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Research Article

Hematological changes in fish *Mastacembelus armatus* (Lacepede) of Song River

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Abstract: Present study was designed to investigate any seasonal (winter, summer and rainy)fluctuation in hematological parameters in the blood of fish *Mastacembelus armatus*. No significant change have been observed in RBC Count, Hb, PCV,MCHC,MCV,ESR and Clotting time while Significant change in WBC in winter and rainy season was observed. Higher WBC count was observed in winter and rainy season. The effect of total hardness , and temperature of with WBC have been discussed.
Keywords: *Mastacembelus armatus*, hematological parameters, Water hardness

INTRODUCTION

The Zing Zag Eel *Mastacembelus armatus* has a very long history. It was recognized and described 200 years ago by Lacepède in 1800. The Spiny Eel (*M. armatus*) is a species of ray-finned, spiny eels belonging to the genus *Mastacembelus* of the family Mastacembelidae. They are found in Asia: Pakistan to Viet Nam, Indonesia and India . The common name "Spiny Eels" comes from the spines found along their back. It has been a favorite spiny eel kept by aquarium enthusiasts for many years and they are quite palatable as a table fish and is nutritious too [1]. This species is listed on the IUCN Red List as least concern (LC). Other common names they are known by are Tire Track Eel, Spiny Eel and White-Spotted Spiny Eel .Both the dorsal and anal fins are extended and joined to the caudal fin. These fish can reach just over 35 inches (90 cm) in length in the wild, though they will not generally exceed about 20 inches" (51 cm) in captivity.

Activities such as construction, clearing of vegetation, dumping of solid wastes, industrial[2-3] and municipal effluents especially in the wetlands acidify of the water body. Other common industrial activities such as gas flaring amongst others yield combustion products such as CO2, NO2, CO, water vapour and soot or carbon particles, heavy metals and incombustibles in the atmosphere that are ionized and become chemically reactive as free radicals [4]. These chemicals and particles in presence of rainwater and water vapour, readily form acids (and other corrosive chemical compounds), which build up in the atmosphere and are eventually washed out as acid rain, altering the pH of the recipient medium. In addition, the effluent arising from industrial activities is discharged into surrounding water bodies thus contributing significantly to the alteration of the pH of the aqueous medium[5]. While some studies observed nutrient enrichment pesticides as the reason to reduce the pH in aquatic medium [6].

However fishes can adapt themselves according to the environmental conditions viz; pond and aquarium by changing their physiological activities up to optimum a range but in extreme change in water quality i.e. dissolved oxygen level, free carbon dioxide level and hardness, pH ,total dissolved solids, can change the hematological parameters than normal values or control. Qualitative and quantitative variations in haematological parameters including the red blood cell (RBC), dependent parameters i.e. haemoglobin(Hb), Packed cell volume (PCV), mean cell volume MCV, Mean cell hemoglobin concentration (MCHC) , erythrocyte sediment rate(ESR) are significant findings for the determination of aneamia, polycythemia, inflammation and infection while total White blood cell numbers (WBC) and differential leukocyte count viz, neutrophils, lymphocyte , eiosinophils, and monocyte are significant findings for the determination in pathological condition viz. leucocytosis and leucopenia [7-8]. Hematological studies on fishes have assumed greater significance due to the increasing emphasis on pisciculture and greater awareness towards the anthropological pollution of natural freshwater resources in the tropics. Such studies have generally been used as an effective and sensitive index to monitor physiological and pathological changes in fishes. Fish blood is being studied increasingly in toxicological research and environmental monitoring as a possible indicator of physiological and pathological changes in fishery management disease investigations [9].

The aim of this study is to Investigate the hematological parameters of fish *Mastacembelus armatus* in relation with water quality so that fish farmers can provide batter water quality for the culture of *fish Mastacembelus armatus* and reduce the mortality rate and achieve the maximum yield in culture practice. For this hematological study of *Mastacembelus armatus* Song river of Dehardun, sub region Gullarghati was selected, where water is available throughout the year.

MATERIALS AND METHODS

The summer season comprises of month March, April, May and June. rainy season comprises July, August, September and October while rainy season comprises November, December, January and February. For this study monthly mean and standard deviation (5 fishes) of hematological parameters was calculated, after that seasonal mean and standard deviation was calculated.

Physico- Chemical estimation of water

For the estimation of physico-chemical parameter of water APHA[10] was considered. The pH of water was noticed with the help of digital pH meter(Chorming model 430) and temperature was recorded by mercury thermometer .The chemicals used in water analysis was supplied by CDH(P)LTD. The hardness of water was determined by complexometric titration using EDTA as standard solution(titrant), EBT as indicator and buffer solution of ammonium chloride and ammonium hydroxide (pH=10.00-11.00).The amount of dissolve Oxygen was determined by Winkler's iodometric titration using N/10 sodium thio sulphate solution as standard solution in presence of freshly prepared starch indicator.

