

### Influence of Acanthocephala parasite on haematological changes in Labeo rohita (Hamilton,1822) of Veeranna Cheruvu, Hasnapur, Mahabubnagar District, Telangana State, India

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### ABSTRACT

Haematological parameters are repeatedly use as an essential tool to assess the health condition of Indian major carp fish. Although fish haematology continues to offer the potential of a valuable tool in establishing normal range values for blood parameters has been low and available research information is isolated, old and often incomplete. The purpose of this study was to assess the reference values of some haematological parameters carried out Acanthocephala (*Neoechinorhynchus* sp.,) infestations either single or mixed of Indian major carps viz. *Labeo rohita* which are collected from freshwater Veeranna Cheruvu, Hasnapur in Mahabubnagar District of Telangana from 2012-2013 and 2013-2014. Variation observed in haematological parameters such as RBC, Hb, MCH, MCV, PCV, TLC, Eosinophils , Basophils, Neutrophils, Lymphocytes and Monocytes are compared with the earlier reference values. A continues assessment is essential for establishing the reference values in the field of heamatological research based on the area of the study nature of waterbody and time duration. **Keywords :** Influence, Heamatological parameters, *Labeo rohita, Neoechinorhynchus* sp., Veerana Cheruvu.

### I. INTRODUCTION

Fishes have been extensively used as a protein rich diet for human consumption in India and thus, contribute a lot to its economy. It is estimated that about 10 million tons of fish is required annually to meet the present day demand of fish protein in India against an annual production of only 3.5 million tons (Shukla and Upadhyay, 1998).

In India the fish management has occupied an important place especially, in the agricultural economy, when the value and usefulness of fish is a cheap source of protein-diet have been greatly realized and emphasized. According to Tatcher (1981) many parasites can live in a host, sometime causing damage, sometimes not.

The changes associated with haematological parameters due to various parasites establish a data base and allow precise diagnosis guiding the implementations of treatment or preventive measures which are indispensable in fish farming and fish industry (Roberts, 1981).

In India, the comparable studies on the effect of helminth parasites in relation to haematological abnormalities especially in Kashmir so far made are only few (Satpute and Agrawal, 1974; Sinha and Sircar, 1974; Dubey, 1980). All these studies indicate the macrocytic anaemia in the fishes.

Keeping in view the increasing importance of fish as a cheap source of protein rich diet, helminth infections in fresh water fishes has drawn attention of the fish biologists, ichthyologists and parasitologists under fish pathology. Therefore, the present study was designed to study the haematological abnormalities on seasonal basis in the fish fauna of Veeranna Cheruvu, Hasnapur, Mahabubnagar District, Telangana State arising due to Acanthocephala infections so that necessary steps are taken to improve health condition of these economically important fish fauna. In natural populations a complex dynamic equilibrium exists between organised and their environment, both biotic and abiotic. The information on the parasites of fish becomes particularly important as these parasites may affect fisheries production.

### **II. MATERIAL AND METHODS**

The present study was carried out between March 2012 to February 2014. This study was conducted on 430 live samples of Labeo rohita with both normal and infected hosts. Live samples were collected from different sites of Veeranna Cheruvu and were taken to the laboratory in large water containers. The fish were identified by using the key provided by Sven et al, (1999). The fish were acclimatized to standard laboratory conditions for 12 hrs and were subjected to haematological investigations. For haematological investigations, blood samples were collected from all fish hosts in glass tubes containing EDTA and were Total RBC's count and Total properly labeled. Leukocyte Count (TLC) were determined by using improved Neubauer haemocytometer. (Hesser, 1960). Haemoglobin (Hb) concentration was estimated by routine Sahli's method. Mean Cell Haemoglobin (MCH) and Mean Cell Volume (MCV) were calculated using the formulae mentioned by Dacie and Lewis (2001). Haematocrit value (PCV) was determined by micro haematocrit capillary tube (Wintrobe, 1967). Leishman's staining method was used for the Differential Leukocyte Count (DLC) of WBC.

The parasitic worms were collected according to the routine parasitological techniques and proper record was maintained.

