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A Comparative Biochemical Profile of Some Cyprinids Fish in Dukan Lake, Kurdistan-Iraq

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Abstract. The present study was carried out to demonstrate the baseline values for some serum biochemical parameters for 64 adult freshwater fish including seven species belong to family Cyprinidae, have been collected in Dukan Lake, Kurdistan region- Iraq. Fishes were weighed, measured, and collect blood for blood chemistry. Serum biochemical analyses were determined using (Cobas C 311) full automatic chemical analyzer. The result of comparative study of serum biochemical parameters of all *Cyprinidae* species showed that serum glucose was (459.10±106.99 mg/dl) and direct bilirubin was (0.056±0.021mg/dl) in *Barbus grypus*, serum total protein (3.511± 0.0484gm/dl) and HDL (133.11±0.4231mg/dl) in *Cyprinus carpio*, serum cholesterol (338.33±43.923 mg/dl) and LDL (86.11±11.871mg/dl) in *Carassius carassius*, serum triglyceride (420.0±28.8mg/dl) and ALK (113.93±20.65U/L) in *Chondrostoma regium*, serum AST and serum ALT in *Capoeta trutta*, were significantly higher when compared to other species. In a conclusion there is variation in biochemical values among species of same family.

INTRODUCTION

Cyprinidae has been one of the oldest domesticated families of freshwater fish and it is among the most important cultured fishes worldwide, the natural distribution of this family ranges from Europe to Asia, thus, Cyprinidae is one of the most important species of a large reservoir lake in Kurdistan region -Iraq [1].

Knowledge of biochemical parameters of native fish in Dukan Lake is important for assessing and managing their populations. Blood parameters used to diagnose fish diseases can be used to assess the physiologic status of a population. Any deviations from expected values for “healthy fish” can assess the impacts of stresses such as environmental pollution and its effects. Fishes live in the closest possible contact with their environment and are extremely dependent upon it and affected by changes in it [2,3].

Serum biochemical parameters are important aspects in the management of endangered family such as Cyprinidae. The values of these parameters can be used for confirming the sex and any changes in the quality of waters and related soils.

The objective of this study was to provide some valuable information to the field of freshwater fish hematology and determination levels of biochemical parameters of some species of this family Cyprinidae which living in natural environment.

MATERIALS AND METHODS

A number of a different biochemical tests have been analyzed such as cholesterol, glucose, total proteins, alkaline phosphatase, total bilirubin, direct bilirubin, lipid profiles, liver function tests and triglycerides [4, 5]. Serum biochemical analyses were determined using (Cobas C 311) full automatic chemical analyzer in Pharma private lab. These tests included total protein (TP: mg/dl), glucose (GLO: mg/dl), Lipid profiles (Cholesterol (CHO: mg/dl), Triglycerides, HDL, LDL, AST, ALT, Alkaline phosphatase, total serum bilirubin and direct bilirubin.

PROCEDURE

One ml of blood were taken from the heart by using direct heart pucture method and the serum was added to flexor tube and serum glucose, total cholesterol, triglyceride (TG) high density lipoproteins (HDL) concentration, total protein, AST, ALT, Alkaline phosphatase, total serum bilirubin and direct bilirubin concentration is analyzed . [6]

DETERMINATION OF LOW DENSITY LIPOPROTEINS (LDL)

The lipid profile does not measure LDL level directly but instead estimates it via the Friedewald equation:
LDL Cholesterol (mg/dl) = (Total Cholesterol - HDL Cholesterol – VLDL)
When VLDL = triglycerides (mg/dl)/ 5.

RESULTS AND DISCUSSION

The analysis of blood biochemical of the seven fish species from Dukan Lake are given in Table (1). Serum glucose level showed highest level in combined sex of *Barbus grypus* and lower level of blood glucose in *Chondrostoma regium*, this value was significantly higher than values reported previously for each of *Capoeta Capoeta* by [7,8], *Carassius carassius* [9] and *Cyprinus carpio* by [10]. Blood glucose level may vary according to season and water temperature, and glucose level in fish decreased with age and size [11]. Also, changes in blood glucose have been suggested as useful general indicator of stress in teleost [12] reported that blood glucose appeared to be a sensitive indicator of environmental stress in fish. The stress related hyperglycemia reported in many species of teleosts is mediated mainly by the effects of catecholamine's (CAs) on glucose release from the liver, the main carbohydrate store in fish with epinephrine being more potent than norepinephrine [13].

In the present study cultured carp had a highest serum total protein value than wild one and lower value had reported in *Luciobarbus xanthopterus*, and it is in accordance with [7, 14] who described an increase of plasma proteins due to an increase in the synthesis of their own immune-globulins as individuals grow and develop. According to [9,15,16] wild carp had a mean serum protein level greater than other species, and crucian carp recorded as the lower TP value. On the other hand, [17] has opined that decline in protein content may be related to impaired food intake, increased energy cost of homeostasis, tissue repair and detoxification mechanism during stress.

The previous studies showed high cholesterol level in *Carassius carassius*. This study was confirmed with findings of [16,18,19]. While in *Capoeta trutta* showed lower level of triglyceride among all other species. The results were disagreement with [15] that showed that the mean Tg level in *Capoeta* sp. was higher than other cyprinids. On the other hand, high HDL and LDL concentration were recorded in *Cyprinus carpio* and *Carassius carassius* respectively; least value was recorded in *Chondrostoma regium* and *Capoeta trutta* respectively. Hyperglycemia under stressful conditions is often accompanied by hyperglycemia (elevated blood triacylglycerol content) due to stress effects on both carbohydrate and lipid metabolism. This mechanism seems to be common in both mammals [20] and fish [21].

