

*Original Research***Biochemical Parameters of Native Chicken of Himachal Pradesh, Dahlem Red and Their Crosses**

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Abstract

Native chicken comprise the important part of free-range poultry production in the rural areas of Himachal Pradesh. They are gaining tremendous importance due to their better adaptability but are not efficient producers, thus has been crossbred with exotic breed Dahlem Red. Characterization of these breeds with respect to their physical and biochemical parameters have not done yet. Thus, the objective of this study was to find the baseline values of plasma biochemical parameters of the native chickens of Himachal Pradesh, Dahlem Red and their crosses and compare these parameters among themselves and gender wise. Significant difference ($p < 0.05$) among the breeds/crosses and for the sexes within a breed /cross were observed for plasma cholesterol, triglyceride, ALT, creatinine, calcium and phosphorus. The baseline values provided may act as foundation for the management of the health of these chicken breeds/crosses.

Key words: Baseline values, Biochemical parameters, Breed/cross, Crossbreeding, Dahlem Red, Native chicken, Poultry production

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Introduction

Poultry farming is the part of livestock industry in India, which through eggs and meat contributes to animal protein requirements of the people (Ullengala *et al.*, 2008). In Himachal Pradesh, rural poultry production system is dominated by the native chicken resources (Katoch *et al.*, 2010). Native chicken of Himachal Pradesh is the non-descript breed of chicken characterized by brown plumage with adult male and female body weights as 1.2(± 0.03) and 1.8(± 0.05) kg, respectively. They possess survival traits such as disease resistance, adaptability to adverse climatic conditions, efficient foraging, scavenging and brooding abilities (Sankhyan *et al.*, 2013; Reen *et al.*, 2014). For the subsidiary income and fulfillment of their animal protein

requirement through meat and eggs, rural farmers rear indigenous birds (Ullengala *et al.*, 2008; Padhi, 2016) but they are not profit makers in comparison to commercial breeds. To enhance the profitability exotic breeds or their crosses with native breeds are generally used. Dahlem Red is one such exotic layer breed used in Himachal Pradesh for improved characters in filial generations by combining qualities of both native and exotic breed (Sankhyan *et al.*, 2013).

Biochemical parameters provide view into the state of health and helps in disease diagnosis (Enam *et al.*, 2018). A knowledge of typical reference values is crucial for distinguishing between healthy and diseased conditions (Oladele, 2009). As avian medicine is undergoing a new shift in developing countries, it is now involving the use of haematological and biochemical indices as tools to diagnose avian diseases (Oladele, 2009). Thus, it is pertinent to determine biochemical reference data for particular geographical areas as diagnostic aids (Enam *et al.*, 2018). Currently no known information on serum biochemical parameters of native chicken of Himachal Pradesh and their crosses with exotic breed Dahlem Red is there. Thus the objective of this study was to establish baseline data of above mentioned parameters for native chickens, Dahlem Red breed, cross of native chicken with Dahlem Red breed (DRN) and cross of DRN with Dahlem Red breed (DND) followed by their breed-wise comparison among the four groups and gender-wise comparison within each breed/cross.

Materials and Methods

The present study was conducted at poultry farm of College of Veterinary and Animal Sciences, CSKHPKV, Palampur, Himachal Pradesh located at 32.1° N latitude, 76.5° E longitude and 1290.8 m altitude at the month of September-October. The average annual precipitation is between 2100-2200 mm and average temperature is around 26° C during summer season and falls to 14° C during winter season. Four breed/cross-wise groups with ten chickens with equal number of males and females of similar age, comprising of native, Dahlem Red, DRN (cross of native with Dahlem Red) and DND (cross of DRN with Dahlem Red), respectively were constituted. Birds were selected randomly and maintained on deep litter with nest boxes. *Ad libitum* feeding with crumbled feed according to their age and feeding requirement done. Leg bands were used for identification of the selected birds. Birds were restrained carefully and 70% (v/v) ethanol was swabbed on the blood collection site. 5 ml blood was collected with sterile needles by the aseptic venipuncture of the ulnar vein in clean screw capped heparinized centrifuge tubes and then centrifuged at 2500 rpm for 10 minutes in the centrifuge (REMI, R8C laboratory centrifuge) to separate the plasma. The plasma pipetted out into the micro centrifuge tubes and stored at -20°C until further analysis. Blood plasma biochemical parameters *viz* glucose, total cholesterol, triglycerides, alanine amino transferase (ALT), aspartate aminotransferase (AST), creatinine, uric acid, calcium and phosphorus were