### **III. RESULTS AND DISCUSSION**

In the present study haematological values of both normal and infected host of *Labeo rohita* on seasonal basis depicted in Table Nos. 1-4 and Figures Nos. 1-22 (mean values are expressed). During the course of research mean values of RBC fluctuated from a minimum of  $1.428\pm0.014x10^6$ mm<sup>3</sup> (premonsoon) to a maximum of  $1.462\pm0.004x10^6$ mm<sup>3</sup> (postmonsoon) in normal *Labeo rohita* fish, while in case of infected *Labeo rohita*, the value fluctuated from a minimum of  $1.152\pm0.041x10^6$ mm<sup>3</sup> (premonsoon) to a maximum of  $1.297\pm0.063x10^6$ mm<sup>3</sup> (postmonsoon). The RBC count showed a negative correlation with the prevalence of infection and decreased with increase in the intensity of infection(Abdul Wahid Shah et al, 2009).

The Mean Values of Haemoglobin fluctuated from a minimum of  $7.90\pm0.68g$  % (premonsoon) to a maximum of  $9.44\pm0.10g$  % (postmonsoon) in normal *Labeo rohita* fish, while in case of infected *Labeo rohita*, the value fluctuated from a minimum of  $5.15\pm0.45g$  %(premonsoon) to a maximum of  $6.47\pm0.16g$  %(postmonsoon).The haemoglobin count thus showed a negative correlation with the prevalence of infection and decreased with increase in the intensity of infection(Abdul Wahid Shah et al, 2009).

The Mean Values of Mean Cell Haemoglobin fluctuated from a minimum of  $40.46\pm2.32$  % (premonsoon) to a maximum of  $52.06\pm1.93$  % (postmonsoon) in normal *Labeo rohita* fish, while incase of infected *Labeo rohita* the value fluctuated from a minimum of  $43.41\pm0.76$  % (premonsoon) to a maximum of  $56.92\pm4.19$  % (postmonsoon). Thus the MCH count showed a positive correlation with the prevalence of infection( M Vijay Kumar, 2016).

The Mean Values of Mean Cell Volume fluctuated from a minimum of  $157.17\pm7.41$  % (Pre-Monsoon) to a maximum of  $166.19\pm4.62$  %(Post-Monsoon) in

normal *Labeo rohita* fish, while as in case of infected *Labeo rohita* fish, the value fluctuated from a minimum of  $170.60\pm4.54$  % (Pre-Monsoon) to a maximum of  $179.11\pm4.05$  % (Post-Monsoon). Thus the MCV count showed a positive correlation with the prevalence of infection (M Vijay Kumar, 2016).

The Mean Values of Packed Cell Volume fluctuated from a minimum of  $20.25\pm3.27$  % (Pre-Monsoon) to a maximum of  $25.8\pm1.82$  %(Post-Monsoon) in normal *Labeo rohita* fish, while as in case of infected *Labeo rohita* fish, the value fluctuated from a minimum of  $9.97\pm1.54$  % (Pre-Monsoon) to a maximum of  $13.8\pm2.23$  % (Post-Monsoon). Thus the PCV count thus showed a negative correlation with the prevalence of infection and decreased with increase in the intensity of infection (M Vijay Kumar, 2016 ; Haidar Ali et al, 2012).

The Mean Values of Total Leucocyte Count fluctuated from a minimum of  $8.31\pm0.18$  % (Pre-Monsoon) to a maximum of  $8.96\pm0.44$  % (Post-Monsoon) in normal *Labeo rohita* fish, while as in case of infected *Labeo rohita* fish, the value fluctuated from a minimum of  $11.42\pm0.23$  % (Pre-Monsoon) to a maximum of  $12.69\pm0.51$  % (Post-Monsoon). Thus the TLC count showed a positive correlation with the prevalence of infection.

The Mean Values of Eosinophils fluctuated from a minimum of  $1.16\pm0.14$  % (Pre-Monsoon) to a maximum of  $1.46\pm0.10$  %(Post-Monsoon) in normal *Labeo rohita* fish, while as in case of infected *Labeo rohita* fish, the value fluctuated from a minimum of  $1.58\pm0.35$  % (Pre-Monsoon) to a maximum of  $1.85\pm0.29$  % (Post-Monsoon). Thus the Eosinophils showed a positive correlation with the prevalence of infection.

