

## Haematology, Serum Chemistry and Electrocardiographic Evaluation in Native Chicken of Kashmir

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**Abstract:** Basic physiology, hematology and serum chemistry of indigenous chicken, reared in eco-friendly environment of backyard of small farmers in temperate regions of J and K State (altitude range 1500-2000 m amsl, average temperature 13°C), was studied in adult chicken from different pockets of Kashmir. The average values for haemoglobin (Hb), Packed Cell Volume (PCV), Total Leukocyte Count (TLC), Total Erythrocyte Count (TEC), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC) were  $13.21 \pm 0.39\%$ ,  $40.70 \pm 0.51\%$ ,  $16.80 \pm 0.47 \times 10^3/\text{cumm}$ ,  $3.20 \pm 0.07 \times 10^9/\text{cumm}$ ,  $127.18 \pm 2.68\text{fl}$ ,  $41.28 \pm 0.56\text{pg}$ ,  $32.45 \pm 0.57\text{g}\%$  and  $11.32 \pm 0.19\text{g}\%$ ,  $35.21 \pm 0.61\%$ ,  $22.29 \pm 0.37 \times 10^3/\text{cumm}$ ,  $2.98 \pm 0.08 \times 10^9/\text{cumm}$ ,  $118.15 \pm 1.76\text{fl}$ ,  $37.98 \pm 0.56\text{pg}$ ,  $32.14 \pm 0.39\text{g}\%$  in cock and hen respectively. Percentage presence of different leukocytes in blood was  $32.55 \pm 0.61$ ,  $48.87 \pm 0.81$ ,  $10.90 \pm 0.35$ ,  $5.67 \pm 0.24$ ,  $2.05 \pm 0.18$  and  $26.32 \pm 0.46$ ,  $49.98 \pm 0.72$ ,  $10.85 \pm 0.36$ ,  $8.69 \pm 0.26$ ,  $3.19 \pm 0.23$  for heterophils, lymphocytes, monocytes, eosinophils, basophils respectively in cock and hen. The cytometry of erythrocytes revealed  $13.86 \pm 0.11$  micrometre and  $12.78 \pm 0.09$  micrometre length,  $8.37 \pm 0.09$  micrometre and  $7.86 \pm 0.07$  micrometre breadth in cock and hen respectively. The values for Hb, PCV, TLC, TEC and RBC size differed significantly ( $p < 0.01$ ) among the cocks and hens. Serum was analysed for glucose, cholesterol, total protein, albumin, globulin, creatinine, calcium, phosphorus and alkaline phosphatase, the average values recorded were  $227.83 \pm 6.07\text{ mg dLG}^1$ ,  $116.33 \pm 4.90\text{ mg dLG}^1$ ,  $3.99 \pm 0.18\text{ g dLG}^1$ ,  $1.78 \pm 0.06\text{ g dLG}^1$ ,  $2.15 \pm 0.17\text{ g dLG}^1$ ,  $6.31 \pm 0.33\text{ mg dLG}^1$ ,  $1.54 \pm 0.17\text{ mg dLG}^1$ ,  $10.79 \pm 0.50\text{ mg dLG}^1$ ,  $4.19 \pm 0.20\text{ mg dLG}^1$ ,  $9.84 \pm 0.67\text{ K.A.U}$  and  $227.43 \pm 4.93\text{ mg dLG}^1$ ,  $141.02 \pm 5.36\text{ mg dLG}^1$ ,  $4.97 \pm 0.16\text{ g dLG}^1$ ,  $2.20 \pm 0.07\text{ g dLG}^1$ ,  $2.79 \pm 0.14\text{ g dLG}^1$ ,  $6.21 \pm 0.40\text{ mg dLG}^1$ ,  $1.62 \pm 0.08\text{ mg dLG}^1$ ,  $12.01 \pm 0.47\text{ mg dLG}^1$ ,  $4.74 \pm 0.30\text{ mg dLG}^1$ ,  $11.11 \pm 0.84\text{ K.A.U}$  in cock and hen respectively. The values for cholesterol, total protein and albumin differed significantly ( $p < 0.01$ ) among the sexes where as no significant difference for glucose, uric acid, creatinine, calcium, phosphorus or alkaline phosphatase was observed. Besides haematology and serum chemistry, heart rate, respiration rate and rectal temperature were recorded and the values were  $285.80 \pm 6.78$  beats/min and  $359.92 \pm 8.48$  beats/min,  $27.29 \pm 0.49/\text{min}$  and  $31.10 \pm 0.32/\text{min}$ ,  $105.59 \pm 0.14^\circ\text{F}$  and  $106.31 \pm 0.09^\circ\text{F}$  in cock and hen respectively that differed significantly ( $p < 0.01$ ) among sexes. Mean electrical axis of QRS was  $-81.4 \pm 1.97^\circ$  and  $-78.38 \pm 1.76^\circ$  in cock and hen respectively. The time intervals of different phases of cardiac cycle in cock and hen were 205 ms and 169 ms, 59.16 ms and 49.44 ms, 102.5 ms and 87.77 ms and 23.75 ms and 12.5 ms for R-R, P-R, R-T and T-P intervals respectively. The study revealed significant effect of sex on various physiological parameters in native chicken of Kashmir.

