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Interactive Effect of Age by Sex on Haematological parameters of Japanese quail *(Coturnix coturnix japonica)*.

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Abstract

The study evaluated Interactive effect of age and sex on the haematological parameters of Japanese quail. Total of 480 Japanese quails (240 quails per sex) were reared in a Randomized Complete Block Design at quail unit, University of Uyo. Weekly body weight was measured. Blood samples were collected from the wing veins of 240 quails of 120 per sex at ages 5 and 7 weeks for haematology analysis. Parameters were: Haemoglobin (HB), Red Blood Cell (RBC), White blood cell(WBC), Pack Cell Volume (PCV), Mean Corpuscular volume (MCV), Mean corpuscular haemoglobin(MCH), and Mean Corpuscular Haemoglobin Concentration (MCHC). Data collected were analyzed in GLM of SAS software ver. 9.2. Means were separated with T- Test at ($p<0.05$). Result showed that age significantly ($P<0.05$) influenced all the haematological parameters of Japanese quail in this study. Japanese quails at 5 weeks of age had higher ($P<0.05$) mean values of 88.14±0.63g/dl, 44.63±1. 21×10^9/L and 16.23±0.59g/l for MCHC, PLT and HB than those of 7 weeks with 27.09±0.19g/dl, 22.10±0.22×10^9/L, 12.72±0.53g/l for the same parameters, respectively. While Japanese quails at 7 weeks of age had significantly ($P<0.05$) higher means of 282.98±0.56×10^9/L, 2.88±0.06×10^9/L,46.71±1.99%,76.19±1.13fl, 46.71±1.99pg for WBC, RBC, HCT, MCV, MCH than those at 5 weeks with 35.42±0.22×10^9/L,1.23±0.04×10^9/L,17.92±0.62%, 144.60±1.09fl and 38.32±0.24pg of the same parameters, respectively. Result showed that sex significantly ($P<0.05$) influenced some of the haematological parameters of Japanese quails measured. Male quails had higher ($p<0.05$) means of 2.25×10^9/L, 16.79±0.33g/dl, 36.75±2.26%, for RBC, HB, HCT than females with 1.86±0.12×10^9/L,12.16±0.66g/dl and 27.87±2.37% for the same parameters, respectively. Haematological parameters showed increased in mean values with increase in age. Male quails had higher values than females' counterpart. Male quails at younger age should be used for haematological studies in birds.

Keywords: Age; Haematological parameters; Japanese Quails; Sex; Interactive effect

1. Introduction

The Japanese quail belongs to the order Galliformes, family Phasinidae, genus *Coturnix* and species *japonica*. The scientific designation for Japanese quail is *Coturnix japonica* which is different from common quail (*Coturnix coturnix*) [1]. According to Deka and Borah [2] Japanese quail (*Coturnix coturnix japonica*) is one of the diversified poultry species reared for commercial egg and meat production. It possessed the unique characteristics of fast growth, early sexual maturity, high rate of egg production, short generation interval and shorter incubation period that makes it suitable for diversified animal agriculture. They are fairly resistant to diseases, and impart less worry for vaccination. Because of low volume, low weight, less feed input and space requirements, the commercial quail farming for table egg and meat production can be started with much lower capital investment as compared to chicken and duck with almost the same profit margin. Feeding is a major components in poultry production and it controls profit maximization in poultry sector. They are birds that every household can keep without stress [3]. The development of quail culture has led farmers to rear both meat and egg-type quail breeders [4].

