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HAEMATOLOGIAL AND BIOCHEMICAL INDICES IN HEALTHY AND INFECTED WALKING CATFISH, CLARIAS BATRACHUS FROM WAINGANGA RIVER OF GADCHIROLI DISTRICT (M.S)

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A B S T R A C T

A present investigation designed to compare the haematological and biochemical parameters in healthy and infected *Clarias batrachus*. Haematological and serum biochemical studies on fishes have assumed to be greater significance due to the increasing emphasis and greater awareness of the pollution of natural aquatic bodies. Changes in haematological and biochemical parameters depend on the fish species, age, sex and health condition. These parameters also changes due to environmental stress and fish size. The aim of the present study was to investigate the reference ranges for haematological and serum biochemical values of *Clarias batrachus*. A total of 10 mature fish were collected. Blood samples were then taken from the caudal vein of fishes. Haematological parameters such as haemoglobin (Hb), total leukocyte count (TLC), packed cell volume (PCV), four parameters namely RBC, Hb ($p<0.01$) and WBC ($p<0.05$) revealed significant difference between healthy and infected fish. The findings would be helpful to establish a baseline value and to draw conclusive remarks against the health status of *Clarias batrachus*, showing deviation from the normal parameters.

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INTRODUCTION

Clarias batrachus is a catfish. It is highly nourishing and valued as food. It is mostly used in laboratories for experimental purposes but also used as a food. The flesh has high nutritive value and its flesh is said to have wound healing effect and recuperative attributes. It is highly suitable for intensive culture due to its air-breathing habit. In central India it is commonly found in reservoirs of eastern Vidarbha region (M.S.). It is a faster growing fish than most of the other species of the genus. It is marketed live and fetches high prices in the market. Healthy fishes are prized for their table quality. However, this quality is influenced by several operational environmental factors (Froese, Rainer, and Daniel Pauly, eds.2006).

Diseases are the most serious limiting factors in aquaculture because of increased density of fish in restricted water where the fish pathogens can easily transmit from one fish to another. Much of economic loss is however, preventable with proper fish health management. Suggested that the type of micro-organisms that are found associated with particular fish depends on its habitat classified the bacterial pathogens associated with fish as indigenous and non-indigenous. The non-indigenous contaminate the fish or the habitat one way or the other and examples include *Escherichia coli*, *Clostridium botulinum, Shigella dynteriae, Staphylococcus aureus, V. cholera* and *Salmonella,* which are commonly found on the gills, skin or fins of fishes and lower aquatic invertebrates (Lipp.EK., Rose, JB.1997).

Haematological and biochemical test has not widely applied for diagnosis of piscine medicine but these tests could be a suitable diagnostic tool for monitoring physiological and pathological changes in fishes. Different factors such as season, water contamination, physicochemical parameters of the water, stressors, age and sex, and fish species affect the haematological parameters. One of the difficulties in assessing the state of health of natural fish population has been the lack of reliable references of the normal condition. In pursuant to this goal, many fish physiologists have turned to studies of haematology, probably because it has provided a valuable diagnostic tool in evaluating human health. Determination of haematological parameters can provide substantial diagnostic information, once standardized reference values are established. Moreover, recent attention has been given to the biochemical characterization of fish blood as an internal index (Hrubec, TC. 2000). Blood biochemistry parameters can also be used to detect the health of fish. Only a few normal values for a small number of haematological parameters have been established for some teleosts, but these values range widely due to the lack of standardized collecting and measuring techniques Since the haematological studies on Siluriformes have not been attempted till now, this paper focuses on *Clarias batrachus* that belongs to Siluriformes order. *Clarias batrachus* commonly known as "magur", is the most popular and delicious edible fish in Asia including India, which is rich in protein content. This study finds out the baseline reference values of haematological and biochemical parameters of the walking cat fish based on sexual difference .This analysis could help in understanding the better health condition of this

fish in natural habitat. Since information on haematological investigations of adult *C .batrachus* adults are extremely inadequate, the present work was carried out to arrive at some baseline values (Aldrin, J.F **1982**.).

