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Haemoglobin Values of *Clarias batrachus* Naturally Infected with Digenetic Trematode, *Orientocreadium*

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ABSTRACT

The present investigation is an attempt to study the alteration in haemoglobin values of *Clarias batrachus* infested by the digenetic trematode *Orientocreadium.* The fish were procured from the local markets of Bareilly region. The blood was taken from the caudal vein and the fish were dissected out to find any possible parasitic infection. *Orientocreadium* was recovered from the body cavity and mesenteries of the fish. The parasites thus obtained were fixed, stained, dehydrated and mounted as per routine techniques. On the basis of infection, the fish were divided in three groups, Group A (uninfected), Group B1 (1-11 parasites / host) and Group B2 (12-23 parasites / host). In Group A the haemoglobin value was found to be 13.80 ± 0.28gm/dl whereas anemia was observed in Group B1and B2 in which the values declined up to 10.73 ± 0.63 gm/dl and 8.03± 0.68gm/dl Showing percentage fall of 22.40% and 41.80% respectively.

KEYWORDS *Clarias batrachus*, ***Orientocreadium***, Haemoglobin

INTRODUCTION

Parasitism reflects a life style whereby one or more organisms (parasites) live in close obligate association with the host and derives benefits at host expense.

Fish organs may be parasitized by various groups of parasites which may cause metabolic changes in the host which are sharply reflected in the blood picture of the host

Like terrestrial animals fishes also suffer from various diseases. The aquatic environment where fish resides is a paramount importance for fish health. Pathogens are always present in aquatic environment. Deterioration in the environment quality create stress in fishes, allows infection to proceed unrestrained. The cause of disease may be single factor or even it may comprise parasites, bacteria, viruses etc. Which play a decisive role in connection with the cause and manifestation of disease. Although much research work has been conducted on morphology and taxonomy of parasites infesting fish hosts, the problem of haematology and biochemistry have received scant attention. Hence present work has been aimed to study the effect of intensity of helminthic infection on the haemoglobin of the fish *Clarias batrachus*.

MATERIALS AND METHODS

Source and maintenance of fish:-

Live *Clarias batrachus* were procured from the local fish markets of Bareilly and bought to the laboratory in the wide mouthed plastic jars. They were then kept in large and well aerated glass aquaria, around 6-8 fish were kept in one aquarium to avoid stress. A minimum period of one week was used to acclimatize the fishes to the laboratory conditions. During this period, 50% of water was changed daily and fish were fed on dried prawns twice a day.

Blood collection:-

On the day of experimentation fish were netted individually by hand and were anesthetized to avoid excessive handling which affects the blood parameters quite significantly. They were then carefully wiped dry and put on lateral recumbence. Blood sample was collected in sterile disposable plastic syringes from caudal vein using the lateral line as a landmark. Blood mixed with EDTA (Ethylene Diamine Tetra Acetic acid) was taken for haemoglobin estimation.

Haemoglobin concenteration:-

Blood samples were evaluated for haemoglobin concentration by routine Sahlis acid haematin method by haemolysing blood with N/10 HCl. Haemoglobin was estimated by comparing the colour of haemosylate with index glass of comparator after dilution with distilled water.

Collection of worms

The fish were dissected to find any possible helminthic infection. Digenetic trematode *Orientocreadium* thus obtained from mesentries and body cavity were fixed in AFA(Alcohol Formol Acetic acid) for 24 hrs. then washed and dehydrated with ascending grades of alcohol, stained with borax carmine and mounted in DPX. On this basis, fish were divided in three groups. Group A (uninfected i.e control) and Group B1 (1-11 parasites / host) and Group B2 (12-23 parasites / host).

RESULTS

The worm *Orientocreadium* was recovered from the body cavity and mesenteries of the fish. The digenetic trematode occurred at a prevalence of 32.69% with intensity of 2-23 parasites/ host. For hameoglobin estimation uninfected fish were assumed as controls Gp(A) while the infected ones were divided in two different groups on the basis of intensity of infection i.e Gp B1(1-11 parasites /host) and Gp B2 (12-23 parasites /host). During present course of study the mean values of haemoglobin in Gp A (Control) was found to be 13.8 $\pm$ 0.28g/dl whereas anemia was observed in Group B1and B2 in which the values declined up to 10.73 $\pm$ 0.63 gm/dl and 8.03 $\pm$ 0.68gm/dl showing percentage fall of 22.40% and 41.80% respectively.

DISCUSSION

Icthyohaematology is a common tool in the clinical analysis of economically important fish and is used to understand fish physiology in relation to infection.

