JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

COMPARATIVE STUDIES ON HAEMATOLOGICAL PARAMETERS IN FRESH WATER FISHES

Mangal Sitaram Kadam, Dhanraj Balbhim Bhure* and Sanjay Shamrao Nanware
Post Graduate Department of Zoology, Yeshwant Mahavidyalaya, Nanded-431602. M.S., INDIA

ABSTRACT

Haematological parameters are valuable indicators of fish health status. This study is aimed to provide baseline data of the blood profile of freshwater fish species living in different environments and with divergent feeding behaviour, namely C. mrigala, Catla catla, Tilapia sp. and Mastacembelus armatus collected from Nanded. The reported values of haematological parameters are varied with species to species. The range of haematological parameter of C. mrigala, Catla catla, Tilapia sp. and Mastacembelus armatus are as RBC 3.78 to 5.56 mill/cum, Hb 10.2 to 16.0 gm%, MCV 71.87 to 92.27cu/micr, MCH 24.94 to 36.51 Pg; MCHC 27.03 to 42.39 %; HCT 34.5 to 45.3% and PCT 0.2 to 0.5 %. Overall, findings from this study provide a better understanding of the influences of divergent environmental conditions and feeding habits on fish blood parameters.

Key words: Haematological parameters, C. mrigala, Catla catla, Tilapia sp. and Mastacembelus armatus

INTRODUCTION

Fish and fish related aquaculture research activities plays a major role in shaping the economic prosperity of India where a major part of the population is dependent on agriculture and farm based products for their livelihood. To carry out a fruitful aquaculture practice, maintenance of fish health is of prime concern as it has direct effect on the annual yield. The blood is fluid connective tissue which acts as the main transporting system of the body in all animals. It acts as principal transport medium of the body, carrying oxygen, nutrients and chemical messages to the tissues and waste products and synthesized metabolites away.

The blood constituents in fishes are influenced by factors like temperature ecological habitat, food selection and mode of life. Therefore, it is difficult to establish any normal values for the class as a whole. But, if data are collected for different species as well as within species under different condtions some normal ranges of values can be arrived at, which can form a valuable diagnostic aid in fisheries. Any deviation from this normal may be a clue to the physiological and pathological states of the animal. Haematological parameters are commonly used as valuable indicators for the assessment of fish health status. The blood plays in coordination of individual cells into a whole complex organism. Along with dissolved nutrients, metabolites, electrolyte, hormones, substances to counteract infection and haemorrhage, it acquires a significant place to maintain an equilibrium condition between blood cells and blood stream. Variations in blood parameters depend upon the fish species, aquatic biotope, health and nutritional status, age and sexual maturity. Moreover, blood parameters of fish are highly sensitive to environmental changes. Quality of water, oxygen, temperature and salinity are directly reflected in blood

parameters. The blood parameters in fishes are influenced by many factors (Mishra et.al.,1977). According to Bhagat and Banerjee,1986 the sex, size, season and age of fishes are directly reflected on blood parameters. The values of haematological parameters depend on season and slow or active movement of fishes (Yasmin et.al.,1993). Harikrishnana et.al., 2003 reported that haematological parameters are influenced by microbial infection of fish. A correct interpretation of fish haematology depends on the availability of reference values, helpful in understanding the relationship of blood characteristics to the phylogeny, activity, habitat and adaptability of the species to the environment. This study is therefore aimed at providing baseline data of the haematological profile of two teleost fish species living in different aquatic environments, namely C. mrigala, Catla catla, Tilapia sp. and Mastacembelus armatus.

MATERIALS AND METHODS

Freshwater Fishes were collected from Nanded and brought to laboratory condition without any mechanical injury. Blood sample in fishes were collected by puncturing the caudal vessel. The blood collected using 2 ml sterile disposable syringe. The use of glass syringes avoided because it may quicken coagulation. The syringe rinsed with anticoagulant (potassium salt of ethylene diamine tetra acetic acid, EDTA). Blood was taken under gentle aspiration and then the needle withdrawn. After detaching the blood mixed well in a vial containing anticoagulant (EDTA) at the concentration of 5 mg EDTA per ml of blood. The collected blood of fishes were used for the determination of Haematological parameters in freshwater fishes C. mrigala, Catla catla, Tilapia sp. and Mastacembelus armatus. The red blood corpuscles (RBC) were counted by using Neubauer haemocytometer. The Haemoglobulin content (Hb), Packed cell volume (PCV) mean corpuscular volume (MCV) mean corpuscular haemoglobin (MCH) mean corpuscular haemoglobin concentration (MCHC) was determined by the method Welchselbam, 1943.

RESULTS

The haematological parameters of freshwater fishes are presented in Table 1. The range of haematological parameter of C. mrigala, Catla catla, Tilapia sp. and Mastacembelus armatus are as RBC 3.78 to 5.56 mill/cum, Hb 10.2 to 16.0 gm%, MCV 71.87 to 92.27cu/micr, MCH 24.94 to 36.51 Pg; MCHC 27.03 to 42.39 %; HCT 34.5 to 45.3% and PCT 0.2 to 0.5 %.