The present results showed that liver transaminase enzyme ALT and AST levels in *Capoeta capoeta* were significantly higher in comparing with all other species. Whereas previously stated that *Carassius carassius* had highest ALT and AST levels [9,15]. However, a few studies have suggested that plasma enzyme evaluation in fishes may not be as straightforward as it is in mammals. For example, the high ammonia levels of fish may lead to high transaminase activities; therefore, the increase in activities may be associated with liver disease or changes in plasma ammonia concentration. High activities of AST and creatine kinase (CK) also occur in muscle of fish; therefore, elevated plasma activities of these enzymes will increase following muscle injury or strenuous muscle activity associated with capture and restraint [22].

Comparing the ALK level in six species of family Cyprinidae, it has been found that *Chondrostoma regium* (113.93±20.65) were significantly higher than *Luciobarbus xanthopterus* (12.17±1.746) and *Capoeta trutta* (20.23±0.996) in agreement with [8], in *Cyprinus carpio* by [18] and in *Carassius carassius* by [23]. These observations are also in agreement with those of [24] reported no significant differences in pre-spawning and post-

spawning periods and also demonstrated that, the activity of serum ALK was a positively correlation with water temperature and pH. Similar results were obtained by [25] who reported that AP activity was positively affected by water temperature in salmon.

Statistical comparison between total and direct bilirubin among members of Cyprinidae showed no significant differences. The total amount of bilirubin in fish blood is an average value to that in humans, and other vertebrates. It ranges from trace to a few mg/dl depending on the species. The normal presence of biliverdin in some fish blood is unique among vertebrates, and it can be compensated by the elimination of the unwanted molecules through the elimination of the unwanted molecules through the gills and skin [26].

TABLE 1. Comparison of the biochemical parameters of the mixed sexes among some species of freshwater fish in Dukan Lake.

Biochemical parameters	<i>Cyprinus carpio</i> (Cultured)	<i>Cyprinus carpio</i> (Wild)	<i>Barbus grypus</i>	<i>Luciobarbus xanthopterus</i>	<i>Capoeta trutta</i>	<i>Chondrostoma regium</i>	<i>Carassius carassius</i>
Serum glucose mg/dl	190.67±0.441 ^{ab}	280.0±37.01 ^{abc}	459.1±106.9 ^c	322.0±69.1 ^{bc}	342.0±36.24 ^{bc}	96.00±17.606 ^a	326.78±55.43 ^{bc}
Serum total protein mg/dl	3.511±0.04843 ^c	2.57±0.269 ^{ab}	2.97±0.3676 ^{bc}	1.745±0.411 ^a	1.770±0.2989 ^a	3.500±0.1316 ^c	2.956±0.109 ^{bc}
Serum cholesterol mg/dl	273.78±1.382 ^{cd}	272.2±53.95 ^{cd}	270.8±26.64 ^{cd}	142.1±28.6 ^{ab}	98.50±15.557 ^a	219.0±0.966 ^{bc}	338.33±43.923 ^d
Serum Triglyceride mg/dl	181.89±0.5386 ^a	101.50±12.58 ^a	144.70±52.65 ^a	127.2±30.84 ^a	96.60±15.687 ^a	420.0±28.805 ^b	159.44±23.908 ^a
HDL mg/dl	133.11±0.4231 ^c	104.4±9.255 ^b	96.100±16.27 ^b	43.30±7.33 ^a	42.20±2.999 ^a	30.333±0.421 ^a	87.44±9.927 ^b
LDL mg/dl	59.333±0.5527 ^b	75.40±21.436 ^b	65.80±10.657 ^b	13.10±0.691 ^a	12.60±0.3399 ^a	12.667±0.211 ^a	86.11±11.871 ^b
Serum ALT U/L	48.66±0.9428 ^{ab}	34.70±8.121 ^{bc}	72.40±27.15 ^{bc}	43.50±9.611 ^{ab}	119.3±31.174 ^c	79.00±7.33 ^{bc}	11.00±1.258 ^a
Serum AST U/L	313.22±2.247 ^a	255.30±45.92 ^a	562.6±142.4 ^{ab}	798.6±89.74 ^b	1193.7±201.7 ^c	663.0±51.31 ^{ab}	372.33±50.062 ^a
Alkaline phosphatase U/L	67.422±0.3345 ^c	58.58±8.309 ^c	45.80±4.859 ^{bc}	12.17±1.746 ^a	20.23±0.996 ^{ab}	113.93±20.65 ^d	37.533±3.573 ^{abc}
Total Bilirubin mg/dl	0.0178±0.0022 ^a	0.022±0.0044 ^a	0.026±0.0075 ^a	0.015±0.003 ^a	0.018±0.0041 ^a	0.0167±0.004 ^a	0.0211±0.0031 ^a
Direct bilirubin mg/dl	0.0322±0.0049 ^{ab}	0.022±0.0036 ^a	0.056±0.0217 ^b	0.025±0.003 ^a	0.019±0.0031 ^a	0.030±0.003 ^{ab}	0.0233±0.0066 ^a

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