MATERIALS AND METHODS

Fish samples

For haematology the fish samples were collected from a freshwater pond of Bramhapuri District, Gadchiroli, Chandrapur during the period October 2015 to February 2016. The numbers of fishes caught were transported on the same day in a container filled with pond water to the laboratory and the analysis was carried out. A total of 10 adult specimens of the species having mean length 20.14±0.40 cm, breadth 3.63±0.08 cm and weight 125.20 ± 4.18 g were utilized in the present investigation.

Blood Collection

Fishes were kept in aquarium at room temperature (20^0c). Laboratory aquarium was aerated and provided with external filtration and a layer of gravels on the bottom. They were allowed to acclimate to captive condition prior to experimentation. Careful handling was implemented to minimize the stress. Then blood was collected from live fish putting it on a a tray. A damp cloth was used to cover the fish head. A small sample of whole blood was drawn from the caudal vein. Blood was collected in the morning hours to avoid diurnal variation. Collected blood was transferred from the syringe into a anticoagulant, Ethylenediaminetetraacetic acid (EDTA) containing vials, for haematological studies and some blood into Eppendorf tube which was kept undisturbed for clotting.

Haematological Analyses

All the haematological parameters were determined by using the standard techniques .The haematological parameters included, haemoglobin (Hb), total erythrocyte count (RBC), Total Leukocyte Count (TLC/WBC) and Packed Cell Volume (PCV). Haemoglobin concentration (Hb) was measured by Sahli's acid hematin method (H. Sahil, 1909). Red blood cell counts and Total leucocytes counts were carried out with a Haemocytometer method. packed cell volume (PCV) was determined by means of a Microhaematocrit method (Mcinroy, RA. 1953).Erythrocytes indices such as mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC) were calculated as per following formulae.

MCV=PCV/ Erythrocytes count ×10
MCH= Haemoglobin/ Erythrocytes count ×10
MCHC= Haemoglobin /PCV ×100

Statistical Analysis

Haematological and Biochemical parameters were expressed as mean±SE in both male and female fish and compared according to sex using t-test. All these statistical analyses were performed using the Microsoft Office Excel 2007.

RESULTS

The present work focuses is on changes in blood value depending upon infection of *Clarias batrachus* (Table 1).

The haematological and biochemical parameters of healthy and infected *Clarias batrachus.* were presented in Table. In present study the total RBC count, haemoglobin content, haematocrit (PCV), ESR and total leucocyte count (TLC) were observed 2.88±0.09× 10^6/mm^3, 9.60±0.28gm/100 ml, 27.78±1.73%, 4.23±0.81mm/hr and 11.73±1.94× 10^3/mm^3 in healthy fishes and 1.96±0.34× 10^6/mm^3, 7.33±0.32gm/ml, 20.65±5.02%, 4.53±0.81 mm/hr and 12.18±1.31×10^3/mm^3 in infected fishes respectively. The lymphocyte, neutrophils, monocytes, basophils and eosinophils percentage were observed 35.65±3.04%50.82±3.81%, 0.73±0.21%, 1.35±0.35% and 11.12±1.44% in healthy fishes and 32.77±2.31%, 53.67±2.22%, 0.74±0.23%, 1.25±0.21%, and 12.35±1.20% in infected *Clarias batrachus* respctively. Thus the data represent that RBC, haemoglobin, haematocrit and lymphocytes were significantly reduced ($P < 0.01$) in infected fishes whereas total leucocytes, neutrophils, eosinophils and MCV significantly increased ($P < 0.01$ and $P < 0.05$) in infected fishes as compared to healthy ones (Table). Thus bilirubin was significantly reduced ($P < 0.01$) in infected *Clarias batrachus* in comparison to healthy individuals (Table).

DISCUSSION

To investigate the fish blood factors and their changes, the normal rate of these factors must be initially measured in healthy fish. In the present study the blood parameters including Hb, PCV and RBC were found higher in healthy common carp. The lower value of these parameters in infected common carp was in accordance with (Maheswaran R., 2008). Boon pointed out the erythrocyte count of fish infected with parasite was significantly lower in comparison to those in non-infected fish and they reported no significant difference between the fish.