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Blood chemistry refers to the chemical composition of blood. lt plays an important role in transportation of nutrients, metabolic waste products and gases around the body and discard waste ones as well as in detecting any blood disease of the animals including poultry. It includes normal haematological, biochemical and serological tests. Haematology refers to the study of the numbers and morphology of the cellular elements of the blood – the red cells (erythrocytes), white cells (leucocytes), and the platelets (thrombocytes) and the use of these results for the diagnosis and monitoring of disease [5]. In haematological studies of some blood parameters such as the haemoglobin percentage, lymphocytes and monocytes are usually estimated [6]. Blood parameters of healthy birds can be influenced by several factors including physiological, environmental condition, dietary contents, age, sex, and continuous supplementation of vitamins [7, 8, 9]. Changes in the haematological profile in breeding and sexual maturation of Japanese quails were studied [8]. Blood analysis is undertaken to evaluate the health status of bird along with diagnosis and clinical monitoring of any disease [10]. The need for more and location specific research on age and their underlying Haematological studies in Japanese quail is crucial and has necessitated the need for this research, effect of age and sex on the haematological parameters of Japanese quail *(Coturnix coturnix japonica*).

2. Materials and Methods

The experiment was conducted at the quail breeding unit of the Department of Animal Science, Faculty of Agriculture, University of Uyo, Uyo, Akwa Ibom State which is located in the coastal southern part of the country, lying between latitude 4^0 32'N and 5^0 33'N, and longitudes $7^0$25'E and $8^0$25'E. The rainfall ranges from 800 – 3200 mm per annum which begins in March and continues till October. The topography is gentle slope with a sandy loamy soil and a soil pH of 4.5 - 6.5 [11]

2.1. Procument and Management of Experimental birds

The experimental site was cleaned by washing with detergent, disinfected and fumigated a week before the arrival of the birds to avoid spread of diseases or incidence of pest attack on the experimental birds. A hutch containing 20 cells was constructed for the research. Beddings made of wood shavings were laid on the floor of each cell of the hutch. This served as a source of heat to the birds. Adequate sanitary measures were kept; wood shavings were changed weekly. Feeding troughs, drinkers and other needed equipment for successful rearing of the quail birds were kept clean and also heat source was provided. The birds were kept under intensive management system.

Five hundred fertile eggs were incubated. Four hundred and eighty- five eggs hatched out and the unsexed Japanese quail chicks were weighed then kept in the brooder for three weeks with water and starter feed containing 23.00% and 2860Kcal/Kg Metabolizable Energy given *ad libitum f*or the purpose of this research. On the fourth week 480 chicks were transferred to the grower pen made of wooden battery cage system (hutch) which comprises of four tiers of 20 cells of 62cm x 80cm x 56cm each. Growers mash containing 20% and 2900Kcal/Kg Metabolizable Energy was fed to the birds up to the 5^{th} week. Then layer marsh containing 18% Crude Protein and 3000Kcal/Kg Metabolizable Energy was given to the birds from 6^{th} week to 7^{th} week where the research terminated.

Glucose and vitamins were added to their drinking water on the first day to address the effect of stress due to transportation. Feed and water were supplied *ad libitum.* Medications were administered too to prevent diseases. They were vaccinated against Newcastle disease and infectious bursal disease (Gumboro).

2.2. Data collection

At 5^{th} (before point of lay) weeks of age, blood samples were collected from 240 birds of 120 per sex from the wing vein of the birds into blood sample bottles containing Ethylene Diamine Tetra Acetic Acid (EDTA) as anticoagulant for haematological analysis. The same procedure and analysis was repeated at week 7 (point of lay). Parameters looked at were: Haemoglobin (Hb)White Blood Cell (WBC), Red Blood Cell (RBC), Packed Cell Volume (PCV), Haemoglobin concentration, Erythrocyte indices which includes; Mean Corpuscular Volume (MCV), Mean Cell Haemoglobin(MCH). Haematological analyses were carried out at Biochemistry Laboratory of the University of Uyo, where the equipment for the analysis was available. The machine used for the analysis was Mindray Auto Haematology Analyser, model BC-5300, manufactured by Shenzhen Mindray Biochemical Electronics Ltd, China. The Auto Haematology Analyzer machine was switched on and it automatically flushed the fluidic lines, checked the background and entered the count screen. The sample mode was selected by pressing the menu key. The blood in the sample tube was mixed using a mixer machine, after bringing it to room temperature. It was then presented to the analyser probe tip making sure it submerges well into the sample. The aspirate key was pressed to start the count and the result was issued.

