



BLOOD SERUM CONCENTRATION OF PROTEIN, ALBUMIN AND GLOBULIN IN LOCALLY AVAILABLE FOUR FRESH WATER FISHES

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ARTICLE INFO

Article History:

Received 06th October, 2020

Received in revised form 14th

November, 2020

Accepted 23rd December, 2020

Published online 28th January, 2021

Key words:

Fish. Serum protein, albumin, globulin

ABSTRACT

In the normal functioning of physiology of fish, the albumin and globulin along with protein in the blood plasma is needed as albumin is required for transportation of organic substances and globulin for immunity. Their presence provides normal physiology and health condition of the fish. Hence, in the present investigation blood serum protein, albumin and globulin concentration was studied in some locally available four fresh water carp fish species to understand the differences and their significance in health condition of the fishes in an aquatic body. The fishes selected for this study are four fresh water fishes which includes three major carps such as: *Labeo rohita*, *Cirrhana mrigala*, *Catla catla* and *Pangasius bocourti*. All these fishes were collected live from local market brought by the fisherman in living condition. The blood was collected from the fishes sacrificed at the spot through hypodermic 5ml syringe and transferred to the tubes separately labelling as per fish species and brought for the determination of serum protein, albumin and globulin by applying specific methods in a laboratory. The results indicated that the serum protein concentration ranged from 4.6g/dl to 7.8g/dl, the serum albumin from 1.0g/dl to 1.9g/dl and serum globulin from 3.3g/dl to 6.6g/dl in four fish species studied. The serum protein concentration in the serum was found to be higher with less concentration of albumin and increased level of globulin as compared to albumin. The significance of these serum levels suggests that the fishes are provided with proper transportation mechanism of nutrients for growth and health condition in an aquatic body.

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INTRODUCTION

Total protein content provides information regarding a general status; more clinically useful data are obtained from fractionating the total protein. The normal serum protein level is 6 to 8 g/dl. Albumin makes up 3.5 to 5.0 g/dl, and the remainder is the total globulins. These values may vary according to the individual laboratory determinations. Among transport proteins in the blood plasma, it is known that only albumin is able to bind wide diversity of drugs reversibly with high affinity and is typically the major anionic protein in vertebrate plasma, representing more than 52% of the total plasmatic protein content (Silva *etal*; 2015). Much data about quality and structure of mammalian albumin can be found in literature (Silva *etal*;2004).However, very few information about fish albumin is available (Silva *etal*;,2010). In view of absence in the albumin in some fishes such as channel catfishes, *Anguilla* species and in eels was not detected whereas in some species of fishes it was detected. Hence, in the present study protein, albumin and globulin presence and their concentration was investigated in four types of local

fishes such as *Labeo rohita*, *Cirrhana mrigala* *Catla catla* and *Pangusius becourti* collected from local fish market in live condition. The specific technique was applied in a clinical laboratory for the determination of protein, albumin and globulin concentration in blood plasma in four types of fresh water fishes.

MATERIALS AND METHODS

The blood serum levels of protein, albumin and globulin were determined in four types of fresh water fishes such as *Labeo rohita*, *Catla catla*, *Cirrhana mrigala* and *Pangusius becourti*. The blood was collected from these four fishes by using 2cm disposable syringe and a 21 gauge disposable hypodermic needle. The blood was taken under gentle aspiration until about 2 ml has been obtained and blood serum was prepared by centrifugation and then used for the determination of protein, albumin and globulin by applying specific procedure in a clinical laboratory by spectrometric method using commercial kit available in the market.

Statistical treatment of the data

The obtained data was analyzed statistically by adopting varied statistical methods. Standard deviation and the student's- t' test was carried out to know the levels of significance using the

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standard formula. All the values of P below 5% level are designated as significant, and the values above 5% level are designated as non-significant.