Fishes were caught by seine net with the help of local fisherman throughout the year .The Fish was identified with morphometric characters. Five male juvenile fish were selected per Collection of fish, blood sample and determination of haematological parameters: month for experimental work, weighing 180±10 gm .and total length 26.00±1.50cm. Females are normally plumper than males. As soon as possible after catching, the fishes were transferred to a plastic tub already containing the solution of MS 222(90.00mg/L).After 30 minute of the blood sample was drawn by puncturing the heart using sterile needle of (21G).The blood sample was transferred to vial containing heparin (5,000 IU). Hemoglobin content(Hb), red blood cell count (RBC), packed cell volume(PCV) , mean cell volume (MCV), Mean cell haemogolbin concentration(MCHC), and White blood cell (WBC)count was done according to Rauthan *et al.* [11]. Haemoglobin estimation was done by Sahli's method by diluting the blood with N/10 Hydrochloric. The Red blood cells (RBCs) was counted under 45 X using Hayem's solution in haemocytometer (improved Neubauer Weber scientific LTD). Packed cell volume % (PCV) was determined by centrifuse machine the blood sample at 3000 rpm.for 30 minutes Wintrobe method made by REMI INSTRUMENTS LTD VASAI (INDIA), Serial No. VCAK-435. The white blood cells in thousand/mm^3, was counted under 45X using Shaw's diluting fluid with the help of Neubauer counting chamber. MCV (fl) and MCHC (%) were calculated using following formulae:

$$MCV = PCV \times 10 / RBC\ count$$
$$MCHC = Hb \times 100 / PCV$$

ESR was determined by Westergran method [12] by allowing the blood filled (up to the mark) Westergran tube in stand for one hour. The blood clotting time was carried at catching site of fish without adding anticoagulant in blood, Clotting time was recorded by capillary method [13]. Modified Dale's method applied for determination of clotting time. Blood was is taken into a standard glass capillary tube by the capillary action. Subsequent to this the end of capillary tube is broken every 30 sec. until the clot is formed and the end of capillary tube starts hanging.

RESULT

The seasonal changes in physic-chemical parameters of water and haematological parameters of fish *Mastacemblus armatous* was analyzed by Graph pad prism 5 software applying two way ANOVA followed by bonferroni post-test presented in table -1 and 2.

Table –1: Showing seasonal changes in physico-chemical parameters of water of river Song.

Water parameters	winter	summer	Rainy	control
Temp.in ^0C	17.79±0.42* *	26.97 ± 1.20* *	23.62 ± 3.16^{ns}	22.32±0.26
pH	6.70 ± 0.08^{ns}	7.33 ± 0.09^{ns}	8.200 ± 0.21^{ns}	7.47±0.09
DO in ppm	8.42 ± 0.68^{ns}	6.35 ± 0.16^{ns}	5.52 ± 0.31^{ns}	7.55±0.17
Hardness in mg/L	120.12±4.48***	141.70±2.23***	158.96±3.43***	99.17±2.85

The values are mean of 4 month (1season) ±SD are marked with stars are significant at P<0.05*, P<0.01**,P<0.001***

Table-2: Showing seasonal hematological change in *Mastacembelus armatus*

Parameters	Winter	Summer	Rainy	Control
RBC 10^6/mm^3	1.41±0.13	1.56±0.23	2.06±0.24	2.09±0.25
Hb gm/%	5.39± 0.36	8.45± 0.29	9.53±0.64	10.83±0.41
MCHC (%)	23.80±1.49	32.15±1.55	34.25±1.89	34.78±2.05
MCV (fl)	166.51±6.74	193.21±5.16	238.63±2.27	243.70±2.20
PCV %	30.97±0.79	33.68±2.12	34.24±2.18	35.69±1.43
Clotting time(Sec.)	13.83±1.24	18.78±0.56	17.36±0.44	22.65±1.66
ESR in first hour	8.31±0.20	4.55±0.28	2.43±0.23	3.19±0.47
WBC in thousand/mm3	15300.00±355.90 ***	9387.93±164.533	10058.29±493.900***	9510.410±300.1453

All the value are mean of 4 month (1season)±SD are marked with stars are significant at P<0.001***