**Key words:** Chicken, haematology, serum chemistry, electrocardiogram

### Introduction

The local native chicken population of Jammu and Kashmir State figures 7.3 lac out of which 63.50% is in Kashmir Division alone (17th Indian Livestock Census, 2003), being reared as backyard of rural population in scavenging system of farming. These birds thrive on kitchen waste, damaged cereals, leftover human foods or occasionally provided rice, paddy or maize as a supplementary feed. In India backyard poultry production has increased only by 16% as compared to 150 times increase in broiler production (Ravi Kumar *et al.*, 2002). With the advent of a concept of sustainable and ecofriendly agriculture, it is being realized to explore the local indigenous genetic potential to conserve

indigenous livestock genetic resources and evolve different types of birds suitable for their own agroecological conditions and production systems (Sharma *et al.*, 2002). A new research focus on village chicken has developed in many developing African and Asian countries and in China village chicken production system has been included in mainstream agriculture. Household poultry has been included in the FAO special programme for food security (FAO, 1997). Since little is known about the basic physiology of native chicken of Kashmir, which is considered to be a different subspecies than the rest desi poultry of mainland India, with high genetic diversity, the present study was undertaken to record various basic physiological profile

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Table 1: Haematological profile in Native Chicken of Kashmir

Parameter	Cock (n = 30)	Hen (n = 55)
Hemoglobin (g%)	13.21±0.39 <sup>a</sup>	11.32±0.19 <sup>b</sup>
Packed cell volume (%)	40.70±0.51 <sup>a</sup>	35.21±0.61 <sup>b</sup>
Total Erythrocyte count (million/cumm)	3.20±0.07 <sup>a</sup>	2.98±0.08 <sup>b</sup>
Total leukocyte count (thousand/cumm)	16.80±0.47 <sup>a</sup>	22.29±0.37 <sup>b</sup>
Heterophil (%)	32.55±0.61	26.32±0.46
Leukocyte (%)	48.87±0.81	49.98±0.72
Monocyte (%)	10.90±0.35	10.85±0.36
Eosinophil (%)	5.67±0.24	8.69±0.26
Basophil (%)	2.05±0.18	3.19±0.23
Mean corpuscular volume (fl)	127.18±2.68	118.15±1.76
Mean corpuscular hemoglobin (pg)	41.28±0.56	37.98±0.56
Mean corpuscular hemoglobin concentration (g%)	32.45±0.57	32.14±0.39
Erythrocyte Length (μ):	13.86±0.11 <sup>a</sup>	12.78±0.09 <sup>b</sup>
Breadth (μ):	8.37±0.09 <sup>a</sup>	7.86±0.07 <sup>b</sup>

Mean under same superscript in the same row did not differ significantly

of native chicken of Kashmir (Kashmir favorella). This study was based on the assumption that village chicken production systems can be improved and transformed from subsistence to semi-commercial production systems to increase food security and income, especially among the rural populace and disadvantaged members of the community.

### Materials and Methods

The present study was conducted in adult native chicken from different pockets of Kashmir within the altitude range of 1500 to 2000 metres above mean sea level, average temperature of 13°C and annual precipitation of 660 to 1400 mm. 2 and ½ ml of blood was collected from the wing vein with the help of disposable syringe using 22 gauge needle. One mL of blood was preserved for haematology in vials with 2 mg ethylenediaminetetraacetic acid (EDTA), whereas one and a half ml of blood was allowed to coagulate for separation of serum to study serum chemistry.