estimated by using respective biochemical estimation kit (Agappe diagnostics ltd.) in an automatic blood biochemistry analyzer (Mispa Nano, Agappe).

Statistical Analyses

The biochemical values observed were analyzed by GraphPadInStat software (GraphPadInStat, 2008) using one-way analysis of variance (ANOVA) using Tukey’s test at five percent level of significance.

Results and Discussion

Table 1: Plasma biochemical values of the birds (mean ± standard error)

Parameters		Native	Dahlem Red	DRN	DND
Glucose (mg/dl)	Male	259.10±7.25	241.44±2.60	264.60±11.09	260.14±8.66
	Female	227.1±8.23	241.44±2.60	233.44±14.21	242.28±6.42
Total cholesterol (mg/dl)	Male	128.94±6.42 ^a	218.22±11.06 ^b	238.06±3.91 ^b	253.16±11.13 ^{bx}
	Female	136.42±13.90 ^a	178.36±7.29 ^{ab}	200.04±7.24 ^b	182.10±6.39 ^{by}
Triglycerides (mg/dl)	Male	84.54±4.03 ^a	58.64±4.90 ^{ax}	58.22±4.55 ^a	56.60±7.14 ^a
	Female	84.20±5.20 ^{ab}	104.24±4.69 ^{ay}	59.58±7.85 ^b	72.08±7.12 ^b
AST(U/L)	Male	241.40±1.99	202.12±4.62	234.72±14.52	235.40±14.38
	Female	223.08±6.71	198.54±5.36	195.64±25.31	229.96±8.90
ALT (U/L)	Male	16.72±1.12 ^a	10.58±0.61 ^b	14.64±0.42 ^{ab}	14.42±1.33 ^{ab}
	Female	14.86 ±1.55 ^a	12.62±0.50 ^a	12.98±1.58 ^a	11.60±0.60 ^a
Creatinine (mg/dl)	Male	1.24 ±0.08 ^a	1.07±0.03 ^a	1.53±0.02 ^{bx}	1.17±0.07 ^a
	Female	1.06±0.03 ^a	1.13±0.07 ^a	1.09±0.05 ^{ay}	1.29±0.04 ^a
Uric Acid (mg/dl)	Male	5.70±1.06	7.26±0.32	6.28±0.21	7.04±0.26
	Female	6.28±0.87	5.36±1.11	7.40±0.66	5.78±0.46
Calcium (mg/dl)	Male	11.88±0.49 ^a	9.58±0.19 ^b	10.16±0.57 ^{ab}	9.82±0.41 ^b
	Female	11.92±0.57 ^a	11.36±0.26 ^a	10.36±0.18 ^a	11.74±0.71 ^a
Phosphorus (mg/dl)	Male	3.86±0.26 ^a	3.04±0.21 ^a	3.06±0.33 ^a	5.30±0.08 ^b
	Female	3.02±0.12 ^a	3.10±0.51 ^a	3.76±0.22 ^a	5.54±0.37 ^b

Figures with different superscripts (a, b, c, d) in columns differ significantly ($p < 0.05$) in different breeds/crosses. Figures with different superscripts (X,Y) in rows differ significantly ($p < 0.05$) in different sexes within breeds/crosses.

Plasma glucose value showed no significant difference ($p > 0.05$) among the breeds/crosses. The range observed fell within the reference range given by Clinical Diagnostic Division (1990) but lower than that observed by Bora *et al.* (2017). Sex difference was insignificant ($p > 0.05$) for glucose value which was similar to the findings of Simaraks *et al.*, (2004) in Thai indigenous chicken and Bora *et al.* (2017) for indigenous chicken.

