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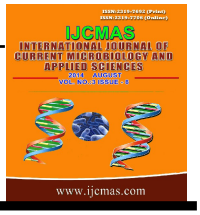

Original Research Article

Heamatological and Biochemical Parameters on Few Fresh Water South Indian Teleosts

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Keywords

Haematological parameters; Biochemical parameters, fresh water, Teleosts

A B S T R A C T

A characteristic feature of fish is the wide physiological range of blood parameters and also the large individual variations. The aim of this study was to compare the haematological profile, Blood glucose and Blood protein levels of four teleost fish species (*Channa striatus, Cyprinus carpio, Catla catla* and *Labeo rohita*) and to establish the similarities and differences between these species which are widely present in the Palar-porunthalaru dam Environment. The blood parameters viz., total WBC and RBC count,DLC,ESR, Hb, PCV, MCV, MCH and MCHC values were analyzed using standard methods. Statistical analysis confirmed statistical differences in blood parameters among the four species. Our findings show a higher level of Glucose,Protein, Red blood cells, White blood cell, Easnophils,Hematocrit and haemoglobin in *Catla catla*with respect to the other species. Lymphocytes, Haemoglobin, MCV and MCHC result higher in *Channa striatus*. The differences found in this study can be attributed to the feeding behaviour, life style and adaptation of the different fish species to the habitat in which they dwell.These results show that low value of Haemoglobin, Packed cell volume, Red blood corpuscles determination indicated the presence of anaemia in the fishes of Palar-poruntharu dam environment.

Introduction

Life is possible only through the metabolic processes of cells, mainly by requiring constant supply of nutrients, and oxygen and by constant removal of waste products. In vertebrates, metabolic processes were done in the blood vascular system, which is regulating the life activities are seen in this between homeotherms and poikilotherms because it is the communicating tissue and medium for all the cells of a body.

Fishes belonging to different taxonomic groups are adopted variously depending ondifferent prevailing ecological conditions. Haematological characteristics are an important tool that can be used to understand as an effective and sensitive index to monitor physiological and pathological changes in fishes. Changes in haematological parameters depend upon the aquatic biotope, fish species, age, and sexual maturity and health status (Patriche et al.

2011; Radu et al. 2009).Various blood parameters in fish have been established by different investigators in fish physiology and pathology (Rey V´azquez. et al., 2007, Satheeshkumar et al., 2012, Fazio et al., 2013).

Haematological and biochemical studies help in understanding the relationship of blood characteristics to the habitat and adaptability of the species to the environment. The fish haematological parameters such as RBC, WBC, Hb and PCV values etc., are thus shown to be influenced by many factors include environmental factors (Pandey, 1977).

So it is more beneficial to aquaculturists to study the varying aspects of haematological and biochemical changes in different conditions. For the present study deals with the comparison of important blood parameters of different species of freshwater fish, viz., *Channa striatus, Cyprinus carpio, Labeo rohita,* and *Catla catla.*

Materials and Methods

Irrespective of sex and almost of equal size of10 each live fishes (length and weight)*Channa striatus, Cyprinus carpio, Labeo rohita,* and *Catla catla*were captured from Palaru-Porunthlaru dam using fisherman net and brought to the laboratory and maintained glass aquaria tanks (2mx1mx1m) without causing much disturbance.

The fishes were fed adlibitum by different varieties of food such as mosquito larva, chironomous larva, phytoplankton and zooplankton as available in natural conditions for a couple of days. The cement tanks were supplied with a continuous flow of tap water (Temp:28^{o}; hardness: 247 ppm as Ca Co_3; pH 7.6 ± 0.2; alkalinity 4.1 mmol/lit).

Blood sample collection

A small sample of whole blood was drawn from the caudal veinby introducing disposablesterile syringe (2.5mL) and transferred in a Miniplast 0.5 ml tube containing EDTA (1.26 mg/ 0.6 ml) as an anticoagulant, for blood cell studies, and the other without EDTA allowing the clot and serum to separate for protein estimation. The collected blood samples were immediately subjected to hematological analysis.

Analysis of blood Haematological parameters

The bloods were diluted with appropriate diluting fluids for RBC and WBC counts and were determined using improved Neubauer haemocytometer and calculated (Blaxhall and Daisley. 1973). Replicated counts were made for each blood samples to minimize the error.Thehemoglobin was determined by cyanmethemoglobin method (Lee *et al*., 1998). Haematocrit (Hct) was determined by the microhaematocrit method (Snieszko, 1960). Mean Corpuscular Volume (MCV) was calculated according to Feldman *et al*. (2000). Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobinconcentration (MCHC) were calculated according to Stoskopf (1993).

Analysis of blood Haematological parameters

Blood glucose was estimated by Nelson-Somagyi method as described by Hawks physiological chemistry (Oser, 1965). The serum protein was estimated by Lowry's et al. (1951).