Data collected were subjected to Analysis of Variance using GLM of SAS statistical software package, ver. 9.2. Means were separated with Duncans Multiple Range Test at ($P<0.05$) of the same software [12].

3. Results and Discussion

3.1. Effect of age on Haematological Parameters of Japanese Quail

The results in Table 1 showed that birds at 7 weeks of age had significantly ($p<0.05$) higher mean values of 282.98 ± 0.56×10^9/L,2.88±0.06×10^9/L, 46.71±1.99%, 176.19±1.13fl and 46.71±1.99pg in WBC, RBC, PCV, MCV, and MCH than those at 5 weeks of age with mean values of 35.42±0.22×10^9/L,1.23±0.04×10^9/L,17.92±0.62%,144.60±1.09fl and 38.32±0.24pg of the same parameters respectively. However, Japanese quail of 5 weeks had higher ($p<0.05$) significant mean values of 16.23 for Hb than those of week 7 for the same parameters, respectively. The result obtained from quails at 7th week for WBC in this study was not in accordance with the report of [13] who reported the mean value of quail's WBC to be 2.64±0.30×10^9/L at 7 weeks of age (control) when the birds were fed with different levels of Furazoline. The result obtained for RBC in this study is not in accordance with the work of [14] who reported RBC mean value of 1.38±0.22×10^9/L for Japanese quails of 5 weeks. This study observed different mean value from the report of [13] who had RBC mean value to be 3.05±0.085×10^9/L for control group when Japanese quails of 7 weeks (control) were fed with different levels of furazoline. The result observed in this study is in agreement with the observation of [15] who reported the overall mean value for RBC with the minimum and maximum values as: RBC to be 4.31 x 10^6ul (2.02 ± 6.99 x 10^6ul). Nevertheless the result obtained in this study is not in agreement with the report of [16] who reported RBC mean value as 3.62±0.61×10^9/L for Japanese quail at 5 weeks. Contrary[17] reported for RBC in broilers to be 3.13 x 10^6ul as against the values observed in this study.The result obtained in this study for Hb is in line with the range of values reported by [16] that normal range of Hb for chickens is 7-13g/dl. Furthermore, [15] reported the overall mean value for Hb with the minimum and maximum values of haemoglobin (Hb) as: 16.21 g/dl (8.61 ± 20.57g/dl) which was in agreement with the result obtained at week 5 of this study. However the result obtained for Hb in this study was inconsistent with the report of [13] who reported Hb mean value of 119.9±41% for Japanese quail at 7 weeks. Also, the result obtained in this study is not in agreement with the report of[16] who had Hb level of 10.54±0.87% for Japanese quail at 5 weeks.[14] had mean value of Hbas 8.95± 0.24% for Japanese quails at 5 weeks to be different from the result obtained in this study. Also [6] reported on Hb percentage of Japanese quail as 13.13 ± 0.22%different from the result obtained in this study. Nasifi and Asasi [13] reported on control mean value of HCT as 0.42±0.009% when fed Japanese quails of 7 weeks with different levels of furazolidone. This is inconsistent with the result obtained in this study. The result obtained in this study is in contrast with the result obtained by [16] who reported HCT value of 31.41± 1.14% for Japanese quail of 5 weeks. The result obtained in this study for MCV is in contrast with the result of [16] who reported mean value of 88.81±22.07fl for Japanese quail of 5 weeks. The result obtained in this study is lower than the result of [14] who reported MCV value of 401.02±131.04fl for Japanese quail at 5 weeks. The result obtained in this study for MCV is in contrast with the result of [15] who reported the Mean Corpuscular Volume (MCV) of 100.69 fl (64.68 ± 131.91fl) for Japanese quails. The result obtained in this work is contrary to the report of (18) who reported that MCV increased from 123.80 ± 2.16fl at 5th week to 147.24 ± 1.29fl at 7th week with slight decreased at 6th week. The result obtained in this study is in accordance with the result of [15] who reported the overall mean value for MCH with the minimum and maximum values as: Mean Corpuscular Haemoglobin (MCH) 39.17 pg (20.72 ± 69.08 pg). However, the result obtained in this study is not in within the range reported by (19) who had MCH values for weeks 5, 6 and 7to be 49.33 ± 3.83 pg, 44.88 ± 2.34 pg and 54.10 ± 1.94 pg respectively. The result obtained in this study is within the range of [17] who reported control level of MCH for broilers as (33.77pg) although it was slightly lower than the result obtained in this work. The result obtained in this study for MCH is contrary to the report of [16]) who reported MCH mean value of 29.21±7.33 pg for Japanese quails at 5 weeks.

