of Japanese quails (CBS and PWS), it was observed that sex positively influenced Total Proteins and Globulin concentration in female quails while males were higher in cholesterol levels. Strain also positively influenced Total proteins, Globulin and Albumin concentration in PWS while CBS showed higher concentration in cholesterol content. However, sex by strain interaction had no effect on those parameters measured in this study. In conclusion, female Japanese quails and PWS had higher values in important blood biochemical parameters (TP, ALB and GLOB) and should be used for production purpose for human utilization

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