Statistical Analysis

Haematological parameters south Indian fresh water fish were statistically evaluated

with the Student's t-test, and the results are presented as mean and standard deviations (SD).

Results and Discussion

The RBC levels were highest in *Catla catla (*2.9 x 10^6 /mm^3)followed by *L.rohita* and *C.striatus* and lowest in *C.carpio (0.77*x 10^6 /mm^3)(Fig.1). However this value was lower other fresh water fishes like *Clarias batrachus 2.1* x 10^6 /$mm^3$and *Labeo rohita 2.0* x 10^6 /mm^3 (Sudha Summarwar and Santosh Verma, 2012),*Sparus aurata 3.06* x 10^6 /mm^3 and *Dicentrarchus labrax 3.49* x 10^6 /mm^3 (Fazio et al 2013). In the present study *Cyprinus carpio* has been observed poor erythrocyte content of0.9 x 10^6 /mm^3 when comparing the other three fishes. WBCs are the suspicious cells of the body. According to Douglass and Jane 2010, their levels have implications for immune responses and the ability of the animal to fight infection. Species with higher levels of WBC will be able to fight infection more effectively than other species. Our findings showed that WBC counts seem to have wide range of variation from 2.20 x 10^4 /mm^3 to 5.0 x 10^4 /mm^3(Fig. 2). Among our studied species, *Catla catla* and *L.rohita* able to fight infection more effectively than other species. The same inverse relationship between WBCs and RBCs was found by Satheeshkumar et al. 2012.

Highest Hb and Hemotocrit (Hct) or PCV concentrations were observed in *C. striatus* followed by *C. carpio*and *Catlacatla* (fig.1),the highest value are corresponding due to the high value of cellular component of the blood; the lowest levels were recorded in *L.rohita.* Low Hct or PCV in the fishes probably indicated anemia orhemodilution (Wedemeyer *et al.*, 1976). Low Hct level should be noted that the differences recorded in blood parameters between fish of various sizes according to Satheeshkumar et al. (2012), Fazio et al. (2013). MCV, MCH and MCHC were calculated indirectly with reference to RBC, Hct and Hb; therefore, their changes are directly linked with these blood parameters. With respect to erythrocyte indices the lowest values of MCV, MCH and MCHC were found in *Catla catla*, highest values found that *C. Striatus.*A decrease in MCV of *Catla catla*(30.47 pg), *L.rohita* (42.71 pg) and MCH of *Catla catla*(20 pg), *L.rohita*(10 pg) values are observed in thepresent investigation. The decrease in MCV indicates microcytic anaemia, while inhypocromia, there is a decrease in cell haemoglobin and MCH. This type of anaemiais found generally in chronic infection or chronic diseases. It is called normochromicmicrocytic anaemia. Similar types of observations were also reported in someteleost fishes,Gautam and Gupta (1989) and Joshi (1989). Converse to these two values,MCHC value decreased by *Catla catla*(4.49), *L.rohita* (4.88) in the present study, it is thus observed in the presentstudy that microcytic anaemia is found to occur commonly when the fish is induced tosome abnormal hassle conditions (Fig.1)

Erythrocyte sedimentation rate (ESR) values of the fishes are *L.rohita*5 mm/h;*C.striatus*4 mm/h; *C.carpio*3 mm/hand *Catlacatla*2 mm/h, Fig:1. scanty information available regarding ESR values or healthy fishes under natural condition. The increase in ESR values has been attributed to anaemic condition and low haemoglobin content.Higher ESR can be observed in the cases of infection or stress. Thin blood can also be the cause of higher ESR. (Sudha Summarwar and Santosh Verma, 2012). Based on our result *L.rohita*and*C.striatus* were thin blood, so its causes of higher ESR rather than *C.carpio* and *Catla catla.*

Table.1 Haematological parameters observed in four different species of teleost fishes