The Mean Values of Basophils fluctuated from a minimum of  $1.32\pm0.10$  % (Pre-Monsoon) to a

maximum of  $1.67\pm0.10$  %(Post-Monsoon) in normal *Labeo rohita* fish, while as in case of infected *Labeo rohita* fish , the value fluctuated from a minimum of  $1.67\pm0.10$  % (Pre-Monsoon) to a maximum of  $2.01\pm0.56$  % (Post-Monsoon). Thus the Basophils were found to be least altered both in case of normal and infected.

The Mean Values of Neutrophils fluctuated from a minimum of  $3.19\pm0.11$  % (Pre-Monsoon) to a maximum of  $3.65\pm0.06$  % (Post-Monsoon) in normal *Labeo rohita* fish, while as in case of infected *Labeo rohita* fish, the value fluctuated from a minimum of  $3.46\pm0.07$  % (Pre-Monsoon) to a maximum of  $4.30\pm0.47\%$  (Post-Monsoon). Thus the Neutrophils showed a minor increase in number infected hosts while as in case of normal hosts (Abdul Wahid Shah et al, 2009).

The Mean Values of Lymphocytes fluctuated from a minimum of  $26.50\pm0.75$  % (Pre-Monsoon) to a maximum of  $32.03\pm0.42$  %(Post-Monsoon) in normal *Labeo rohita* fish, while as in case of infected *Labeo rohita* fish, the value fluctuated from a minimum of  $22.32\pm1.04$  % (Pre-Monsoon) to a maximum of  $24.93\pm1.36$  % (Post-Monsoon). Thus the Lymphocyte count showed a negative correlation with the prevalence of infection and decreased with increase in the intensity of infection.

The Mean Values of Monocytes fluctuated from a minimum of  $1.81\pm0.28$  % (Pre-Monsoon) to a maximum of  $3.08\pm0.47$  % (Post-Monsoon) in normal *Labeo rohita* fish, while as in case of infected *Labeo rohita* fish, the value fluctuated from a minimum of  $3.81\pm0.12$  % (Pre-Monsoon) to a maximum of  $4.49\pm0.26$  % (Post-Monsoon). Thus the Monocyte count showed a positive correlation with the prevalence of infection and decreased with increase in the intensity of infection(Abdul Wahid Shah et al, 2009).



Plate 1. Veeranna Cheruvu Google Map



Plate 2. Infected *Labeo rohita* 

Plate 3. View of the Veeranna Cheruvu

### Table No 1: Seasonal haematological variations in normal and infected host of Labeo rohita during 2012-2013

	RBC		Hb		MCH		MCV		PCV		TLC	
	(Nx10 <sup>6</sup> /mm³)		(gm/100ml)		(pg)		(μm³)		(%)		(Nx10³/mm³)	
SEASONS	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED
PRE	1.434±	1.152±	7.960±	5.15±	45.54±	48.23±	157.17±	171.52±	22.8±	9.97±	8.31±	11.42±
MONSOON	0.015	0.041	0.068	0.45	5.50	5.02	7.41	3.11	1.38	1.54	0.18	0.23
MONSOON	1.440±	1.287±	8.33±	6.37±	48.57±	51.05±	161.56±	175.97±	24.62±	11.0±	8.47±	12.17±
	0.016	0.096	0.70	0.17	3.43	0.86	5.09	3.12	0.86	0.81	0.26	0.81
POST	1.461±	1.297±	8.74±	6.47±	52.06±	56.92±	166.19±	179.11±	25.8±	13.8±	8.63±	12.69±
MONSOON	0.015	0.063	0.60	0.16	1.93	4.19	4.62	4.05	1.82	2.23	0.63	0.51

