



Biochemical Values of the fresh water fishes *Channa punctatus* and *Channa striatus* (Bloch)

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ARTICLE INFO

Article history:

Received: 22 June 2013;

Received in revised form:

20 August 2014;

Accepted: 29 August 2014;

Keywords

Haematology,

Haematocrit,

Cholesterol.

ABSTRACT

Alive freshwater fishes *Channa punctatus* and *C. striatus* were collected from freshwater bodies of Cauvery delta and their s parameters were thoroughly studied. RBC and WBC count, haemoglobin content and haematocrit were showed slight fluctuation. The range of different in biochemical parameter of these species are RBC 3.29×10^6 to 3.42×10^6 /cumm; WBC 4.3×10^3 to 4.6×10^3 /cumm; Hb 9.37 to 10.84 g/dl; PVC 34.42 to 36.14 %/dl; MCV 104.62 to 105.67 μm^3 , MCH 24.09 to 28.48 Pg/dl; MCHC 27.22 to 29.99 g/dl. The serum protein, albumin and cholesterol were found to be slightly higher value in *C. punctatus* than *C. striatus*. The globulin and triglycerides showed elevated level in *C. striatus*. The average values of protein content showed higher value when compared to cholesterol and glucose. The present study suggested that these fishes are important sources of animal protein and good for human health.

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Introduction

The blood parameters in fishes are influenced by many factors¹⁻³. Quality of water, temperature, food availability and physiological status of fish either directly or indirectly influence on blood constituents of fish⁴⁻⁶. According to⁷ the sex, size, season and age of fishes are directly reflected on blood parameters. Changes in physico-chemical parameters may be reflected biochemical parameters of the fishes⁸⁻¹².¹³⁻¹⁴ studied the comparative aspects of haematological parameters.

The variation in protein, cholesterol and glucose level is directly related to sex, size and age of the fishes¹⁵⁻²⁰.²¹ reported that the percentage of plasma protein varied from species to species. The values of biochemical parameters depend on season and slow or active movement of fishes²².²³⁻²⁴ reported that biochemical parameters are influenced by microbial infection of fish and toxicants. Though numerous works are available on haematology of fishes, the comparative studies of air breathing fishes is meager. The present paper deals with the comparison of important blood parameters of fish *Channa punctatus* and *C. striatus*.

Materials and methods

The samples were collected from fresh water bodies of Cauvery delta in and around Kumbakonam during August 2012 to April 2013. 50 alive animals of each species (irrespective of sex and almost medium size group) were taken and brought to the laboratory. The blood samples were drawn by cardiac puncture using 21 gauge hypodermic needle in two different vials, one containing the anticoagulant EDTA, for blood cell studies and the other without EDTA allowing the clot and serum to separate for studying some biochemical constituents. Standard biochemical procedure described by²⁵ were adopted for experimental analysis.

The red and white blood corpuscles (RBC and WBC) were counted using the spencer's haemocytometer. Absolute blood parameters such as haemoglobin content (Hb), Packed cell volume (PCV) mean corpuscular volume (MCV) mean

corpuscular haemoglobin (MCH) mean corpuscular haemoglobin concentration (MCHC) were determined by the method given by²⁶. The methods employed for determination of blood chemistry were referred to serum protein²⁷ glucose²⁸ cholesterol²⁹ triglyceride³⁰ albumin and globulin. The data were analysed statistically and presented in a vivid manner.