Table 1 Effect of Age on Haematological Parameters of Japanese Quails (LSM±SE)

				Parameters			
Age	**No**	**WBC(×10^9/L)**	**RBC(×10^9/L)**	**Hb(g/dl)**	**PCV (%)**	**MCV(fl)**	**MCH (pg)**
5	240	35.42±0.22^b	1.23±0.04^b	16.23±0.59^a	17.92±0.62^b	144.60±1.0^b	38.32±0.24^b
7	240	282.98±0.56^a	2.88±0.06^a	12.72±0.53^b	46.71±1.99^a	176.19±1.1^a	47.65±0.39^a

^{a,b}= Means with different superscript within the same column are significantly different($P<0.05$). White Blood Cell -WBC, Red Blood Cell- (RBC, Packed Cell Volume-PCV, Haemoglobin -Hb, Mean Corpuscular Volume -MCV, Mean Cell Haemoglobin—MCH

3.2. Effect of Sex on Haematological Parameters of Japanese Quail (Lsm±SE)

The results in Table 2 and 3 indicated that males of Japanese quail had the highest mean values in most of the haematological parameters recorded in this study than their female's counterparts. Males recorded 2.25(×10^9/L),

16.79±0.33g/dl, 36.75±2.26% for RBC, HB, PCV or HCT which were significantly (p<0.05) higher than those of Females with 1.86±0.12 (×10^9/L), 12.16±0.66 g/dl, 27.87±2.37% for the same parameters respectively.

This report was in consistent with the work of [20] which observed that Males had higher mean value of haemoglobin than females. It is also in consistent with the work of [21] who reported higher RBC in males quail than the female's counterpart. Nevertheless, the result in this study agrees with the observation of [22] who had males of the Japanese quail performed better in haematological parameters than their female counterparts. This result agrees with the observations of [23] which reported that the majority of haemotological parameters for indigenous chickens increase with advancing age, males generally report higher value than females. This result is in consistence with the observations of [24] which reported that male chickens generally had higher mean values than their female counterpart across all genotypes.

However, there was no significant (p<0.05) difference for WBC, MCV, MCH, MCHC, and PLT in both sexes in their mean values, though there were variations in values obtained in this study.

Table 2 Effect of Sex on Haematological Parameters of Japanese quail at 5 weeks (LSM±SE)

Parameters						
SEX	**No.**	**WBC(×10^9/L)**	**RBC(×10^9/L)**	**HB(g/dl)**	**HCT (%)**	
M	120	159.15±16.05[a]	2.25±0.12 [a]	16.79±0.33 [a]	36.75±2.26 [a]	
F	120	159.24±16.19[a]	1.86±0.12[b]	12.16±0.66 [b]	27.87±2.37 [b]	

[a,b]= Means With Different Superscript within the same column are significantly different(P<0.05), N=number of observations, WBC=White Blood Cell. HB=Haemoglobin, RBC=Red Blood Cell, PCV=Packed Cell Volume, MCHC=Mean Corpuscular Haemoglobin, MCV=Mean Corpuscular Volume

Table 3 contd. Effect of Sex on Haematological Parameters of Japanese quail at 7 weeks (LSM±SE)

