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STUDY OF SELECTED HAEMATOLOGICAL INDICES OF FRESHWATER FISH FROM BISALPUR RESERVOIR

***Sudha Summarwar and Santosh Verma**

Department of Zoology, S.D. Government College Beawar (Raj.) M.D.S University Ajmer

**Author for Correspondence*

ABSTRACT

The present study was deal with determination of haematological parameters in fishes of Bisalpur reservoir. . Four areas related to Bisalpur reservoir were selected i.e. Bisalpur, Nasirda, Thadoli and Nagdiya. From each area 20 fishes were collected which are *Clarias batrachus* (10) and *Labeo rohita* (10).Haematological parameters were determined in fishes, the result show highest mean value of Haemoglobin, Packed cell volume, Red blood corpuscles were observed in the fishes of Bisalpur reservoir and highest mean value of Erythrocyte sedimentation rate, White blood corpuscles and Differential leucocytes count were observed in the fishes of Thadoli and Negdiya area. The result show that low value of Haemoglobin, Packed cell volume, Red blood corpuscles determination indicated the presence of anaemia in the fishes of Thadoli and Negdiya area. Higher alkalinity or pH of water can lead to poor condition of body, as was observed in the fishes of Thadoli and Negdiya area.

Key Words: *Clarias Batrachus ,Labeo Rohita, Environmental Pollution, Blood Collection*

INTRODUCTION

The widespread use of chemicals to control pest weeds has been recognized in agricultural practices. Indiscriminate use of these chemicals to improve agricultural production and yield may result in aquatic pollution due to rain and surface runoff (Farombi *et al.*, 2008). Fish can serve as bio indicators of environmental pollution and therefore can be used for the assessment of the quality of aquatic environment since they are directly exposed to chemicals resulting from agricultural production via surface runoff of water or indirectly through the food chain of ecosystem (Ateeq *et al.*, 2002). One of the difficulties in assessing the state of health of natural fish population has been the paucity 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 proved a valuable diagnostic tool in evaluating human health.

Fishes can adapt themselves to bad environmental conditions by changing their physiological activities. Qualitative and quantitative variations in haematological parameters including the red blood cell (RBC) and white blood cell (WBC) numbers, cell proportions of leukocyte, the amount of haemoglobin (Hb), and the size of RBC and WBC are the most significant findings as regards diagnosis.

Haematological studies on fishes have assumed greater significance due to the increasing emphasis on pisciculture and greater awareness of the 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.

To achieve the objective the investigation haematological study of Bisalpur reservoir was carried out. The Bisalpur Dam is the important centre of Rajasthan state which is made on river Banas nearby Deoli, District Tonk. This dam lies between 26° 28' to 26° 29' north latitudes and 74° 37' 30" to 74° 38' east longitudes. It covers about 500 km perimeter area and its maximum depth is about 30.0 m when full of water. In this dam the water is run off from the surrounding of Banas River during the monsoon season. Bisalpur Dam supplies the water in seven cities i.e. Kekri, Sarvar, Nasirabad, Kishangarh, Ajmer and Beawar. The areas related to Bisalpur reservoir i.e. Bisalpur, Nasirda, Thadoli and negadiya are used for collection of fishes. To carry out such studies, it becomes important to note that areas selected should have proper distance. Bisalpur reservoir fulfils this condition having a variation of distance of approximate 20-25 Km. from each other. This produces spatial variation with different kind of exposure

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and level of water quality, stress etc. Various ambiances like moderate, extreme cold, extreme hot and moist warm produce considerable effects on the aquatic ecosystem. Study of haematological parameters in fish species make useful in assessing the whole aquatic environment of the area. Improvement in the status of water reservoir having fishes especially the major carp and cat fish by proper investigation haematological studies related to fish diseases is an urgent requirement. There is a need of continuous monitoring of fish biological data, physico-chemical conditions and plankton status of the water body like Bisalpur reservoir as it is also related with human health.

MATERIALS AND METHODS

Fish samples

For haematology the fishes were collected from four areas i.e. Bisalpur, Nasirda, Thadoli and Negdiya. The fishes included *Clarias batrachus* and *Labeo rohita*.

