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Haematological Analyses of Japanese Quail (*Coturnix Coturnix Japonica*) At Different Stages of Growth

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Abstract

Japanese quail is a more disease resistant species than that of chicken and as poultry bird is a commercially much viable option due to its several other characteristics. The present study was carried out to compare the basic haematological parameters in Japanese quail reared in Central Poultry Development Organisation (CPDO), Eastern Region (ER), Govt. of India, Bhubaneswar. Blood samples were taken from the wing vein of 10 Japanese quails at different stages of growth, i.e., 1st, 2nd, 3rd, 4th, 5th, 6th and 9th week. Haematological parameters such as Haemoglobin (Hb), Red Blood Cell (RBC), White Blood Cell (WBC), Packed Cell Volume (PCV) , and Erythrocytic indices, i.e., Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin(MCH), and Mean Corpuscular Haemoglobin Concentration(MCHC)) of 10 clinically healthy birds were measured and expressed as mean±SE. Samples of different age groups are compared by using One Way ANOVA to assess the significance of differences at $p<0.05$, $p<0.01$ and $p<0.001$ by the help of Paleontological statistics (PAST) version 2.17. The mean value of Hb, RBC and PCV differed highly significantly ($p<0.001$) between different age groups of Japanese quail. WBC, MCH ($p<0.01$) and MCV, MCHC ($p<0.05$) indicate significant difference between different age groups. The study would help to draw conclusive findings regarding the health status of Japanese quail and serve as a suitable model organism for experimental study.

Keywords: Japanese quail, blood cell, haematological parameters, erythrocyte indices.

Introduction

Recently Japanese quail has emerged as a suitable option for diversification of poultry farming and exploration of popular delicacy of egg and meat. Japanese quail as poultry bird is a commercially much viable option due to its low volume and weight, early maturity and growth, high rate of egg laying, short generation interval, low feed and floor space requirement. Quail possesses excellent disease resistance than that of chickens[1]. 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*)[2,3]. The Haematological analysis is undertaken to evaluate the health status of bird along with diagnosis and clinical monitoring of any disease[4]. Haematogical and biochemical analysis of the Japanese quail at different growth phases were done which showed that with age the biochemical profile of the bird changes, but on the other hand it does not seem to affect the haematological parameters[5]. Changes in the haematological profile in breeding and sexual maturation of Japanese quail were studied[6]. A haematological analysis is one method that contributes to detection of some changes in health status which may not be apparent during physical examination, but which affect the fitness of the birds[7]. Both haematological and biochemical blood values serve as indicators of the physiological state of birds[8]. The present study was designed to assess various haematological profiles of Japanese quails at different growth phases.

Material and Methods

The research work which involved laboratory experiments were done at Cytogenetic Laboratory of P.G. Department of Zoology, Utkal University, Vani Vihar, Bhubaneswar-751 004. The blood samples were collected from the poultry farm of Central Poultry Development Organisation (CPDO) Eastern Region(ER), Govt. of India, Bhubaneswar-751 012 where the birds were reared under standard management practice. The blood samples were collected by puncture of wing vein at different interval, i.e., 1st, 2nd, 3rd, 4th, 5th, 6th, and 9th week of age which marks different stages of growth and production. The bird attains its sexual maturity at 6th week and is at its fully laying stage during 9th week of its growth. For the haematological analysis, blood sample was collected from the birds with the proper restraint method by a 2.5ml capacity disposable syringe and were transferred immediately into the anti-coagulated vacutainer tubes and mixed properly. The collected samples were carried to the laboratory in ice box and preserved in refrigerator until analysed.

The Haematological parameters were determined using 10 clinically healthy Japanese quails. Blood samples were collected

mostly during morning hours in between 8:00 am to 9:00 am from January to February. Blood cell analysis, i.e., Hemoglobin (Hb) was estimated by using Sahil's Haemometry[9]. Red Blood Cell (RBC) and White Blood Cell (WBC), was done with the help of Neubaurs Haemocytometer having Neubauers chamber slide and Hund Wetzlar microscope. Packed cell volume (PCV) was determined with microhematocrit tube at 3500 rpm for 15 minutes by centrifuge machine. From these basic data erythrocytic indices, i.e., mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were estimated by following procedures[4]. The data was analysed and presented as mean± standard error (S.E) by using statistical software Microsoft office excel 2007 and one way analysis of variance (ANOVA) was used to assess the significance of differences at $p<0.05$, $p<0.01$ and $p<0.001$ by the help of Paleontological Statistics (PAST) version 2.17.

