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Biochemical and haematological parameter of Uttara and its crosses with other chicken breeds

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Abstract

The present study was focused on exploration of biochemical and haematological parameters of Uttara and its crosses with White Cornish, Kadaknath and White leghorn. The groups of crosses were: Uttara ♂× White Cornish ♀, White Cornish ♂ × Uttara ♀, Uttara ♂× Uttara ♀, White Cornish ♂× White Cornish ♀, Uttara ♂× Kadaknath ♀, Kadaknath ♂× Uttara ♀, Uttara ♂× White leghorn ♀, and White leghorn ♂× Uttara ♀. The traits viz. Haemoglobin concentration, packed cell volume, total protein, albumin, globulin, A: G ratio, creatinine, triglycerides, LDL, HDL, cholesterol and glucose were studied. Highest blood glucose, cholesterol, triglycerides, LDL and HDL were recorded in 1st group and found to be 215.77±1.88 (mg/dl), 119.15 ± 0.55(mg/dl), 251.56±1.10 (mg/dl), 25.22±0.42 (mg/dl) and 40.77±0.38 (mg/dl) respectively. Higher values of protein and globulin were observed in 1st group. Highest albumin and creatinine were recorded in 5th and 6th groups and highest haemoglobin was recorded in 5th group is 8.25±0.30 (%) and highest PCV was recorded in 4th group is 23.38± 0.15(%)

Keywords: Haematological, biochemical, Uttara, white cornish, Kadaknath, white leghorn

Introduction

Indian poultry industry is most organized and fast growing sector in animal Husbandry and worth app. Rs. one lakh crore. India is the third largest egg producer after China and USA and the fourth largest chicken meat producer after China, Brazil and USA. The per capita egg consumption has gone from 30 to 69 and chicken from 400 gm to 3 kg. Human nutritionist recommended a minimum of 180 eggs and 10 kg Chicken for a health of adult human Jalaludeen *et al.* (2018)^[4].

The conservation of poultry genetic resources is a multidimensional activity which comprise of preservation and maintenance of existing breed and also their improvement and proper management. Its main aim is sustainable utilization, restoration and enhancement of resource which can meet the need of present and as well as future mankind Kumar and Pandey. (2018)^[10]. To preserve native chicken, the need for conservation and improvement of animal genetic resources has been globally accepted (FAO 2007)^[3].

Haematological and biochemical parameter of birds are essential in diagnosing the various metabolic disorders. They can be used as diagnostic tool in order to assess the health status of individual and flock of birds. Haematological changes are routinely used to determine the status of the body and stress condition due to environmental, nutritional, managemental and pathological factors. Haematological values of chicken are influenced by breed, season, sex, age, climate, day length, time of individual, nutritional status, geographical location, present status of individual and other pathological factors (Ducks, 1955)^[2]. Haematological and blood biochemical parameters have been analyse to provide valuable information on immune status of animal. Scanty information is available on haematological and bio-chemical parameters of Uttara chicken and its crosses. Therefore, the present study was undertaken to record normal haematological and biochemical parameters of feathered shank Uttara chicken and its crosses.

Materials and Method

The study was conducted to evaluate the biochemical and haematological parameters of Uttara and its crosses with other chicken breeds. An experiment was carried out at Instructional Poultry Farm, Nagla, College of Veterinary and Animal Sciences, GBPUA&T University Pantnagar, Uttarakhand. The experiment involved the crosses: Uttara ♂× White Cornish ♀, White Cornish ♂ × Uttara ♀, Uttara ♂× Uttara ♀, White Cornish ♂× White Cornish ♀, Uttara ♂× Kadaknath ♀, Kadaknath ♂× Uttara ♀, Uttara ♂× White leghorn ♀, and White leghorn

♂ × Uttara ♀. The blood samples were collected from 80 birds, 10 birds from each group, each group samples divided in two duplicates. The blood was collected at end of trial period at 32 week of age by collecting blood samples (2ml) from all the birds through wing vein to evaluate the blood glucose (mg/dl), total cholesterol (mg/dl), Triglycerides (mg/dl), low density lipoprotein (mg/dl), high density lipoprotein (mg/dl), total protein (mg/dl), albumin, globulin, albumin globulin ratio, creatinine, haemoglobin and packed cell volume (PCV%). All biochemical characteristics were determined calorimetrically (Span Diagnostics Kit). All chicks were vaccinated with a standard vaccination schedule. All the experiments were conducted strictly in accordance with the guideline of Institutional Animal Ethics Committee (IAEC).

Blood biochemical and haematological parameter of Uttara chicken and its crosses were analysis by statistical analysis system software (SAS) 2020.