RESULTS

Serum analysis of serum protein, albumin and globulin has been determined in locally available four fish species to understand their presence and differences in the concentration of fish species and their significance and assessing the health condition of the fishes in an aquatic body. The fishes selected for this study are three major carps such as: *Labeo rohita*, *Cirrhana mrigala*, *Catla catla* and another *Pangasius bocourti*. The results obtained for all these compositions in all the four fish species are presented in the table -1 and fig-1. The data indicated that the serum protein concentration ranged from 4.6g/dl to 7.8g/dl, the serum albumin from 1.0g/dl to 1.9g/dl and serum globulin from 3.3g/dl to 6.6g/dl in four fish species studied. The serum protein concentration was found to be higher with less concentration of albumin and increased level of globulin as compared to albumin. The detection of albumin and globulin of fish in the present study has indicated that their significant role in the transportation of various metabolites and other organic substances. Albumin serves in the transport of bilirubin, hormones, metals, vitamins, and drugs.

Table 1 Showing serum concentration of protein, albumin and globulin in four local freshwater fishes collected from aquatic bodies in Kalaburagi.

Name of the fish	Protein in mg/dl. (Reference Value)	Albumin in g/dl. (Reference Value)	Globulin in g/dl. (Reference Value)
<i>Labeo rohita</i>	5.2 ± 0.25 (L)	1.0 ± 0.12 (L)	4.2 ± 0.25 (H)
<i>Catla catla</i>	7.8 ± 0.15	1.2 ± 0.15 (L)	6.6 ± 0.15 (H)
<i>Cirrhana mrigala</i>	6.7 ± 0.10	1.9 ± 0.10 (L)	4.8 ± 0.20 (H)
<i>Pangasius bocourti</i>	4.6 ± 0.10 (L)	1.3 ± 0.10 (L)	3.3 ± 0.10 (H)

Each value is expressed as mean ± SD, N = 6. All values are significant P = < 0.01, H-Higher level and, L-Lower level of concentration.

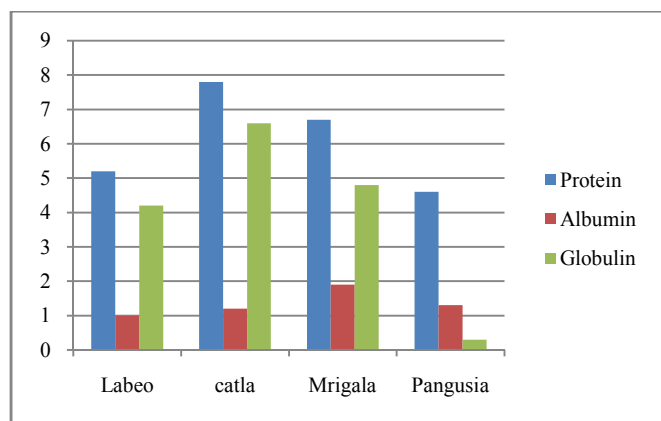


Fig 1 showing serum level of protein, albumin, globulin in four local fresh water fishes

It has an important role in fat metabolism by binding fatty acids and keeping them in a soluble form in the plasma. This is one reason why hyperglycemia occurs in clinical situations of hypoalbuminemia. The significance of these serum concentrations suggests that all these fishes are provided with proper protein nutrition in the aquatic body and albumin with globulin concentration in the blood plasma for proper transportation of variety of needed organic substances

including nutritional compositions for keeping healthy condition of fishes in an aquatic body.