Blood Collection

Live fish was put on a bed in a tray. A damp cloth was used to cover the fish head. A small sample of whole blood was drawn from the caudal vein into dipotassium EDTA containing tube by the process as described by (Hrubec and Smith, 2000). According to Hrubec and Smith, (2000), the haematological techniques used for mammals are also applicable for fishes; hence all the haematological parameters were determined by using the standard techniques as described by Jain, (1986). The haematological parameters included RBC counting, WBC counting, ESR, PCV, haemoglobin and DLC.

The following indices have been determined for blood samples taken for testing:

*Red blood cell counts and Total leucocytes counts were carried out with a Haemocytometer method.

*Haemoglobin concentration (Hb) was measured by Sahlis method.

*Packed cell volume (PCV) was determined by means of a Haematocrit method.

RESULTS AND DISCUSSION

Haematology of fishes i.e. *Clarias batrachus* and *Labeo rohita* collected from various areas viz. Bisalpur, Nasirda, Thadoli and Negdiya included the haemoglobin (Hb), erythrocyte sedimentation rate (ESR), Packed cell volume (PCV), RBC counts, WBC counts and Differential leucocytes count (DLC). The mean values of haemoglobin (Table 1) differed significantly from each other according to different areas. Highest mean values of haemoglobin were observed in the fishes of Bisalpur area. It was followed by the mean values in Nasirda, Negdiya area and Thadoli areas. The results of haemoglobin determination indicated the presence of anaemia in the fishes of Thadoli and Negdiya areas. Higher alkalinity or pH of water can lead to poor condition of body, as was observed in the fishes of Thadoli and Negdiya areas. The mean values of ESR (Table 1) differed significantly from each other according to different areas. Highest mean values of ESR were observed in the fishes of Thadoli area. It was followed by the mean values in Negdiya, Nasirda and Bisalpur areas. At each area the mean values were significantly higher in the blood of *Clarias batrachus* than in *Labeo rohita*. Higher ESR can be observed in the cases of infection or stress. Thin blood can also be the cause of higher ESR. The mean values of PCV (Table 1) differed significantly from each other according to different areas. Highest mean values of PCV were observed in the fishes of Bisalpur area. It was followed by the mean values in Nasirda, Negdiya area and Thadoli areas. At each area the mean values were significantly higher in the blood of *Clarias batrachus* than in *Labeo rohita*. Low PCV in the fishes probably indicated anaemia.

The mean values of RBC count (Table 1) differed significantly from each other according to different areas. Highest mean values of RBC count were observed in the fishes of Bisalpur area. It was followed by the mean values in Nasirda, Negdiya area and Thadoli areas. At each area the mean values were significantly higher in the blood of *Clarias batrachus* than in *Labeo rohita*. The results of RBC count indicated the presence of anaemia in the fishes of Thadoli and Negdiya areas.

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Table 1: Effect of varying ambiances on haematology of fishes collected from different areas /villages of Bisalpur reservoir (n=10)