Parameters					
SEX	**NO**	**MCV(fl)**	**MCH(pg)**	**MCHC(g/dl)**	**PLT(×10^9/L)**
M	120	158.08±2.19[a]	43.54±0.56[a]	58.58±4.07[a]	33.33±1.76[a]
F	120	162.71±2.44[a]	42.43±0.79[a]	56.65±3.93[a]	33.40±1.65[a]

[a,b]= Means With Different Superscript within the same column are significantly different(P<0.05), N=No of Observation, WBC=White Blood Cell. HB=Haemoglobin RBC=Red Blood Cell, PCV=Packed, Cell Volume, MCHC=Mean Corpuscular Haemoglobin, MCV=Mean Corpuscular Volume

3.3. Effect of Age by Sex Interaction on Haematological Parameters of Japanese quail

The result obtained showed that sex by age interaction of Japanese quail at weeks 5 and 7 in both sexes had no significant (P>0.05) difference but had slight variation in values as showed in this study in Table 4 and 5.

Table 4 Effect of Interaction between Sex and Age on Blood Haematological Parameters (LSM±SE)

Sex	**Age**	**No**	**Parameters**			
			WBC(×10^9/L)	**RBC(×10^9/L)**	**HB (g/dl)**	**HCT%**
M	5	120	35.90± 0.33	1.39± 0.03	18.80± 0.34	19.88± 0.49
F	5	120	34.93±0.25	1.07± 0.06	13.66±0.91	15.94±1.03
M	7	120	282.40±0.40	3.11± 0.06	14.78± 0.23	53.62±0.92
F	7	120	283.56±1.05	2.64±0.09	10.66±0.89	39.80±3.47

[a,b]= Means With Different Superscript within the same column are significantly different(P<0.05), N=No of observation, WBC=White Blood Cell. HB=Haemoglobin, RBC=Red Blood Cell, PCV=Packed, Cell Volume, MCHC=Mean Corpuscular Haemoglobin, MCV=Mean Corpuscular Volume

Table 5 Contd: Effect of Interaction between Age and Sex on Blood Haematological Parameters (LSM±SE)

Sex	Age	No.	Parameters			
			MCV(fl)	MCH(pg)	MCHC(g/dl)	PLT(×10⁹/L)
M	5	120	143.40± 1.23	39.44± 0.11	89.56± 1.05	44.66± 1.91
F	5	120	145.80±1.79	37.20±0.37	86.72±0.62	44.60±1.52
M	7	120	172.76± 1.77	47.64± 0.33	27.60± 0.25	22.00±0.33
F	7	120	179.62±1.13	47.66±0.71	26.58±0.27	22.20±0.29

[a,b]= Means With Different Superscript within the same column are significantly different(P<0.05), N=No of observations, WBC=White Blood Cell. HB=Haemoglobin, RBC=Red Blood Cell, PCV=Packed Cell Volume, MCHC=Mean Corpuscular Haemoglobin, MCV=Mean Corpuscular Volume

4. Conclusion

Conclusively, haematological parameters increase with increase in age. Male quails had higher values in haematological parameters than Females counterparts. The haematological parameters of Japanese quails increased with increase in age with Male quails having higher values in blood parameters than Females counterpart. Haematological parameters studies here are useful in examining the health status of quails which can help in establishing a breeding program for the improvement of breeds of quail. Male quails should be used for haematological studies for the health status of quail birds at younger age than at older age.

Compliance with ethical standards

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Disclosure of conflict of interest

Author declares that there is no conflict of interest with any financial, personal, or other relationships with other people or organization related to the material discussed in this manuscript.

Statement of ethical approval

This research was conducted in accordance with ethical guidelines governing the use of animals and genetic materials in scientific research as stipulated by the Ethical Committee of Department of Animal Science, Faculty of Agriculture, University of Uyo, which is in line with Animal health care constitution.

Statement of informed consent

Author has given an approval and consent for the article to be publication.

Author declaration

Author has declared that this article is original article submitted for publication which has not been published anywhere in the world.

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