85 blood samples (30 from male and 55 from female) were analysed for hemoglobin (Hb), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Total Leukocyte Count (TLC) and Differential Leukocyte Count (DLC). Hb estimation was done by cyanmethaemoglobin method and PCV by microhematocrit method (Bernard *et al.*, 2000). TEC and TLC were done using Neubaur's hemocytometer and Tualidine blue (0.015%) saline as diluant (Brar *et al.*, 2002). The blood films stained with Wright's stain (Benjamin, 1985) were studied for DLC. MCV, MCH, MCHC were calculated (Stockham and Scott, 2002). The erythrocytes were measured using micrometer (Campbell, 1995).

The serum was separated and analysed for glucose (Trinder, 1969), cholesterol (Flegg, 1973), total protein and albumin (Tietz, 1970), creatinine (Bonses and Tauskay, 1945), uric acid (Fossati *et al.*, 1980), calcium (Gitelman, 1967), phosphorus (Gomorri, 1942) and

alkaline phosphatase (Kind and King, 1954). Rectal temperature was recorded using mercury thermometer and respiration rate by observing the raising of abdomen per minute. It was impossible to record heart rate by simple auscultation method therefore electrocardiogram was recorded (Cardiart 108 T, BPL India) to determine the heart rate and various intervals in the cardiac cycle. Only standard bipolar and augmented unipolar limb leads were used in a mammalian fashion, attached to the recording sites with alligator teeth clips and ECG jelly was applied at the attachment sites (Whitrow, 2000). The birds were allowed to get calm for few minutes after attaching leads and thereafter electrocardiogram was recorded with speed set at 50 mm/sec and voltage 1mv = 10mm. Mean electrical axis of QRS was determined from bipolar standard limb leads (Arthur, 1991). The data generated was statistically analysed using standard statistical procedures (Snedecor and Cochran, 1967).

### Results and Discussion

The mean haematological values along with standard error among the two sexes for Hb, PCV, TEC, TLC, MCV, MCH, MCHC and DLC are presented in Table 1. The haematological values recorded in present study do differ significantly ( $p < 0.01$ ) among the cock and hen. The values for Hb and PCV recorded in native chicken of Kashmir were on higher side and values for TLC and DLC were simulating the findings of Bernard *et al.* (2000), Gaikwad and Raote (2000), Kumar and Balachandran (2005) and Pampori (2003) in domestic chicken, broilers or White leghorn. The raised hemoglobin levels may probably be an adaptation to high altitudes. The pattern of leukocyte distribution (Plate I) was almost similar in cock and hen with heterophil percentage insignificantly more in cock than in hen. The length and breadth of erythrocytes recorded in present study differed between the two sexes and the values are in near agreement to the findings of Palomeque and Planos (1977).

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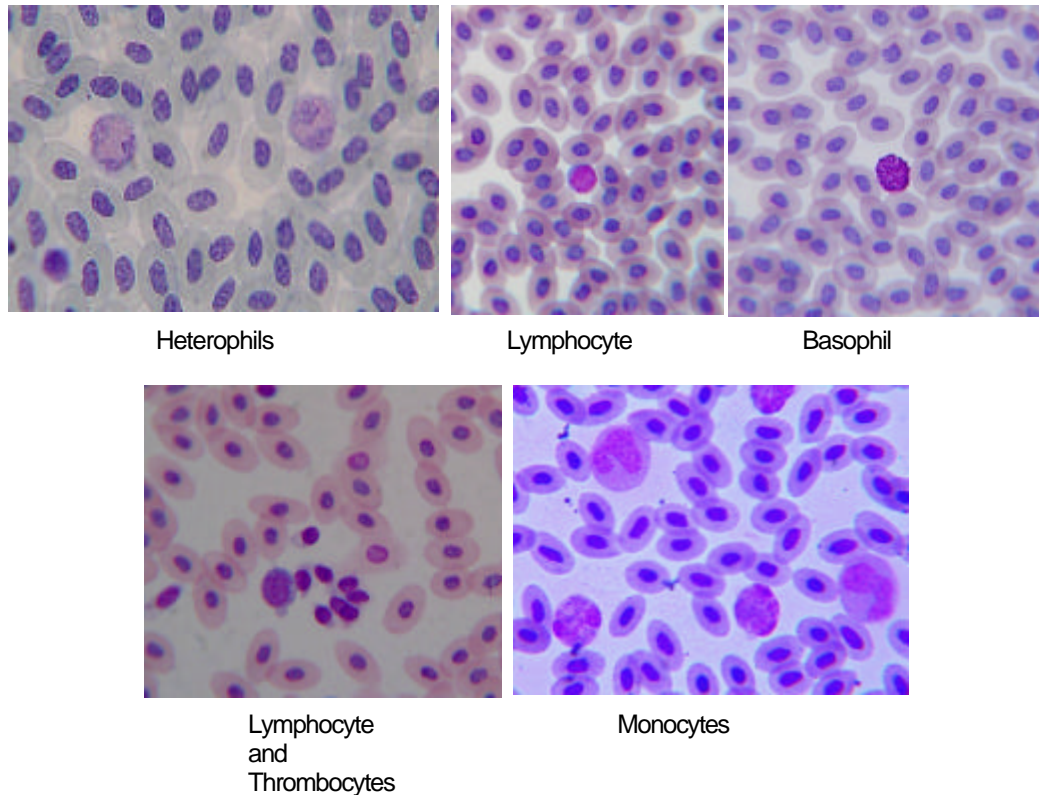