Haemoglobin is involved in the transportation of respiratory gases and due to this property its concentration in blood assumes great significance. Parasitic infection in fish host are known to induce secretion/excretion of haemolysin associated with acidosis and haemodilution and may be regarded as an important criterion for inducing anemia in fish.

Parasitic infestations are known to destroy erythrocytes, leading to anemia (Von Brand, 1973). Singh and Virmani (1978) analysed blood picture of *Colisa fasciatus* infested by *Clinostomum piscidium* metacercaria and found low haemoglobin values in the infected fishes which is indicative of anemia. Kadav and Agarwal (1981) studied the effect of caryophyllid infection on *Clarias batrachus* and found depleted values of haemoglobin in the infected fishes.

The value of haemoglobin is associated with the burden of parasites (Lawrence, 1986), when the worm number is high there is increased blood loss caused by hemorrhage and consumption by worms; leading to an overall low Hb. This can affect the productivity of the fish through mortalities, by decreasing growth rate, reducing the quality of the meat and making the host more susceptible to pathogenic parasites and bacteria.

Macrocytic hyprochromic anemia was observed by Sinha and Sinha (1988) in in *Heteropneustus fossilis* infected by *Procamallanus spiculogubernaculus*. The authors concluded that total erythrocyte count and haemoglobin concentration of the infected fish was lesser in comparison to non-infected ones and correlated the Hb concentration to the degree infection.

The decrease in RBC count was observed in Rita rita infected with trematode (Agarwal *et al*., 1989) and in Rainbow trout infected with *Proteocephalus* (Engelherdt et al., 1989). The decrease in haemoglobin content under infected conditions has been also observed by Sinha (2000) in *Clarias batrachus* and by Yoshinaga *et al*. (2001) in Japanese flounder infected with *Neoheterobothrium hirame*. Similar results were obtained by Mlay et al. (2007) in *Clarias* sp. and *Tilapia* sp. due to the worm burden. According to the authors, when the worm number is high, there is increased blood loss caused by haemorrhage and consumption by worms; leading to an overall low haemoglobin.

Ruhela *et al*. (2005) observed macrocytic anemia in *Clarias batrachus* induced by *Procamallanus* infection, authors found significant decrease in haemoglobin content and infected fish showed restlessness and reflecting respiration. Impact of helminth parasitism on the haemoglobin values of *Cyprinus* and *Schizothorax* spp was studied by Shah et al. (2009). The authors negatively correlated Hb values with the prevalence of infection and reported Hb decrease as the intensity of infection increase. Zaki *et al*. (2010) in their studies found that *Saprolegina parasitica* infection in *Tilapia zilli* leads to significant decrease in Hb concentration. Khurshid and Ahmad (2012) concluded that the intensity of helminthic infection is responsible for altering haematology of fish. It was further speculated by Kaur and Srivastava (2014) that mechanical damage caused by the parasites could cause vitamin B-12 and iron deficiency which are responsible for RBC maturation. The parasites damage the organs in which they subsist and hinder the physiological activities of the victim fish as observed in fresh water murrels.

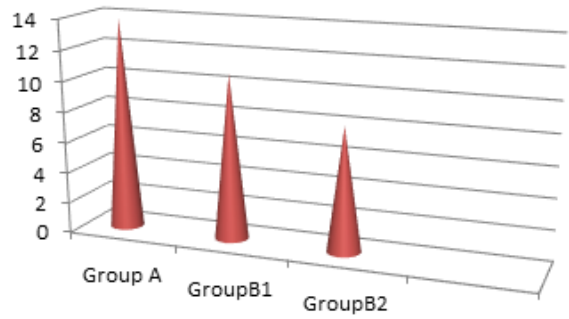
Therefore the lower values of haemoglobin causing anemia can be attributed to-

1. Deficiency of folic acid due to its utilization by the parasite.
2. Deficiency of vitamin B12 caused by the parasites
3. "Sidetracking" of iron to the affected tissues instead of being sent to the bone marrow for there is a greater need for "iron" in the tissues infected with parasites and thereby haemopoesis is impaired.

Table: Table showing fall in the haemoglobin values of *Clarias batrachus* due to parasitic infection.

Host	Groups	Hb (g/dl)	% fall
Clarias batrachus	Group A (control)	13.80 ± 0.28	-------
	GroupB1 (mild infection)	10.73 ± 0.63	22.4%
	Group B2 (Heavy infection)	8.03 ± 0.68	41.8%

Graph: Graph showing the haemoglobin values in different groups of *Clarias batrachus*.



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