Results

The biochemical parameters of *Channa punctatus* and *C. striatus* are given in the table 1 and 2. On the basis of the data obtained from two species the ranges of values of some biochemical parameters are RBC 3.29×10^6 to 3.42×10^6 /cumm; WBC 4.3 to 4.6×10^3 /cumm; haemoglobin 9.37 to 10.84 g/dl; PVC 34.42 to 36.14 %/dl; MCV 104.62 to 105.67 μm^3 ; MCH 24.09 to 28.48 Pg/dl and MCHC 27.22 to 29.99 g/dl. The range of protein 4.9 to 5.1 g/dl; albumin 26 to 28 g/dl globulin 1.8 to 2.0 g/dl; glucose 95 to 98 mg/dl; cholesterol 187 to 198 mg/dl cholesterol HDL 74 to 76 mg/dl and triglyceride 130 to 138 mg/dl. From the data it is clearly shows that the biochemical parameters showed slight fluctuation between the two species. The RBC count, haemoglobin, packed cell volume, mean corpuscular volume and mean corpuscular haemoglobin concentration showed higher value in *C. punctatus* and lower value in *C. striatus*. WBC count and mean corpuscular haemoglobin were found to be an elevated level in *C. striatus* than *C. punctatus*.

The results of haematobiochemical analysis revealed that the protein content was recorded maximum in the blood of both *C. punctatus* and *C. striatus*. The biochemical pictures such as protein, albumin cholesterol and cholesterol HDL showed higher value in *C. punctatus* and they were found to be lower value in *C. striatus*. Glucose, globulin and triglycerides were found to be an elevated level in *C. striatus* than *C. punctatus*. The protein showed higher value when compared to cholesterol and glucose.

Discussion

The Biochemical parameters in a fish are reflected of by the physico-chemical conditions of its habitate^{5,19}. Lesser values of biochemical parameters were observed in slow moving, sedentary and benthic species than predacious and pelagic species. In *Channa gughua* and *Mystus gulia* there were more eosinophil cell in females than in males¹⁷.

Table 1. The biochemical parameters of *Channa punctatus* and *C. striatus*

Biochemical component	<i>C. punctatus</i>	<i>C. striatus</i>	Normal value
Protein (g/dl)	5.1 ± 0.28	4.9 ± 0.26	6.0 – 8.0
Albumin (g/dl)	2.8 ± 0.16	2.6 ± 0.15	3.5 – 5.0
Globulin (g/dl)	1.8 ± 0.14	2.0 ± 0.16	2.5 – 3.5
Glucose (mg/dl)	95 ± 2.36	98 ± 2.29	80 – 120
Cholesterol (mg/dl)	198 ± 2.42	187 ± 2.51	130 – 220
Cholesterol HDL (mg/dl)	76 ± 1.69	74 ± 1.48	35 – 70
Triglyceride (mg/dl)	130 ± 2.11	138 ± 2.18	40 – 170

The biochemical values such as RBC and WBC count haemoglobin, PVC, MCV, MCH and MCHC obtained in the present study almost agrees with earlier workers^{6,14}. Variation observed in RBC and WBC count in the blood of experimental fishes *C. punctatus* and *C. striatus*. According to¹⁶ the average basophilic cells were found to be very low in *Cirrhinus mirgala*. The total erythrocytes count are positively correlated with body length⁷. Seasonal changes in RBC count and haemoglobin content were observed in a freshwater exotic fish²². In *C. punctatus* RBC level increased when the fish exposed to sublethal concentration of cadmium⁹. There was decrease level in RBC, Hb and increase in WBC when the fish *C. punctatus* treated with malathion¹³. Similarly variations observed in blood cells count of *C. punctatus* due to toxicants²¹.

Table 2. The biochemical parameters of *Channa punctatus* and *C. striatus*

Biochemical compounds	<i>C. punctatus</i>	<i>C. striatus</i>	Normal value
RBC (mi) lionable/en.mm	3.42 ± 0.51	3.29 ± 0.48	3.9 – 4.2
WBC (thousand cells/km.mm)	4.3 ± 0.58	4.6 ± 0.61	4.5 – 11,0
Hb g/dl	10.84 ± 0.65	9.37 ± 0.66	10 – 16
PCV %/dl	36.14 ± 0.76	34.42 ± 0.74	40 – 54
MCV µm ³	105.6 ± 0.82	104.62 ± 0.79	78 – 94
MCH Pg	24.09 ± 0.57	28.48 ± 0.58	27 – 32
MCHC % mg/dl	29.99 ± 0.41	27.22 ± 0.36	30 – 40