Plate 1: Different leukocytes of native chicken (×100)

Table 2: Serum chemistry in Native Chicken of Kashmir

Parameters	Cock (n = 24)	Hen (n = 32)
Glucose (mg dLG <sup>-1</sup> )	227.83±6.07 <sup>a</sup>	227.43±4.93 <sup>a</sup>
Cholesterol (mg dLG <sup>-1</sup> )	116.33±4.90 <sup>a</sup>	141.02±5.36 <sup>b</sup>
Total Protein (g dLG <sup>-1</sup> )	3.99±0.18 <sup>a</sup>	4.97±0.16 <sup>b</sup>
Albumin (g dLG <sup>-1</sup> )	1.78±0.06 <sup>a</sup>	2.20±0.07 <sup>b</sup>
Globulin (g dLG <sup>-1</sup> )	2.15±0.17 <sup>a</sup>	2.79±0.14 <sup>b</sup>
Uric acid (mg dLG <sup>-1</sup> )	6.31±0.33 <sup>a</sup>	6.21±0.40 <sup>a</sup>
Creatinine (mg dLG <sup>-1</sup> )	1.54±0.17 <sup>a</sup>	1.62±0.08 <sup>a</sup>
Calcium (mg dLG <sup>-1</sup> )	10.79±0.50 <sup>a</sup>	12.01±0.47 <sup>a</sup>
Phosphorus (mg dLG <sup>-1</sup> )	4.19±0.20 <sup>a</sup>	4.74±0.30 <sup>a</sup>
Alkaline phosphatase (KA unit)	9.84±0.67 <sup>a</sup>	11.11±0.84 <sup>a</sup>

Mean under same superscript in the same row did not differ significantly

Table 3: Basic physiology of Native Chicken of Kashmir

Parameters	Cock	Hen
Rectal temperature (F <sup>0</sup> )	105.59±0.14 <sup>a (55)</sup>	106.31±0.09 <sup>b (76)</sup>
Respiration rate/minute	27.29±0.49 <sup>a (54)</sup>	31.10±0.32 <sup>b (87)</sup>
Heart rate/minute	285.80±6.78 <sup>a (23)</sup>	359.92±8.48 <sup>b (28)</sup>

Mean under same superscript in the same row did not differ significantly, Figures in parenthesis indicate number of observations

The mean values for various serum constituents in cock and hen are presented in Table 2. The values for cholesterol, total protein and albumin recorded in present study differed significantly (p<0.01) among the two sexes, however, no significant difference was

observed for glucose, uric acid, creatinine, calcium, phosphorus and alkaline phosphatase. The values recorded for serum constituents in present study were in agreement to the findings of Gaikwad and Raote (2000), Kumar and Balachandran (2005), Pampori (2003) and Rajgude *et al.* (2005), recorded in broilers or white leghorn or domestic chicken.