Table 1 Mean ±SD Haematological parameters results of the healthy and infected *Clarias batrachus*

Parameters of blood	Healthy		Infected		Deviation (%)	t- test
	Range	Mean ± SD	Range	Mean ± SD		
RBC(X10^6/mm^3)	2.82 - 2.95	2.88±0.09	1.72 - 2.20	1.96±0.34	31.94	3.69**
Haemoglobin (gm/100ml)	9.40 - 9.80	9.60±0.28	7.10- 7.55	7.33±0.32	23.64	7.55**
Haemotocrit (PCV)%	26.56 -29.00	27.78±1.73	17.10- 24.20	20.65±5.02	25.66	7.13**
ESR (mm/hr)	3.65 - 4.80	4.23±0.81	3.95 - 5.10	4.53±0.81	-7.09	0.37
TLC (100/MM^3)	10.35 -13.10	11.73±1.94	11.25 - 13.10	12.18±1.31	-3.86	0.27*
Lymphocytes%	33.50 -37.80	35.65±3.04	31.14 - 34.40	32.77±2.31	8.07	1.07**
Neurtophyils%	48.12-53.51	50.82±3.81	52.10 - 55.24	53.67±2.22	-5.60	0.91*
Monocytes%	0.58 - 0.88	0.73±0.21	0.58 - 0.90	0.74±0.23	-1.36	0.05*
Basophils%	1.10 - 1.60	1.35±0.35	1.10 - 1.40	1.25±0.21	7.40	0.35
Eosinophils%	10.10- 12.14	11.12±1.44	11.50 - 13.20	12.35±1.20	-11.06	0.93
Bilirubin (mg/ml)	2.60 - 3.50	3.05±0.64	2.20 - 2.70	2.25±0.35	19.65	1.16
Blood glucose (mg/ml)	55.0 - 60.00	57.50±3.54	54.60 - 62.20	58.40±5.37	-1.56	0.20*

**Shows significance (p<0.01) between samples
*Shows significance (p<0.05) between sample

Haematological analyses of fish are important as these are linked to the health of fish. Fish species are impacted with different factors such as pollution, water quality, and microorganisms in natural habitat. They adapt somewhat to these adverse conditions by changing their physiological activities. Findings of reference value for fish species will help to establish and identify the causes of disease in fish which presents challenge for the ichthyologist. The RBC of fish determines the dissolved oxygen carrying capacity. The result of the RBC count of this work for infected *Clarias batrachus* is 2.89±0.08 x10 6 /mm3and 1.96±0.34x10 6 /mm3 which is higher than the healthy *Clarias batrachus* RBC value 2.88±0.09x10 6 /mm3 as reported. Present study showed lower RBC count in infected fishes than healthy. RBC counts have proven to be a highly variable blood parameter among fishes (Maheswaran R. 2008).

Further, the Differential Leucocytes Count (DLC) value showed fluctuations. In this study neutrophils, monocytes and eosinophils increased whereas lymphocytes and basophils decreased in monogenean infected fishes. A higher degree of *infections* was observed in Cat fish, *Clarias batrachus* carrying bacterial infections Similar to this work, a decrease in the percentage of lymphocytes and an increase in the percentage of granulocytes (neutrophils and eosinophils) were seen in (Swain P, Dash S. 2007).

The decrease in bilirubin content in monogenean infected fishes points to a possible hepato-dysfunction i.e. malfunction of liver. It causes less secretion of bilirubin into blood and leads to hypobilirubinemia. Hypobilirubinemia was reported in several fishes inhabiting in both natural as well as experimental conditions.

CONCLUSION

The present findings revealed differences in blood profile of *Clarias batrachus*, owing to the healthy and infected differentiation of the fish. The results of the present investigation serve as a baseline value for haematological and biochemical parameters to draw conclusive remarks against the health status of *Clarias batrachus*, showing deviation from the normal parameters.

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