Total cholesterol concentration for Dahlem Red and their crosses (DRN and DND) was significantly ($p < 0.05$) higher than the native male and female chicken. This lower cholesterol content of native birds can be ascribed to their high-energy demand because of more body activity (Almeida *et al.*, 2006). The range

observed for cholesterol was higher than that observed by Bora *et al.* (2017) for indigenous birds and Pampori and Iqbal (2007) for male native chicken of Kashmir. In DND cross, females had significantly ($p < 0.05$) lower total cholesterol as compared to male birds. The significant breed and sex differences in total cholesterol was similar to the findings of the Meluzzi *et al.* (1992) and Bora *et al.* (2017).

No significant difference ($p > 0.05$) among the breeds/crosses was observed for the plasma triglyceride levels in male birds. Triglyceride content of female crosses were significantly ($p < 0.05$) lower than the females of native and Dahlem Red breeds. Low concentration of triglyceride can be due to lesser hepatic lipogenesis or more utilization of triglycerides by body tissues except the adipose tissue (Griffin *et al.*, 1982). The observed range falls within the range observed by the Durotoye *et al.* (2001) in adult male domestic chicken. On contrary Silva *et al.* (2007) reported higher plasma triglyceride concentration in broiler chickens than the observed range. Significant ($p < 0.05$) sex difference in Dahlem Red birds were found where females have higher triglyceride content than males which is similar to the findings of Prahsanth *et al.* (2012) for grower chicken whereas on contrary Meluzzi *et al.* (1992) observed higher triglyceride content in male broilers.

No significant difference ($p > 0.05$) among the breeds and sexes was observed for the AST enzymatic activity. Bora *et al.* (2017) on contrary observed significant difference in male and female birds of Kadakanth and Rajsri birds. Scholtz *et al.* (2009) observed higher AST values for male Japanese quail than the observed range. The range observed in this study was higher than that observed by Abdi-Hachesoo *et al.* (2012) but lower for turkey birds and ring necked pheasant (Szabo *et al.*, 2005 and Nazifi *et al.*, 2011).

ALT activity of native and Dahlem Red males was found to be significantly ($p < 0.05$) different which can be due to breed difference. The ALT levels among females were insignificant. Prahsanth *et al.* (2012) observed higher range for ALT activity than this observed range whereas Abdi-Hachesso *et al.* (2012) observed a lower range.

No significant ($p > 0.05$) difference was observed among birds and sexes for uric acid levels. The values observed for plasma creatinine and uric acid was similar to those observed by Pampori and Iqbal (2007) for native chicken of Kashmir. Creatinine value of DRN male birds was significantly ($p < 0.05$) higher than the other birds which can be due to difference in its protein and nitrogen metabolism (Szabo and Milisits, 2007).

The plasma calcium values obtained were significantly ($p < 0.05$) different among the males of all the breeds/crosses in this study. Insignificant ($p > 0.05$) difference among the sexes was observed which was

similar to reports by Meluzzi *et al.* (1992), Ibrahim (2012) and Elagib *et al.* (2012). The range observed falls under the reference range given by the Clinical Diagnostic Division (1990).

Plasma phosphorus content of DND males and females was significantly ($p < 0.05$) different than the native, Dahlem Red and DRN birds. The range observed is lower than that observed by Pampori and Iqbal (2007) and Prahsanth *et al.* (2012) except for the DND birds. No significant ($p > 0.05$) difference was observed among the sexes which is similar to the findings of Ibrahim (2012) and Elagib *et al.* (2012) for indigenous chicken but contrary to the findings of Abdi-Hachesoo *et al.* (2013) and Bora *et al.* (2017).

Conclusion

The observed biochemical values can serve as reference baseline values of the blood biochemical parameters of poultry birds. Since rural poultry production is given importance to improve the livelihood of the farmers, these biochemical parameters will have direct application in breeding programs, assessing diseases and improving health status of these chicken breeds/ crosses that are used for poultry production in Himachal Pradesh.

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