Results and Discussion

The mean and standard error on the haematological analysis of Japanese quail *(Coturnix coturnix japonica)* at different phases of growth, i.e., 1st, 2nd, 3rd, 4th, 5th, 6th, and 9th week of age were recorded which show significant difference (table-1). It is observed that the parameters namely Hb, RBC, WBC, PCV, MCV, MCH and MCHC are significant within different age group weeks. The haemoglobin level of the bird was observed to remain almost stable up to 5th week of age. A significant increase was observed between week 6 and week 9 of the laying period. The haemoglobin amount, red blood cell count, white blood cell and haematocrit (PCV) value increased with increase in age where as the values were lowest in chicks and highest in adults[10]. This collaborates with studies done by some other researchers[11].

Haemoglobin ($p<0.001$), Red blood cell ($p<0.001$), white blood cell ($p<0.01$) and packed cell volume ($p<0.001$) show highly significant with the weekly growth performance of the birds. Packed cell volume or haematocrit determines the percentage of volume of red blood cells in whole blood, which was found to be the highest in ninth week and lowest in first week of age. PCV was also increased with age[12]. An increase in PCV value is probably due to its higher growth rate, metabolic activities and production of gonadotropins, sex and metabolic hormones. The observation shows highly significant difference, i.e., ($p<0.0001$) within the age groups. The 1st, 2nd and 3rd weeks have significant difference with 9th week of growth period.

Packed Cell Volume and Mean Corpuscular Volume value increases depending on environmental temperature and storage duration of Samples[13]. MCV, MCH and MCHC to be calculated on the basis of PCV, RBC and Hb[14]. Mean corpuscular volume (MCV) determines the average volume of red blood cell in femtoliters (fl) or cubic microns (μm^3) which was observed to be the highest in 4th week and lowest in 3rd week. It shows significant difference $p< 0.05$ in the rows. Second and 3rd week have significant difference with 4th week. The calculated indices reflect higher or lower value due to low haemoglobin concentration in blood. In the present study, MCH was found to have significant differences at $p< 0.01$, and MCHC projects significant difference at ($p<0.05$) within the age groups. MCH and MCHC reflect the Hb content of Red Blood Cell. This measure may be used to diagnose the type of anemia[15].

Table-1
Mean and SE (n=10) of haematological parameters of Japanese quail at different stages of growth (age)

Parameter	Chick			Grower		Adult		F value
	1st week	2nd week	3rd week	4th week	5th week	6th week	9th week	
Hb(g/dl)	7.16± 0.71^{a}	7.09± 0.23^{b}	7.57± 0.14^{c}	8.75± 0.32^{d}	8.95± 0.24^{abe}	11.23± 0.43^{abcde}	11.3± 0.47^{abcde}	18.89***
RBC ($10^6 mm^3$)	0.97± 0.20^{a}	1.94± 0.10	1.89± 0.10	1.43± 0.29	1.38± 0.22	2.14± 0.21^{a}	3.14± 0.28^{abcde}	9.66***
WBC($10^6 m^3$)	10307± 1881.38^{a}	10512.4± 1097.23	17471.1± 2934.3	17015± 1676.14	20365± 1467.65^{abe}	11240± 954.63^{e}	12360± 1.62^{e}	5.23**
PCV (%)	23.21± 2.32^{a}	27.9± 1.64^{b}	31.85± 1.93^{ac}	32.14± 1.25^{ad}	35.7± 1.43^{a}	39.3± 2.29^{ab}	53.6± 1.62^{abcd}	12.19***
MCV(m3)	364.15± 92.15	146.75± 11.07^{b}	73.34± 14.11^{c}	682.33± 284.70^{bcd}	401.02± 131.04^{d}	197.10± 19.20	193.65± 31.11	2.54*
MCH(pg)	110.28± 27.19	37.76± 2.89^{b}	40.88± 1.78^{c}	189.89± 78.99^{bcd}	92.48± 24.53	57.411± 6.302	39.11± 4.431^{d}	2.84**
MCHC (%)	31.75± 1.565^{a}	26.45± 2.217	24.77± 1.97^{a}	27.37± 0.91	25.46± 1.266	29.28± 1.785	21.34± 1.282	2.18*

Note: * significant at ($p<0.05$), ** Significant at $P<0.01$, *** significant at $P<0.001$, Similar alphabet in the superscripts represents significant difference among the different age groups (weekly)

Conclusion

The study indicates that the Japanese quail possesses an excellent adaptation capacity as far as its haematological parameters are concerned for requirements of space flights, and seems to be a suitable species for long-time exposure to cosmic life conditions. This will provide a database for quail farmers, poultry industries, ornithologist, naturalists, pathologists, biologists and will be also helpful for veterinarians. It will also helps in analysis of summative health status of the quail approaching towards bird's physiological and pathological conditions. This study concludes that the majority of haematological parameters for Japanese quail increases with advancement of growth.

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