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RESEARCH ARTICLE

HEMATOLOGICAL AND SERUM BIOCHEMICAL PARAMETERS IN TWO TYPES OF FISHES COLLECTED FROM DIFFERENT HABITAT

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ABSTRACT

The haematological and serum biochemical studies has been carried out in two types of fresh water fishes collected from different habitat. The fresh water fish, *Notopterus notopterus* collected from a river and *Channa marulius* collected from a pond. The fish, *N.notopterus* is a continuously moving fish and frequently comes to the surface for gulping air and also respires through gills. The fish, C*hanna marulius* remains in the bottom of pond and spends more time, very occasionally comes to the surface for gulping air. The haematological and serum biochemical parameters determined in these two fishes exhibited marked difference. All the parameters observed were on the higher side in the fish *Channa marulius* compared to that of the fish, *N.notopterus*. Indicating that behavioural pattern and habitat influence the blood parameters in fish

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INTRODUCTION

The distribution of individual fish species based on the local environmental condition using physico-chemical parameters are still to be carried out in Indian fresh water fishes of different regions (Siddique,1987). Such studies provide information on the species specific patterns of habitat associations. Studies of haematology and blood chemistry in different species of fish are of comparative physiological interest and they contribute to a greater understanding of habitat, food selection and mode of life. In general these studies have been developed from two view points, the first object with the establishing a possible relationship between blood characteristics with regard to such factors as phylogenetic position ecological, blood characteristics and environmental changes (Peterson, 1990; Marini sky *et al*., 1990). The haematological studies help in understanding the relationship of blood characteristics to the habitat and adaptability of the species to the environment. In the present investigation base line levels of blood parameters has been determined for two types of fishes having different habitat and behaviour and the blood parameters were compared with regard to habitat and behaviour of the fish.

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MATERIALS AND METHODS

Live specimens of the Indian fresh water fish, *N.notopterus* were collected from Bheema River and the fish, *Channa marulius* from a pond situated near Gulbarga, Karnataka State, India and transported to the laboratory. They were given a minimum period of a week to acclimatize to the laboratory conditions during which time they were fed with earth worms, boiled eggs and guppy fishes locally to avoid the possible effect of starvation on any of the hematological parameters. Blood sample collection: The fish blood samples obtained from the caudal circulation with the aid of heparinized 2 cm. disposable plastic syringes and 21 gauge disposable hypodermic needle. Blood samples was separated in two portions, one portion was mixed with anticoagulant another portion of sample was centrifuged without anticoagulant for serum separation. Hemoglobin was measured using the standard cyanmethemoglobin method described by Baker and Silverton (1976). Haematocrite value was determined by standard Wintrobe method, and expressed in percentage. Blood sample were loaded in Wintrobe tubes and spun in a centrifuge at 3000 rpm for 5 min and measured. Total serum proteins (TP) was measured by using the modified Biuret method, end point assay as described by Lawrence, (1986), serum glucose determined by (GOD-POD) Glucose oxidase – peroxidase, end point and assay method, blood urea nitrogen (BUN) was determined by modified Berthelot method, cholesterol was

determined by (CHOD-PAP) cholesterol oxidase - phenol aminophenazone method. Triglycerides (TG) were determined by (GPO-PAP) glycerol-3-phosphate oxidase - phenol aminophenazone end point assay method. Creatinine was determined by modified Jaffe's method Kinetic test without deproteinisation according to the Jaffe's method. Serum glutamate oxaloacetate transaminase (SGOT) and serum glutamate pyruvate transaminase (SGPT) activity was assayed following modified International Federation for Clinical Chemistry (IFCC) method using commercial kit. Serum Alkaline phosphatase activity was determined by kinetic assay (IFCC) method using commercial kit. Sodium and potassium were determined by colorimetric method and calcium was determined by Modified Arsenazo method. The data was analyzed statistically by adopting varied statistical methods. The student't' test was carried out to know the levels of significance using the standard formula.