Blood parameter	Species of fishes			
	Channa striatus	***Cyprinus carpio***	***Catla catla***	***Labeo rohita***
Blood Leucocytes &thrombocyte				
WBC ($X10^4/mm^3$)	3.7 ± 0.09	2.2 ± 0.14	5.0 ± 0.54	4.5 ± 0.09
Differential Leucocytes count				
a) Lympocyte (%)	93.0 ± 0.89	83.0 ± 0.06	53.0 ± 0.37	44.0 ± 0.07
b) Polymorphonucleocyte (%)	20.0 ± 0.17	15.0 ± 0.20	45.0 ± 0.31	50.0 ± 0.28
c) Eosnophil (%)	0.02 ± 0.24	0.02 ± 0.02	2.0 ± 0.09	1.10± 0.18
Thrombocyte ($X10^4/mm^3$)	2.0 ± 0.32	1.3 ± 0.13	1.0 ± 0.17	1.0± 0.22
RBC Indices				
RBC ($X10^6/mm^3$)	0.9±0.13	0.77 ±0.56	2.9 ± 0.03	1.5 ± 0.42
Haemoglobin (g %)	9.5 ± 0.14	7.2 ± 0.37	4.0 ± 0.08	4.0 ± 0.05
MCH (Pico gram)	150	120	20	10
MCV (µl x 10^{-9})	62.19 ± 0.11	57.98 ± 0.34	30.47 ± 0.15	42.71 ± 0.25
MCHC (%)	14.84	9.35	4.49	4.88
Hemotocrit (%)	64.0 ± 0.06	77.0 ± 0.12	89.0 ± 0.27	82.0 ± 0.01
ESR (mm/h)	4.0 ± 0.02	3.0 ± 0.04	2.0 ± 0.05	5 .0 ± 0.87
Biochemical parameters				
Blood Glucose (mg/100ml)	12.5 ± 0.03	9.3 ± 0.32	73.0 ± 0.56	60 .0 ± 0.05
Blood plasma protein (mg/100ml)	2.2 ± 0.4	3.1 ± 0.18	4.1 ± 0.23	3.9 ± 0.3

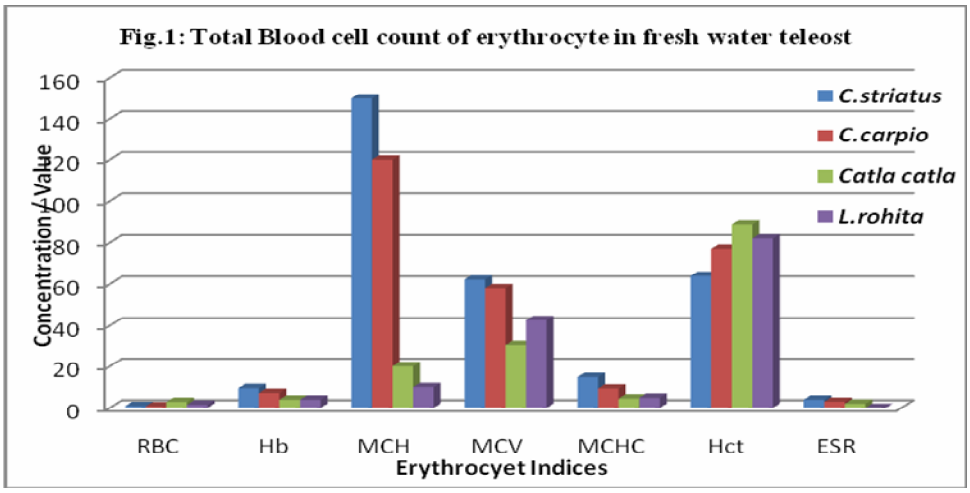
Fig.1: Total Blood cell count of erythrocyte in fresh water teleost
160
140
120
100
80
60
40
20
0
Concentration / Value
C.striatus
C.carpio
Catla catla
L.rohita
RBC
Hb
MCH
MCV
MCHC
Hct
ESR
Erythrocyet Indices

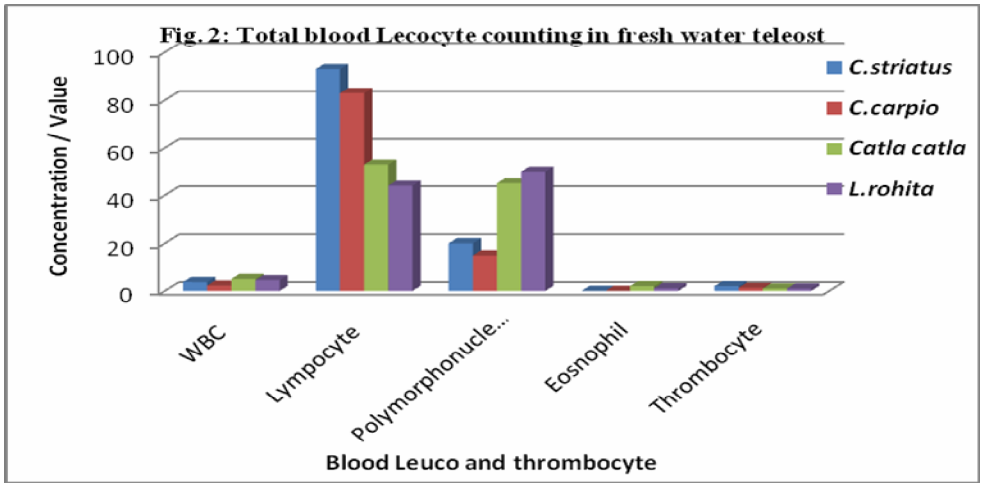
Fig. 2: Total blood Lecocyte counting in fresh water teleost
100
80
60
40
20
0
Concentration / Value
C.striatus
C.carpio
Catla catla
L.rohita
WBC
Lympocyte
Polymorphonucle...
Eosnophil
Thrombocyte
Blood Leuco and thrombocyte