The basic physiological profile of body temperature, heart rate and respiration rate are presented in Table 3. The results recorded in present study for rectal temperature and respiration rate did differ significantly (p<0.01) among the two sexes of native chicken. The respiration rate in present study was on higher side whereas rectal temperature was in agreement to the findings of Melvin (2004).

Besides monitoring heart rate electrocardiogram (Plate II and Plate III) was useful in recording the timings of various phases of cardiac cycle. The heart rate did differ significantly (p<0.01) between cock and hen. The timings recorded for various phases of cardiac cycle are presented in Table 4. Significant (p<0.01) difference was recorded in timings for R-R, P-R and T-P intervals among the cock and hen. However, Mean Electrical Axis (MEA) of QRS wave was reported -81.4±1.97 and -78.38±1.76 in cock and hen respectively which did not differ significantly. The heart rate, MEA and timings of various phases of cardiac cycle recorded in present

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Table 4: Timings of different phases of cardiac cycle in Native Chicken of Kashmir

Parameters	Cock	Hen
R-R interval	205±4.17 ms	169.44±4.06 ms
P-R interval	59.19±1.48 ms	49.44±1.70 ms
R-T interval	102.5±2.71 ms	87.77±1.72 ms
T-P interval	23.75±2.14 ms	12.5±1.62 ms
Mean electrical axis (MEA)	-81.4°±1.97°	-78.38°±1.76°

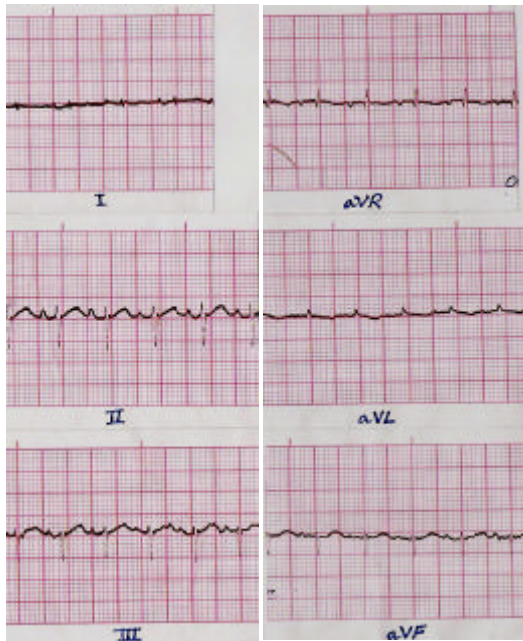


Plate II: ECG of Cock

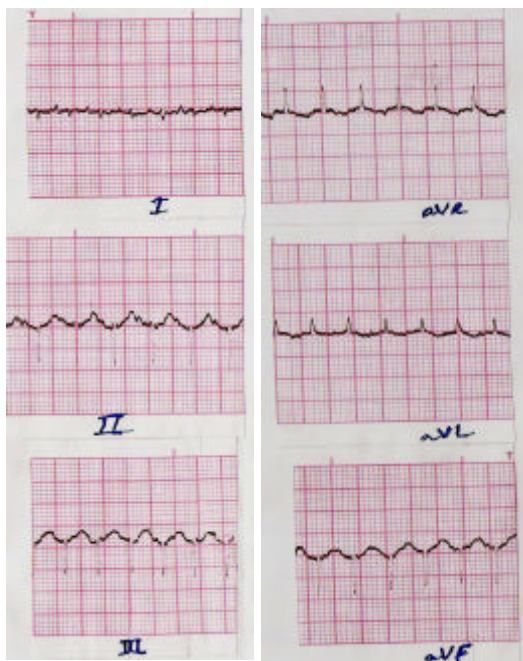


Plate III: ECG of Hen

study for native chicken were challenging and infact there are very few reports of these values in chicken. The time intervals and MEA reported were comparable to the findings of Whittow (2000).

The present study was aimed to augment the efforts towards the conservation of local germplasm, which is must for preserving biodiversity. Since the importance of rural poultry development in national economy of developing countries and its role in improving nutritional and financial status of small farmers has been recognized by various scholars and rural development agencies in last two decades (Creevey, 1991; FAO, 1987), it becomes necessary to generate quantitative and qualitative data to understand and to support the importance of local chicken production. Present study in native chicken of Kashmir being reared as backyard of small rural farmers was a noble attempt towards this goal of understanding local chicken physiology.

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