RESULTS AND DISCUSSION

Two types of fishes belonging to two different orders and having different habitat were collected from local aquatic bodies. the fish, *Notopterus notptersus* from Bheema river which is flowing aquatic body and the other fish, *Channa marilius* form a pond. The normal haematological and serum biochemical contents were analysed to find out the difference and influence of aquatic body on the changes in the haematology. The normal haematological and biochemical parameters includes the determination of erythrocyte count (RBC),haemoglobin, haematocrite, mean corpuscular volume (MCV),,mean corpuscular haemoglobin, (MCH), mean corpuscular haemoglobin concentration (MCHC), serum biochemical contents such as; protein glucose, urea creatinine, cholesterol, triglycerides, serum enzymes, serum glutamate oxaloacetee transaminase (SGOT), serum guluatamate pyruvate transaminase (SGPT), alkaline phosphatase, electrolytes such as sodium, potassium, calcium and phosphorus.

Table 1. Showing haematological, serum biochemical, enzymes and electrolyte Concentration of two freshwater fishes, *N.notopterus and Channa marulius*

S.No.	Blood Parameters	*N.notopterus*	*C. marulius*
1.	RBC (million/ul)	1.33 ± 0.17	3.10 ±0.038
2	Haemoglobin (Hb) g/dl	6.36 ± 1.24	9.90 ± 0.016
3	Haematocrite (Hct) %	17.40 ± 3.09	39.40 ±0.014
4	MCV	130.35 ± 10.30	127.10 ±0.56
5	MCH (Pg)	47.47 ± 4.54	31.9 ±0.071
6	MCHC (%)	36.52 ± 1.75	25.10 ±0.21
7	Glucose (mg/dl)	47.18 ±8.37	61.00 ±0.45
8	Protein (g/dl)	7.70 ± 0.54	2.46 ± 0.26
9	Urea (mg/dl)	45.49 ±2.76	19.90 ±0.18
9	Creatinine)mg/dl)	3.17 ± 0.85	01 .00 ±0.40
10	Cholesterol (mg/dl)	153.56 ± 56	198.00 ± 0.10
11	Triglycerides (mg/dl)	302.96 ± 65.09	108 ±0.80
13	SGOT (u/L)	14.06 ± 1.29	19.00 ± 0.26
14	SGPT (u/L)	16.68 ± 0.74	31.00 ± 0.66
15	ALP (ul/L)	48.91 ± 11.93	62.00 ± 0.64
16	Sodium (Na) (mmol/l)	82.43 ± 17.5	127.00 ±0.36
17	Potassium (K)(mmol/l)	14.27 ± 1.71	04.86 ± 0.40
18	Calcium (Ca)(mg/dl)	8.71 ± 1.25	9.77 ± 0.34
19	Phosphorous (mg/dl)	0.093± 0.005	04.02 ±0.035

Each value is expressed as mean ± SD, N = 6.NS = Not significant, * = significant P = < 0.05, ** = significant P = < 0.01, *** significant = P < 0.001

The length of the fish ranged from 25-28 cm in the fish, *N.notopterus* with average weight of 102.25 gm. and 40-45cm in the fish, *C. marulius* with average weight of 150 gm. The data of the above blood parameters are presented in the Table-1 and the results indicate that marked difference in both haematological and serum biochemical parameters. The RBC count, haemoglobin, haematocrite, glucose, cholesterol, SGOT, SGPT, alkaline phosphatase, sodium, calcium and phosphorus were on the higher side in the fish, *C,marulius* whereas MCV, MCH, MCHC, protein, urea, creatinine, triglycerides and potassium were on the higher side in the fish, *N,notopterus*. Fish haematology has revealed that interpretation of blood parameters is quite difficult since variations in the blood are caused by internal and external factors.