Results and Discussion

The mean values along with standard error of biochemical and haematological parameters of Uttara and its crosses are presented in Table 1. Analysis revealed that Uttara ♂ and Kadaknath ♀ and its reciprocal crosses have lower glucose level 153.56±0.91 and 153.4±0.65 g/dl respectively in comparison to other crosses. Kaur *et al.* (2013) [5] reported higher value of glucose in male and female local hill fowl birds Kumar *et al.* (2014) [9] reported higher value in Uttara chicken 237.90±9.66 mg/dl. Simaraks *et al.* (2004) [13] observed lower blood glucose level. However, Kaur (2007) [5] observed higher blood glucose level.

It was observed that total cholesterol were significantly different in Uttara and its crosses. Lower cholesterol value was observed as 101.34±0.24 and 101.48± 0.48 mg/dl in the crosses of Uttara ♂ and Kadaknath ♀ and its reciprocal crosses, respectively. Kaushal *et al.* (2018) [7] revealed higher cholesterol level in different dietary treatment in broilers. Kaur (2013) [5] reported similar value of total cholesterol in local hill fowl except in case of Uttara ♂ X Kadaknath ♀ and its reciprocal crosses in this study. Present study indicated that Uttara its crosses with Kadaknath had low cholesterol content in their blood. Blahova *et al.* (2007) [1] observed low cholesterol level in blood of experimental birds as an effect of low environmental temperature. Lower content of cholesterol in indigenous poultry may be result of high body activity and high need of energy in these birds.

Triglycerides level were significantly lower in Uttara crosses with Kadanath and White Leghorn in comparison to other crosses. Kaushal *et al.* (2018) [7] reported lower triglycerides level in different dietary treatments in broiler. The higher triglyceride concentrations in improved high laying RIR breed

and relatively lower concentration in Fayoumi chicken is attributable to an increased lipogenic activity of liver stimulated by the endogenous estrogens resulting from selective breeding North and Bell. (1990) [12].

The lower values of LDL and HDL were observed of Uttara cross with Kadanath and White Leghorn in comparison to other crosses. Kaushal *et al.* (2018) [7] reported higher level of LDL and similar level of HDL under different dietary treatment in broiler. Singh *et al.* (2014) [14] reported higher values of LDL and HDL 42.02 to 66.90 and 61.89 to 76.49 mg/dl respectively with different treatments in Guinea fowl.

The protein level was 5.00 ±0.04 g/dl in cross of Uttara ♂ X White Cornish ♀, which is higher than other crosses in the present study. Kaur *et al.* (2013) [5] also reported similar findings in feathered shank local hill fowl. The lower albumin values were observed in Uttara, White Cornish and its crosses from ranging 1.42±0.4 to 1.85 g/dl than other crosses Kaur *et al.* (2013) [5] reported similar albumin level in male and female. Higher albumin value were found in Uttara with Kadaknath and White Leghorn crosses in present study. Mohinddin (1976) [11] reported higher values for albumin in white leghorn breeds.

The significance differences were observed for globulin among groups. The higher value were observed as 3.15 ±0.08/dl in Uttara ♂ × White Cornish ♀ crosses and the lower values were observed in Uttara ♂ × White Leghorn ♀, and White Leghorn ♂ × Uttara ♀ crosses to be 2.13 ±0.14 and 2.16 ±0.10 g/dl respectively. However, Kaur *et al.* (2013) [5] reported 2.70g/dl in feathered shank local hill fowl.

In present study albumin and globulin ratio were lower in Uttara, white Cornish and its crosses, whereas, higher values were observed among crosses of Uttara × Kadaknath and Uttara × white leghorn and its reciprocal crosses. Kaur *et al.* (2013) [5] reported 0.69±0.04 in feathered shank local hill fowl.

The creatinine values of Uttara and its crosses were in the range between 0.15±0.01 and 0.18±0.01 mg/dl except Uttara ♂ × Kadaknath ♀, Kadaknath ♂ × Uttara ♀ crosses range 0.44±0.03 and 0.44±0.02 g/dl respectively mg/dl. However, Singh *et al.* (2014) [14] observed range from 0.15±0.01 to 0.23±0.01 in guinea fowl under neem leaf powder treatments.

The haemoglobin in Uttara and its crosses range from 7.25 to 8.25% which is lower than the finding of Kaur *et al.* (2013) [5] in feathered shank local hill fowl. Verma *et al.* (2021) [15] reported higher value of Hb% in different broiler treatment. However, Kubena *et al.* (1971) [8] reported variation in haemoglobin level due to temperature changes. In present finding PCV% values were ranging from 22.69±0.32 to 23.38±0.15, which is lower than the reports of Kaur *et al.* (2013) [5] and Verma *et al.* (2021) [15] as they observed higher PCV% in shank feathered local fowl and broiler respectively.

Table 1: Comparative biochemical and haematological parameters of Uttara and its crosses with White Cornish, Kadaknath and White leghorn.