Haemato biochemical constituents of *C. punctatus* and *C. striatus* are directly related to their behavioral physiology^{8,13}. The maximum values of the protein in the blood of fishes are agrees earlier workers^{16,21}. The slight variation in total serum protein content between the experimental fishes were comparable with earlier observations^{12,18}. In the present study other biochemical parameters have more or less strictly followed the orders of protein, albumin, globulin, cholesterol triglyceride and glucose in *C. mirgala*³; *Cyprinus carpio*¹¹; *Labeo rohita*¹².

At the glucose content of experimental fishes showed slight fluctuation and found to be low when compare to the protein and cholesterol agrees with earlier observations^{11,17}. According to¹⁵ the blood glucose level in air breathing fish *Channa punctatus*

showed variation. There was a significant full in glucose level observed when the fish *C. punctatus* exposed to thermal stress⁴, and triazophos¹³. Cholesterol HDL and triglycerides were significantly fluctuated in *C. punctatus* and *C. striatus*, similar observations¹⁻². In *Cyprinus carpio* cholesterol value decreased significantly when the fish infected with microbes²³.

In the present study the RBC and WBC number, haemoglobin content were found to be low and slight variation due to less active and bottom living habit of these species. However protein showed higher value when compared to other compounds. Hence the study critically focused that these fishes are important sources of animal protein and good for human consumption.

References

- Mishra, N., Pandey, P.K. and Datta Munshi, S., Biochemical parameters of an air breathing mud eel *Amphipnous cuchia* (Ham.). *J. Fish Biol.*, 1977. **10**: 567-573.
- Mahipal Singh, Biochemical responses in freshwater teleost *Channa punctatus* experimental copper and chromium poinsont. *J. Environ. Biol.*, 1995. **16**: 339-341.
- Kannathasan A., Studies on certain physico-chemical parameters and biochemical characteristics of three freshwater fishes, *Aristichthys nobilis* (Richardson), *Labeo rohita* (H.) and *Cirrhinus mrigala*. M.phil thesis Bharathidasan University. 2008. 1-75.
- Dheer, J.M.S., Biochemical, haematopietric and biochemical responses to thermal stress in an air breathing freshwater fish *Channa punctatus* (Bloch.). *J. Fish. Biol.*, 1988. **32**(20): 197-206.
- Bala, S., Sinha, M.P. and Mehrutra, P.N., Toxicit of sublethal concentration of some heavy metal salts on haematology of *Channa punctatus* 3 Erythrocyte counts. *J. Freshwat. Biol.*, 1994. **6**(2): 187-190.
- Iqbal, M.J., Ali, S.S. and Shakoon, A.R., Toxicity of lead in freshwater fish *Cirrhinus mrigala* Biochemical changes. *J. Ecotoxi. Environ. Moni.*, 1997. **7**(12): 139-143.
- Bhagat, R.P. and Banerjee, V., Haematology of an Indian freshwater cel *Amphipnous cuchia* (Hamilton) Erythrocyte count related parameters with special reference to body length sex and seasons. *Compt. Physiol. Ecol.*, 1986. **2**(1): 21-27.
- Hickely, C.R. Jr., Comparative haematology of wild and captive cunners, *Trans. Am. Fish Soc.*, 1982. **111**: 242-249.
- Hymavathi and Rao, L.M., Biochemical characteristics of *Channa punctatus* under the metallic stress of cadmium. *Asian Fish. Soc. Indian Branch*, 1999. 131-132.
- Ramesh, M., Toxicity of copper sulphate on some biochemical parameters of freshwater teleost *Cyprinus carpio* (Var.). *J. Indian Fish Asso.*, 2001. **88**: 131-136.
- Anbalagan, T., Rajendran, K., Samykkannu, K., Soundarapandian, P. and Veerappan, N., The studies on biochemical parameters and enzymes of wild and farmed fish *Labeo rohita* (Ham.), *J. Aquat. Biol.*, 2008. **23**(2): 181-184.
- Abdul Naveen, P., Venkaeshwaslu and Janaiah, C., Biochemical alteration induced by triazophos in the blood plasma of fish *Channa punctatus* (Bloch.). *Annals Biol. Res.*, 2011. **2**(4): 31-37.
- Holmes, W.N. and Donaldson, E.M., The body compartments and the distribution of electricytes. In *Fish Physiology* [Hoar, W.S. and Randall, D.J. (eds.)], New York: Academic Press, 1969. **1**: 1-89.
- Goel, K. A., and Sharma, S.D., Some biochemical characteristics of *Clarias batrachus* under metallic strees of arsenic comp. *Physiol. Ecol.* 1987. **12**:63-66.