The haematological parameters of fish are closely related to response of fish to environmental and biological factors (Steinhagen *et al*., 1990; Farnandes and Mazon, 2003). The haematological observation in the present study showed that there is difference between the two species of fish. Some of the parameters such as RBC, haemoglobin and haematocrite were on the higher side in the fish, *C.marulius* compared to the fish, *N.notopterus*. It is reported that high erythrocyte number was associated with fast movement, predaceous nature and high activity with steam lined body (Rambhaskar *et al*., 1986). The erythrocyte count have proved to be highly variable among fishes with values between 1.580 million/mm3 for *Prochilodus lineatus* (Parma De Croux, 1974) and 1.67 million/mm3 for African snake head *Paranchana obscura* (Kori Slakpara *et al*., 2005). The number of RBC in the fish blood of *N.notopterus* is 1.33 million/mm3 and in the fish, blood of *C.marulius* is 3.10 million/mm3 .Although the difference exists between the fishes are within the range found for other fishes. However, the higher values obtained for the fish, *C.marulius* indicates higher capacity of the blood to carry oxygen and perhaps this could be attributed to the corni-omnivorous habit of the fish.

Haematocrite provides measurements of red blood cells in the whole blood, while the haemoglobin within those erythrocytes is the main transport mechanism for oxygen and carbon dioxide in the blood. The decrease in the haemoglobin and haematocrite may be because of less in the erythrocyte numbers. In the present study the fish collected from aquatic body, Bheema river (fish, *N.notopterus*) found to be lower in the haemoglobin and haematocrite level and this may be due to low dissolved oxygen and high temperature in comparison to the fish, *C.marulius* collected from a pond having higher dissolved oxygen and low temperature. Thus indicating the local environmental (external) factors influence the haematological parameters. The three indices which are commonly used are MCV, MCH and MCHC, these parameters did not exhibit any difference among the two fishes studied. The protein is less and glucose content is more in the fish, *C. marulius* compared to the fish, *N. notopterus*. It has been stated that the glucose concentration depends on the fish life, mode and particularly on the locomotive activity (Carneiro and Amarel, 1979). The fish, *N.notopterus* is having habitat of flowing water and requires continuous movement and hence, glucose utilization may be extensive and it is less.

The blood urea nitrogen (BUN) test is a measure of the amount of nitrogen in the blood in the form of urea and a measurement of renal function. The level of urea in the blood reveals vital information about how well the kidney is working. The increase in BUN may reflect kidney dysfunction (Liu *etal*; 2007). Creatinine is chiefly filtered out of the blood by the kidneys, if the filtering of the kidney is deficient, blood level rise. In the present study, the fish *C.marulius* exhibited lesser levels of urea and creatinine compared to the fish, *N.notopterus* This may be because of higher rate of conversion of nitrogen compounds in the fish, *N.notopterus* as reported in other fishes (Rehulka, 2003). The cholesterol is less and triglycerides level is higher in the fish, *C.marulius*. The serum enzymes SGOT, SGPT and alkaline phosphatase have increased level in the fish, *C.marulius* compared to the fish, *N.notopterus.*

Measurements of the activity of these enzymes in fish can be used for confirming maturity and monitoring any changes in the quality of water and related soils (Shahsavani *et al*., 2010). The variation found in these two types of fishes studied in the present study may be due to various factors including habitat and diet as reported for other fishes (Shahsavani *et al*., 2010). The electrolytes such as sodium, calcium and phosphorous have normal levels in both fishes studied. These electrolytes regulate acid base balance maintaining thereby an ionic adequacy on the tissue functions (Davis, 2004; Tavares-Dias, 2008). Concusions: The values obtained for various haematological and biochemical parameters for two types of fishes having different habitat in the present study indicates that although they have normal values of a healthy condition, the difference between the two fishes exists with higher haematological and serum biochemical parameters in the fish, *Channa marulius* compared to the fish, *Notopterus notopterus* may be because of the difference in the quality of water, habitat and behaviour of the fish in the aquatic environment.

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