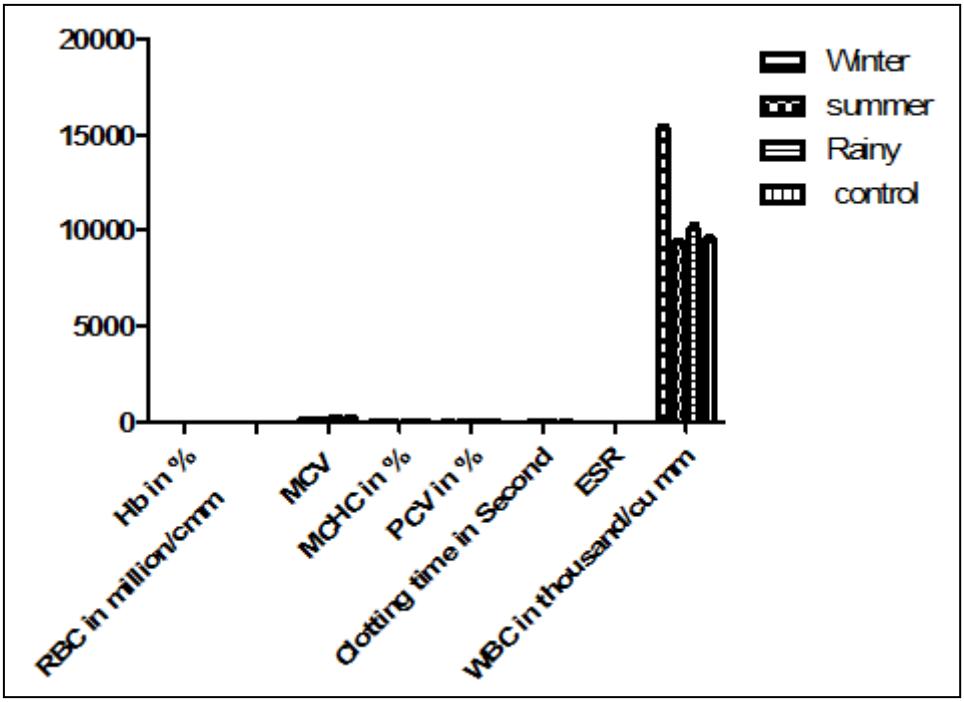

Fig-1: Graph showing the seasonal haematological changes in fish *M. armatus*

RBC count was decreased in winter and season when compare with control. It was 1.41±0.13 in winter and in summer it was recorded 1.56±0.23 while in rainy season it was recorded 2.06±0.25, almost near to control. In comparison of control the lowest amount of Hb recorded in winter season (5.39±0.36), while in summer and rainy season it was recorded 8.450±0.29 and 9.53±0.64 respectively. In comparison of control , decreased MCV value of winter(166.51±6.74) and summer season (193.21± 5.16),while in rainy season it was calculated 238.63± 2.28 .The value of MCHC in winter, summer and rainy was calculated 23.80± 1.49, 32.1525± 1.55 and 34.25± 1.89 respectively. The PCV of winter, summer and rainy season was noticed 30.97±0.79, 33.68±2.12 and 34.24±2.18 respectively. Seasonal difference in clotting time was also observed, it was recorded in winter, summer and rainy season 13.83 ±1.25, 18.78± 0.56,and 17.36± 0.44 respectively. Increased ESR value was recorded in winter(8.31±0.20) in comparison of control while in summer and rainy season it was recorded 4.55 ±0.20 , 2.43±0.230 respectively. Significant change was noticed in total WBC count in winter season (15300.00± 355.90) and rainy season 10058.29± 493.90 in comparison of control, while in summer recorded 9387.93± 164.53 .

DISCUSSION

The water quality parameters examined in this study, indicated values characteristics of fresh water environment all the parameters were in the tolerable range. In this study haematological parameters are observed highest in rainy season. The total hardness of water significantly increased in rainy season, when compared with winter and summer, while temperature was decreased significantly in winter . Except WBC count, all the haematological parameters were not significantly increase or decrease .WBC count was significantly increased in rainy season, might be due to increased in hardness level(Chemical stress) of water . For the culture of *M. armataus* the optimum range of water hardness is 63.00-250ppm [14]. In winter WBC count was also increased might be due Immune

response against cold stress in fish *M. armatus*[15]. It been reported that alteration in haematological parameters are not only associated with physico-chemical properties of water but also due to season and reproductive activities and sex [16] and Banerjee [17], photoperiodism [18, 19] and availability of food[20] and Chemical stress[21, 22]. In this study haematological parameters are observed highest in rainy season. No seasonal significant change was observed in RBC, Hb, PCV, MCV, MCHC ,ESR and clotting time in comparison of control.

CONCLUSION

From the overview of present result, it can be concluded that tatal hardness of water in rainy season, and temperature of water in winter season, induced stress in some extent, in fish *Mastacembelus armatus*..This investigation may be helpful as a tool to monitor the health status of fish *M.armatus* in culture practice.

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