DISCUSSION

Albumin serves in the transport of bilirubin, hormones, metals, vitamins, and drugs. It has an important role in fat metabolism by binding fatty acids and keeping them in a soluble form in the plasma. The binding of hormones by albumin regulates the amount of free hormone available at any time. Because of its negative charge, albumin is also able to furnish some of the anions needed to balance the cations of the plasma. Albumin is synthesized in the liver. The liver produces albumin at less than half of its capacity. The primary factors affecting albumin synthesis include protein and amino acid nutrition, colloidal osmotic pressure, the action of certain hormones, and disease states. Fasting or a protein-deficient diet causes a decrease in albumin synthesis. Thyroid hormone, corticosteroids, growth hormone, and insulin, all can increase albumin synthesis. The globulin fraction includes hundreds of serum proteins including carrier proteins, enzymes, complement, and immune-globulins. Most of these are synthesized in the liver, although the immune-globulins are synthesized by plasma cells. As per some reports true albumin was not found, in the blood serum of fresh water channel catfish, the typical albumin is not found whereas blood plasma of two eel species, *Anguilla* was not revealed to contain the protein-like protein. There are no precise proofs of the existence of typical albumin in blood of representatives of higher bony fish (Andreeva, 1999). In the fresh water representatives of carp and perch like fish there was described a complex albumin system whose major component is an albumin-like protein with mol. mass of about 67kDa (Andreeva, 1999, 2008). The albumin and globulin has been detected along with serum protein in all the four fishes studied in the present investigation by following specific methodology in a well established laboratory. The values of albumin level found in the present study were lower in all the four fishes as compared to other fishes. This variation in these compositions is important to consider that fishes form the largest group among vertebrates with a wide variability of shapes, dimensions and anatomical and also metabolic characteristics as reported (Silva *et al*; 2015). Physiologically such variability reflects in great capacity of adaptation of the group to the aquatic environmental diversity (Roberts, 1981). The fishes belonging to three major carps such as *Labeo rohita*, *Cirrhana mrigala*, *Catla catla* and another *Pangasius bocourti* are found to be well adapted in a cultured condition in an aquatic body. These fishes are mostly herbivorous, feeds on plants and other similar type of vegetarian components and it might explain the variation in the serum protein which may be related to the difference in the feeding pattern of these fishes compared to other fishes. Andreeva (2010) has reviewed the structure of fish albumins from cartilaginous fishes, crossopterygian fishes along with teleost fishes, the concentration of albumin in teleost blood plasma can substantially fluctuate, especially in the higher bony fishes like in the case of marine bony fishes is basically lower than that in fresh water fish (Lukiyanenko and Khabarov, 2005). The fluctuation of albumin level depends on the degree of species natural mobility, the character and duration of mobility, season, stage of gonad maturity and other factors (Kirsipuu and Laugaste, 1979, De Smet *et al*, 1998). In the mobile tunas the relative of albumins can reach 60% of total protein whereas in low moving gobies it does not exceed 5% (Kejvanfar,

1962). It is also reported that the seasonal dynamics of blood albumin level has feedback relation with protein synthesising activity of hepatocytes (Kirsipuu and Laugaste, 1979). The identification of albumins in teleost fish in several cases is rather difficult and this is due to typical location of mobile plasma fractions. The albumins in fish have been identified and described from salmon fish, *Salmo solar*, *Oncorhynchus tshawytscha*, brown trout, *Salmo trutta* and others and their concentration in plasma was found to be rather higher around 15mg/ml (Byrnes and Gannon, 1990, Xu and Ding, 2005). The albumin concentration in the fishes studied were found with variation in *Labeo rohita*, *Cirrhana mrigala*, *Catla catla* and *Pangasius bocourti* similarly in the few representatives of carps and perch like fish has described as a complex albumin system. An albumin like protein in the blood of carp *Cyprinus carpio* (Andrava, 2008, De Smet *et al* ;1998). In the present study all the four fishes including three major carps albumin found at different concentration. The detection of albumin and globulin in these fishes reflects their proper transport mechanism for health good condition of the fishes in the aquatic body where they are harboured or cultured.

CONCLUSIONS

Although considerable variation exists amongst the fish species for existence of albumin, our investigation shows the presence of protein, albumin and globulin in the blood serum of four fishes such as *Labeo rohita*, *Cirrhana mrigala*, *Catla catla* and *Pangasius bocourti* shows that fishes are healthy and active as they are getting proper nutritional requirement and other organic substances because of proper internal blood transportation physiology by albumin and globulin presence in the blood.

Acknowledgement

The author is thankful to Dr.K.Vijayakumar, Chairman, Dept., of Zoology, Gulbarga University, Kalaburagi for providing facility and to Indian Science Congress Association, Kolkata for awarding Sir Asutosh Mookherjee fellowship

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How to cite this article:

Kulkarni R.S (2021) 'Blood Serum Concentration of Protein, Albumin and Globulin in Locally Available Four Fresh Water Fishes', *International Journal of Current Advanced Research*, 10(01), pp. 23613-23615.
DOI: <http://dx.doi.org/10.24327/ijcar.2021.23615.4681>