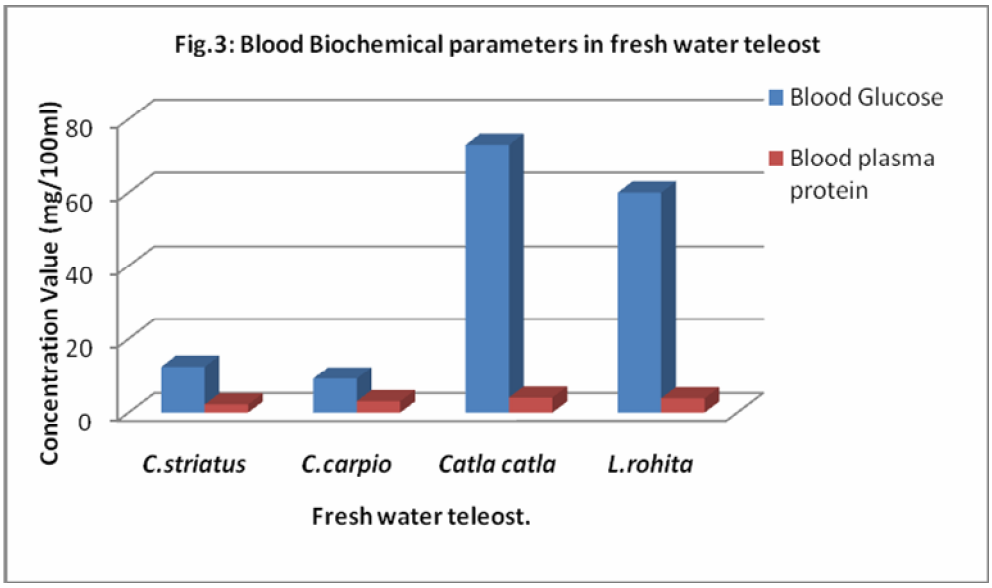
Fig.3: Blood Biochemical parameters in fresh water teleost
80
60
40
20
0
Concentration Value (mg/100ml)
Blood Glucose
Blood plasma protein
C.striatus
C.carpio
Catla catla
L.rohita
Fresh water teleost.

In fig.2, Differential leucocytes count (DLC) of these four fishes varying. The values lymphocytes of *C.striatus* and *C.carpio* (83%) than *Catla catla* (53%) and *L. rohita* (44%), this may indicate as lymphocytosis. Among all the leucocytes, the % of lymphocytes was highest in the fishes. An increase in the percentage of polymorphonucleocyte (neutrophil and eosinophil) indicates infection in fishes (Sahan *et al*., 2007).

Thrombocytes values of the fishes are very poorly recorded from the available sources of information. In fig.2, *C.striatus* is the topping the highest ($2x10^5/mm^4$) of all the four fishes and the same value obtained in the *Catla catla* and *L.rohita*($1x10^5/mm^4$). There are few reports suggesting that fish thrombocytes have phagocytic ability and participate in defence mechanisms (Stosik et al. 2001). It is already recognised that fish thrombocytes are blood phagocytes that form one a protective barrier (Prasad and Charles 2010; Prasad and 1Priyanka 2011).

Blood glucose of *C.striatus*(12.5 mg/100ml) and *C.carpio* (9.3 mg/100ml) are the lower than that of *L.rohita* (60 mg/100ml) and *Catlacatla* (73 mg/100ml) (Fig.3). *L.rohita* and *Catla catla* are Carnivorous fish species show an impaired ability to clear excesses in blood glucose levels and therefore have been traditionally considered as relatively glucose passionate species (Moon 2001). However, glucose is also essential for brain function (Soengas 2002), suggesting the existence of a glucosesensing system in fish. In support of this hypothesis, our results showed levels of glucose to be highest in *L.rohita* and *Catla catla* fishes and lowest in *C.striatus* and *C.carpio.*

Although rich protein content was seen among fishes of all the living organisms and fish protein was readily and easily digestible of all animal proteins and also fishes are very cheap. The present study reports at Fig.3,*Catlacatla* was having the highest protein content of 4.1mg/100 ml, and *L.rohita* (3.9 mg/100ml) correspondingly, the blood plasma protein value was lesser in*C.carpio* 3.1 mg/100 ml and *C. striatus* (2.2mg /100ml). It is identified that, unlike red meats, eggs and dairy products, fish provides very high quality protein(Sabry, 1990).

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