15. Khanna, S. and Singh, J., Studies on the blood glucose level in *Channa punctatus* (Bloch.). *Acta Zool.*, 1973. **52**: 97-101.
16. Raizada, M.N. and Singh, C.P., Seasonal variation in the protein composition of blood serum of freshwater fish *Cirrhinus mrigala*. *Ind. J. Zoo.*, 1980. **8**(7): 381-385.
17. Natarajan, G.M., Some blood parameter in two air breathing fishes of South India. *Comp. Physiol. Ecol.*, 1981. **6**(3): 133-135.
18. Anderson, I.G., Schaumoller, L.F., Kramer, H.L., A preliminary study on the haematology of freshwater reared seabass banamundi *Lates calcarifer*, *Asian Fish Sci.*, 1996.**9**(2): 101-107.
19. Singh, M., Biochemical responses in a freshwater teleost *Channa punctatus* to experimental copper and chromium poisoning, *J. Environ. Biol.*, 1995.**16**(4): 339-341.
20. Dharan Sing, Kamlesh Nath, S.P., Thrivedi and Sharma, Y.K., Impact of copper on biochemical profile of freshwater fish *Channa punctatus* 2008..
21. Menon, K.R., A comparative study of protein concentration of the blood plasma in some representatives vertebrates. *J. Univ. Bombay* 1952. 3.
22. Yasmin, R., Pandey, B.N. and Yasmin, A., Seasonal variation in biochemical indices with reference to the effect of water temperature in *Oreochromis mossambicus* (Peters), *J. Freshwat. Biol.*, 1993. **5**(2): 177-181.
23. Harikrishnana, R., Nisha Rani, M., and Balasundaram, C., Biochemical and biochemical parameters in common carp *Cyprinus carpio* following herbal treatment for *Aeromonas hydrophila* infection. *Aquacult.*, 2003. **221**(1-4): 41-50.
24. Nuzhat Parveen and Shadab, G.G.H.A., Evaluation of micronuclei and biochemical profiles as genotoxic assays in *Channa punctatus* exposed to malathion internation. *J. Sci. Nat.*, 2011. **2**(3): 625-631.
25. Blaxhall, P.C., Daisley, K.W., Routine biochemical methods for freshwater fish a review of selected literature. *J.Fish. Biol.* 1973. 4:593-604.
26. Welchselbam, T.E., *American J. Clin. Path.*, 1946. **16**: 40.
27. Schmidt, F.H., Methodon de Hoan, Und Blutzucker bestimmung II. Bluzuckar, Handbook desbiabetes. E.F. Pleiffer (ed.) mellitus J.F. Lehmann's Veriag. Munich., 1971. **2**: 1-938.
28. Fleg, H.M., *Ann. Clin. Biochem.*, 1973. **10**: 1350-1356.
29. Fossatip, L.P., Serum triglycerides determined colorimetrically with an enzyme that produces hydrogen peroxide. *Clini. Chem.*, 1982. **28**: 2077-2080.