## Table No 2: Seasonal haematological variations in normal and infected host of Labeo rohitaduring 2013-2014

	RBC		Hb		MCH		MCV		PCV		TLC	
	(Nx10 <sup>6</sup> /mm <sup>3</sup> )		(gm/100ml)		(pg)		(μm³)		(%)		(Nx10³/mm³)	
SEASONS	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED
PRE	1.428±	1.156±	7.90±	5.18±	40.46±	43.41±	158.86±	170.60±	20.25±	11.0±	8.33±	11.64±
MONSOON	0.014	0.073	0.68	0.51	2.32	0.76	5.97	4.54	3.27	0.81	0.27	0.096
MONSOON	1.453±	1.160±	8.16±	6.19±	48.79±	51.42±	160.87±	175.97±	22.8±	12.12±	8.52±	11.69±
	0.010	0.068	0.77	0.34	1.93	2.69	11.27	3.12	1.38	1.25	0.22	0.72
POST	1.462±	1.169±	9.44±	6.32±	52.06±	56.92±	163.34±	177.85±	24.12±	13.5±	8.96±	12.22±
MONSOON	0.004	0.074	0.10	0.10	1.93	4.19	4.28	5.49	2.02	1.45	0.44	0.99













Table No 3: Seasonal haematological variations in normal and infected host of Labeo rohita

	EOSINOPHILS %		BASOPHILS %		<b>NEUTROPHILS %</b>		LYMPHOCYTES %		<b>MONOCYTES %</b>	
SEASONS	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED
	1.23±	1.58±	1.32±	1.67±	3.49±	3.84±	27.94±	22.58±	1.81±	4.18±
PREMONSOON	0.14	0.35	0.10	0.10	0.24	0.30	1.38	0.59	0.28	0.41
	1.39±	1.76±	1.44±	1.84±	3.56±	4.05±	30.27±	23.12±	2.13±	4.21±
MONSOON	0.12	0.14	0.17	0.24	0.35	0.23	0.79	0.23	0.21	0.18
	1.46±	1.85±	1.57±	1.98±	3.65±	4.30±	32.03±	24.93±	3.08±	4.43±
POSTMONSOON	0.10	0.29	0.30	0.22	0.06	0.47	0.42	1.36	0.47	0.28

# Table No 4: Seasonal haematological variations in normal and infected host of Labeo rohitaduring 2013-2014

	<b>EOSINOPHILS %</b>		<b>BASOPHILS %</b>		NEUTRO	PHILS %	LYMPHO	CYTES %	<b>MONOCYTES %</b>	
SEASONS	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED	NORMAL	INFECTED
	1.16±	1.58±	1.44±	1.84±	3.19±	3.46±	26.50±	22.32±	2.13±	3.81±
PREMONSOON	0.14	0.35	0.17	0.24	0.11	0.07	0.75	1.04	0.59	0.12
	1.38±	1.70±	1.57±	1.98±	3.42±	4.11±	28.29±	22.74±	2.54±	4.18±
MONSOON	0.11	0.20	0.30	0.22	0.27	0.10	1.31	0.38	0.20	0.03
	1.42±	1.81±	1.67±	2.01±	3.45±	4.30±	30.78±	23.79±	2.86±	4.49±
POSTMONSOON	0.16	0.04	0.10	0.56	0.23	0.47	1.91	1.54	0.45	0.26











The present study revealed that haemotological indices are more prominently altered by helminth parasite infestations showing highest alterations during hotter months than colder seasons, which may be attributed to higher level of water pollution during hotter months (Zutshi, 1980; Yousuf and Shah, 1988; Sarwar, 1999; Shamim and Pandit, 2002) and the life cycle pattern of different helminth parasites. The results also revealed that helminth infection produces macrocytic anaemia with decreased RBC number and increase in TLC and DLC content in fish.

### **IV. CONCLUSION**

The present study reveals that the intensity of Acanthocephala (*Neoechinorhynchus* sp.,) infectionss is responsible for altering the haematology of fish hosts and shows the seasonal relationship of infection with the haematological alterations. It is further speculated that mechanical damage caused by *Neoechinorhynchus* sp., to the host intestine could cause vitamin B-12 and folic acid deficiency which are otherwise responsible for RBC maturation. The mechanical injury may also lead to side tracking of iron to affected tissues which is otherwise

responsible for erythropoiesis. Increased number of TLC and DLC values may be associated with the defense mechanism and immunological responses against infectious diseases caused by *Neoechinorhynchus* sp., parasites.

Study of the life cycle of the *Neoechinorhynchus* sp., parasites of *Labeo rohita* could be prevent infection of humans by such parasites whose vector or intermediate host is fish.

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