Traits	1. U ♂ × WC ♀	2. WC ♂ × U ♀	3. U ♂ × U ♀	4. WC ♂ × WC ♀	5. U ♂ × K ♀	6. K ♂ × U ♀	7. U ♂ × WL ♀	8. WL ♂ × U ♀
(A) Glucose and lipid profile (mg/dl)								
Blood Glucose	215.77 ^a ± 1.83	214.59 ^a ± 1.44	211.35 ^{ab} ± 0.65	208.83 ^b ± 1.61	153.56 ^c ± 0.91	153.41 ^c ± 0.65	214.25 ^a ± 1.82	214.15 ^a ± 1.96
Total Cholesterol	119.15 ^a ± 0.55	114.35 ^b ± 1.25	107.57 ^c ± 1.58	109.46 ^c ± 1.27	101.34 ^d ± 0.24	101.48 ^d ± 0.17	115.03 ^b ± 1.71	113.39 ^b ± 1.70
Triglycerides	251.56 ^a ± 1.10	250.67 ^a ± 0.98	235.23 ^b ± 3.18	234.58 ^b ± 1.67	212.26 ^c ± 1.90	213.53 ^c ± 1.95	209.64 ^c ± 1.86	210.19 ^c ± 1.61
Low density lipoprotein (LDL)	25.22 ^a ± 0.42	24.59 ^{ab} ± 0.31	23.89 ^b ± 0.32	22.87 ^c ± 0.29	20.95 ^d ± 0.17	21.21 ^d ± 0.30	20.98 ^d ± 0.35	21.02 ^d ± 0.33
High density lipoprotein (HDL)	40.77 ^a ± 0.38	40.30 ^{ab} ± 0.34	39.05 ^c ± 0.41	39.50 ^{bc} ± 0.33	34.59 ^e ± 0.49	31.71 ^f ± 0.36	36.56 ^d ± 0.38	35.12 ^e ± 0.46
(B) Serum protein and health status related profile								
Total Protein (g/dl)	5.00 ^a ± 0.04	4.69 ^{abc} ± 0.10	4.75 ^{ab} ± 0.13	4.42 ^{bcd} ± 0.14	4.59 ^{bcd} ± 0.12	4.17 ^e ± 0.10	4.31 ^{de} ± 0.15	4.35 ^{cde} ± 0.12
Albumin (g/dl)	1.85 ^c ± 0.04	1.63 ^{cd} ± 0.06	1.48 ^d ± 0.08	1.42 ^d ± 0.04	2.75 ^b ± 0.07	2.86 ^b ± 0.07	3.19 ^a ± 0.12	3.22 ^a ± 0.13
Globulin (g/dl)	3.15 ^a ± 0.08	2.80 ^b ± 0.09	2.55 ^{bc} ± 0.06	2.48 ^c ± 0.07	2.57 ^{bc} ± 0.06	2.72 ^{bc} ± 0.06	2.13 ^d ± 0.14	2.16 ^d ± 0.10
A:G Ratio	0.59 ^c ± 0.02	0.59 ^c ± 0.03	0.58 ^c ± 0.03	0.58 ^c ± 0.01	1.07 ^b ± 0.01	1.05 ^b ± 0.01	1.56 ^a ± 0.13	1.51 ^a ± 0.04
Creatinine (mg/dl)	0.16 ^b ± 0.00	0.15 ^b ± 0.00	0.16 ^b ± 0.01	0.15 ^b ± 0.01	0.44 ^a ± 0.03	0.44 ^a ± 0.02	0.17 ^b ± 0.01	0.18 ^b ± 0.01

(C) Hematological parameters								
Haemoglobin (gm %)	7.92 ^{ab} ± 0.28	7.77 ^{ab} ± 0.27	7.85 ^{ab} ± 0.26	7.68 ^{ab} ± 0.21	8.25 ^a ± 0.30	7.45 ^{ab} ± 0.23	7.27 ^b ± 0.22	8.17 ^a ± 0.27
Packed Cell Volume (PCV %)	22.69 ^b ± 0.32	23.11 ^{ab} ± 0.21	23.29 ^{ab} ± 0.17	23.38 ^a ± 0.15	23.07 ^{ab} ± 0.16	23.18 ^{ab} ± 0.17	23.17 ^{ab} ± 0.13	23.12 ^{ab} ± 0.18

Conclusion

This study revealed that blood glucose level was significantly lower in Uttara and Kadaknath crosses due to genetic makeup of Kadaknath breed. Total cholesterol, triglycerides, HDL and LDL values differ significantly among the groups. Serum profile of these crosses differed significantly in different groups due to their parents. There was no significant difference in haemoglobin values among all groups except fifth and seventh. Simultaneously PCV values also differed significantly in first and fourth group. Values arrived due to these breeding experiment are novel for biochemical and haematological parameters. Upgradation of such rural breeds of chickens through different breeding technique helps to increase the productivity of the germplasm and also their conservation in their natural habitat as the rural people would be very happy to rear them for their adoptability to harsh environment.

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