Parameters	Areas							
	Bisalpur		Nasirda		Thadoli		Negdiya	
	Cb	Lr	Cb	Lr	Cb	Lr	Cb	Lr
Haemoglobin, g/dl	6.2 ^b ± 0.02	6.0 ^b ± 0.03	6.0 ^b ± 0.01	5.7 ^b ± 0.02	4.9 ^b ± 0.04	4.8 ^b ± 0.01	4.7 ^b ± 0.02	4.5 ^b ± 0.02
ESR, mm/hour	0.5 ^c ± 0.001	0.4 ^c ± 0.001	0.7 ^c ± 0.002	0.6 ^c ± 0.001	1.0 ^c ± 0.001	0.9 ^c ± 0.002	0.8 ^c ± 0.002	0.72 ^c ± 0.001
PCV, %	40 ^d ± 0.1	38 ^d ± 0.3	37 ^d ± 0.2	35 ^d ± 0.4	23 ^d ± 0.3	20 ^d ± 0.2	29 ^d ± 0.1	28 ^d ± 0.3
RBC, million/cmm	4.5 ^e ± 0.01	4.0 ^e ± 0.01	3.5 ^e ± 0.01	3.3 ^e ± 0.01	2.1 ^e ± 0.01	2.0 ^e ± 0.01	2.8± 0.0 ^e 1	2.7 ^e ± 0.01
WBC, thousands/cmm	11.5 ^f ± 0.11	9.2 ^f ± 0.20	12.6 ^f ± 0.21	10.0 ^f ± 0.10	18.0 ^f ± 0.20	16.0 ^f ± 0.10	14.0 ^f ± 0.20	12.0 ^f ± 0.10
DLC, %								
Neutrophils	3.7 ^g ± 0.001	3.0 ^g ± 0.001	3.8 ^g ± 0.001	3.6 ^g ± 0.001	7.8 ^g ± 0.001	7.1 ^g ± 0.001	6.0 ^g ± 0.001	5.5 ^g ± 0.001
Lymphocytes	25.2 ^h ± 0.001	25.0 ^h ± 0.001	21.2 ^h	20.2 ^h ± 0.001	16.1 ^h ± 0.001	14.3 ^h ± 0.001	18.0 ^h ± 0.001	17.2 ^h ± 0.001
Monocytes	4.5 ^k ± 0.001	4.3 ^k ± 0.001	4.0 ^k ± 0.001	4.3 ^k ± 0.001	4.2 ^k ± 0.001	4.3 ^k ± 0.001	4.0 ^k ± 0.001	4.2 ^k ± 0.001
Eosinophils	0.92 ^l ± 0.001	0.90 ^l ± 0.001	0.94 ^l ± 0.001	0.98 ^l ± 0.001	2.0 ^l ± 0.001	1.95 ^l ± 0.001	1.9 ^l ± 0.001	1.8 ^l ± 0.001
Basophils	0.58±0.0 ^m 01	0.28 ^m ± 0.0001	0.16 ^m ± 0.0001	0.52 ^m ± 0.001	0.1 ^m ± 0.0001	0.01 ^m ± 0.0001	0.01 ^m ± 0.0001	0.3 ^m ± 0.0001
Thrombocytes	65.00 ^p ± 0.005	66.00 ^p ± 0.005	70.00 ^p ± 0.001	71.00 ^p ± 0.001	69.00 ^p ± 0.001	72.0 ^p ± 0.008	70.0 ^p ± 0.001	71.00 ^p ± 0.001

n = Number of fishes

All the means values of a parameter super scribed by same letter denote significant ($p \leq 0.05$) differences among different areas. Cb = *Clarias batrachus* Lr = *Labeo rohita*

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The mean values of WBC count (Table 1) differed significantly from each other according to different areas. Highest mean values of WBC count were observed in the fishes of Thadoli area. It was followed by the mean values in Negdiya, Nasirda and Bisalpur areas. At each area the mean values were significantly higher in the blood of *Clarias batrachus* than in *Labeo rohita*.

Among all the leucocytes, the % of lymphocytes was highest in the fishes. The % DLC differed significantly from each other according to different areas. Highest mean values of % neutrophils (Table 1) were observed in the fishes of Thadoli and Negdiya area. It was followed by the mean values in Nasirda and Bisalpur areas. Anaemia is related with higher number of neutrophils. This was the probable cause of higher neutrophils in Thadoli and Negdiya areas. An increase in the percentage of granulocyte (neutrophil and eosinophil) indicates infection in fishes (Sahan *et al.*, 2007).

Conclusions

It was concluded that out of four areas studied under Bisalpur reservoir, two areas were having comparatively higher water pollution. Although concentration of a single pollutant was not alarming but few limnological parameters was high consequently affecting health of the fishes. Haematological studies are one measure to assess the health of the fishes in the water bodies. Many a times symptoms of a particular disease may not arise in the fishes but repeated and chronic exposure of fishes to pollutants may interfere with the physiological mechanisms leading to the development of stress. It may be dangerous in the future to the extent that threat may appear to the existence of the species. Timely scientific attention should be paid on the bio monitoring of these fauna. To support these hypothesis haematological parameters were determined in the tissues of fishes.

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