Table 1: Comparative Haematological Values of Freshwater Fishes

	C. mrigala	Catla catla	Tilapia	Mastacembelus armatus
RBC	5.56 mill/cum	4.0/mill/cum	5.3 mil/cum	3.78 mill/cum
Hb	16.2 gms%	10.0 gms%	15.6 gms %	13.8 gms%
MCH	29.14pg	24.94 pg	30.47 pg	36.51 Pg
MCHC	35.76%	27.03 %	42.39 %	40.00 %
HCT	45.3%	37.0 %	36.8 %	34.5 %
MCV	81.47cu/micr	92.27cu/micr	71.87cu/micr	91.27cu/micr
PCT	0.231%	0.0 – 0.5	0.4 %	2.80 %

DISCUSSION

Fish are known to live in a very intimate contact with their environment, and therefore they are extremely dependent upon it (Guerriero et al. 2003). It is well documented that ambient changes influence blood cell number, morphology and distribution (Srivastava & Choudhary 2010). Haematological parameters are therefore widely used as an early signal of changes in fish health status, and have proven to be a valuable approach also for monitoring the effects of habitat changes on fish biology (Gabriel et al. 2004).

The RBC value that proved to be nearly the same in the two fish species C. mrigala (5.56 mill/cum) and Tilapia sp. (5.3 mil/cum). Whereas the values were decreased in other fish species Catla catla (4.0/mill/cum); Mastacembelus armatus (3.78 mill/cum). It is known that the RBC of an organism determines the carrying capacity of dissolved

oxygen (Al 2000). Therefore, the differences herein observed may be attributable to the divergent physiological activeness of the examined fish species. As previously reported by Svobodova and collaborators (Svobodova et al. 2008), active species present higher values of haematological parameters compared to less active forms. Indeed, high RBC values are usually associated with fast movement and high activity with streamlined bodies, as already documented in various studies conducted on wild and farmed species, including grey mullets (Fazio et al. 2012a, 2012b, 2013, 2016).

The haematocrit and haemoglobin values are found to vary in different fish groups. Within the freshwater fishes these parameters are found to vary, too, from species to species, probably as a physiological adaptation to their different modes of life (i.e., habits) and ecological habitats. According to Larsson et al (1976) the lesser values are observed in slow moving, sedentary and benthic species, whereas the active, predacious and pelagic species give comparatively higher erythrocyte and leukocyte counts, haemoglobin content, etc.

The results of this preliminary study provide basic knowledge of the blood profile of C. mrigala, Catla catla, Tilapia sp. and Mastacembelus armatus, freshwater fish species of ecological and economic importance, allowing better comprehension of the influences of divergent environmental conditions and feeding habits on fish blood parameters.

REFERENCES

Al V. (2000): Organic phosphates in the red blood cells of fish. Comparative Biochemistry and Physiology Part A. Molecular & Integrative Physiology 125:417–435.

Bhagat, R.P. and Banerjee, V. (1986): Haematology of an Indian freshwater eel Amphipnouscuchia (Hamilton) Erythrocyte count related parameters with special reference to body length sex and seasons. Compt. Physiol. Ecol., 1986. 2(1): 21-27.

Dheer, J.M.S. (1988): Haematological, haematopietric and biochemical responses to thermal stress in an airbreathing freshwater fish Channa punctatus (Bloch.). J. Fish. Biol., 1988.32(20): 197-206.

Fazio F., Faggio C., Marafioti S., Torre A., Sanfilippo M., Piccione G. (2012a): Comparative study of haematological profile on Gobius niger in two different habitat sites: Faro Lake and Tyrrhenian Sea. Cahiers De Biologie Marine 53:213–219.

Fazio F., Filiciotto F., Marafioti S., Di Stefano V., Assenza A., Placenti F., Buscaino G., Piccione G., Mazzola S. (2012b): Automatic analysis to assess haematological parameters in farmed gilthead sea bream (Sparus aurata Linnaeus, 1758). Marine and Freshwater Behaviour and Physiology 45:63–73.

Fazio F, Marafioti S, Torre A, Sanfilippo M, Panzera M, Faggio C. (2013): Haematological and serum protein profiles of Mugil cephalus: Effect of two different habitats. Ichthyological Research 60:36–42.

Gabriel U.U., Ezeri G.N.O., Opabunmi O.O. (2004): Influence of sex, source, health status and acclimation on the haematology of Clarias gariepinus (Burch, 1822). African Journal of Biotechnology 3:463–467

Guerriero G, Di Finizio A, Ciarcia G. (2003): Oxidative defenses in the sea bass, Dicentrarchus labrax. In: Dunn JF, Swartz HM, editors. Boston, MA: Springer. Vol. 530.

Harikrishnana, R., Nisha Rani, M., and Balasundaram, C. (2003): Haematological and biochemical parameters in common carp Cyprinus carpio following herbal treatment for Aeromonashydraphila infection. Aquacult., 2003. 221(1-4):41-50.

Larsson, A., M. L. Johansson-Sjobeck and R. Fange. (1976):. Comparative study of some haematological and biochemical blood parameters in fishes from Skagerrak. J.Fish. Biol. 9, 425-440.

Mishra, N., Pandey, P.K. and Datta Munshi, S. (1977): Haematological parametersof an air breathing mud eel Amphipnouscuchia (Ham.). J. FishBiol., 1977. 10: 567-573.

Yasmin, R., Pandey, B.N. and Yasmin, A. (1993): Seasonal variation in haematological indices with reference to the effect of water temperature in Oreochromismossambicus (Peters), J. Freshwat. Biol., 1993. 5(2): 177-181.

Welchselbam, T.E. (1946): American J. Clin. Path., 1946. 16: 40.