

Full Length Research Paper

Determination of some biochemical values in the blood of *Liza klunzingeri* from the coastal water of the Persian Gulf

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Serum biochemical values can be used for monitoring any change in the fish physiological condition and water quality. The aim of this paper was to determine plasma sugar, triglycerides, cholesterol, iron, alkaline phosphatase (ALP) and lactate dehydrogenase (LDH) levels of *Liza klunzingeri* from the Persian Gulf. Blood sample was collected from the caudal vessel with syringes coated with sodium heparin. Biochemical values were: sugar 110.37 ± 28.46 mg/dl, triglycerides 96.82 ± 23.40 mg/dl and cholesterol 177.28 ± 40.75 mg/dl, iron 104.74 ± 19.08 mg/dl, ALP 117.62 ± 34.49 u/l and LDH 1613.00 ± 345.34 u/l. A significant positive correlation ($P < 0.01$) was found between triglycerides and sugar. Triglycerides had a significant and positive relationship with cholesterol ($P < 0.01$). ALP also had a significant and positive relationship with sugar ($P < 0.01$) and triglycerides ($P < 0.05$). LDH correlated positively with sugar, cholesterol, triglycerides ($P < 0.01$) and ALP ($P < 0.05$). The results revealed reverse correlation between iron and cholesterol, sugar, triglycerides, ALP, and LDH ($P < 0.01$). This study contributes to the referential biochemical values of the *L. klunzingeri*. In further studies, the established reference ranges might be useful for the health assessment of this species.

Key words: *Liza klunzingeri*, blood, alkaline phosphatase (ALP), lactate dehydrogenase (LDH).

INTRODUCTION

The mullets are a family (Mugilidae) of ray-finned fish found worldwide in coastal tropical waters. The abundance of grey mullets in estuarine and coastal areas of all tropical and sub-tropical regions of the world may be related to their food and feeding habits, as they occupy a relatively low position in the food web (Wright, 1988). The family Mugilidae has an important role in commercial fisheries and aquaculture worldwide. Klunzinger's mullet (*Liza klunzingeri*) is an important resource in the Persian Gulf and Oman Sea. In Hormozgan province, the total catch was 230 tons in the

2009-2010 fishing season. *L. klunzingeri*, formerly known as *Liza carinata* is caught commercially using beach seines and stake traps (Abou-Seedo et al., 2002). Blood is known to exhibit pathological changes before the onset of any external symptom of toxicity. Fish blood is a pathophysiological indicator of the whole body function and therefore blood parameters are important in diagnosing the structural and functional status of fish exposed to a toxicant (Sampath et al., 1998). Fish blood is being studied increasingly in toxicological research and environmental monitoring as a possible indicator of physiological and pathological changes in fishery management and disease investigations (Mulcahy, 1975; Bansal et al., 1980).

The possibility of evaluation depends on the availability

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of reference values as close as possible to normal values of the various blood components considered as reliable descriptors of healthy fish under natural conditions (Cataldi et al., 1998). Determination of these parameters may also be useful in assessing any changes in water quality, related soil quality and fish response as well (Darvish Bastami et al., 2010). *L. klunzingeri* is native to the Arabian Sea, Indian Ocean, Gulf of Oman and Persian Gulf (Randall, 1995). It is therefore a shared marine fish stock. Unfortunately, there is no published data on blood characteristics of *L. klunzingeri* locally or regionally. Such information would provide a better understanding of the life history and physiological mechanisms of this species. The objective of this study was to investigate the biochemical values of healthy *L. klunzingeri*.

MATERIALS AND METHODS

L. klunzingeri were captured from Persian Gulf in 2011. Each fish was quickly caught and while it was physically restrained, a blood sample was collected from the caudal vessel with syringes coated with sodium heparin. These samples were used for determining the biochemical parameters. For blood plasma assessment, tubes were centrifuged for 5 min at 3,000 rpm. Then, glass tubes were broken, and the resultant blood plasma was emptied into sterile micro tubes for further analysis. The serum samples were analyzed using an auto-analyzer (Technicon, RA1000, USA) and commercial kits (Pars Azmoon, Tehran, Iran). The measuring methods were: alkaline phosphatase (ALP) with the DGKC (Deutsche Gesellschaft für Klinische Chemie) method, lactate dehydrogenase (LDH) with the DGKC (P-L) method. Serum biochemistry determinations included glucose, cholesterol and triglycerides which were made using an autoanalyser (Cobas Integra System, France).

Statistical analysis

Data normality was evaluated by applying the Kolmogorov–Smirnov test. For each normally distributed parameter analyzed, the mean and standard deviation were calculated. In addition, Pearson's coefficient was used for linear correlation (r) between variables at $P < 0.05$.

RESULTS

In order to establish reference ranges, the fish were subjected to an external examination and healthy fish was used. The average weight and length of fish sampled were 25.35 ± 5.30 g and 129.24 ± 9.76 mm, respectively.

Average, minimum and maximum plasma parameters of *L. klunzingeri* are given in Table 1. According to the results presented in Table 1, the values of cholesterol, sugar, iron and triglycerides showed the highest to the lowest content in blood plasma of Klunzinger's Mullet, respectively. LDH content was higher than ALP. As shown in Table 2, representing the relationships among studied factors in serum, cholesterol was positively correlated with sugar ($P < 0.01$). A significant positive correlation ($P < 0.01$) was found between triglycerides and sugar. Triglycerides had a significant and positive

relationship with cholesterol ($P < 0.01$). ALP also had a significant and positive relationship with sugar ($P < 0.01$) and triglycerides ($P < 0.05$). LDH correlated positively with sugar, cholesterol, triglycerides ($P < 0.01$) and ALP ($P < 0.05$). The results revealed reverse correlation between iron with cholesterol, sugar, triglycerides, ALP and LDH ($P < 0.01$).

DISCUSSION

The study of blood parameters is one of the most valuable diagnostic tools because it has been shown that the physiological values of these parameters are species-specific and age-dependent (Anver, 2004; Darvish Bastami et al., 2009). One of the difficulties in assessing the state of health of natural fish populations has been the paucity of reliable reference ranges of the normal condition. To achieve this goal, many fish physiologists have turned to studies of hematology, probably because this area has proved to be a valuable diagnostic tool in evaluating health. Although fish hematology continues to offer the potential of a valuable tool, progress in establishing normal range values for blood parameters has been slow, and literature in this area is inaccessible and often incomplete. The biochemical profile can also provide important information on the condition of the organism (Anver, 2004). Accordingly, hematology and serum biochemistry data are of immense importance to help managers monitor the health of both captive and wild population of these species, especially in fisheries management programs. The use of a biochemical approach has been advocated to provide an early warning of potentially damaging changes in stressed fish. In toxicological studies of acute exposure, changes in concentrations and enzyme activities often directly reflect cell damage in specific organs (Casillas et al., 1983).

Cells contain various enzymes that are related to the function of the cell. ALP is one of the first of the clinically important enzymes identified. The liver produces more ALP than the other organs or the bones. Some physiological conditions, such as liver and skeletal disorders, result in large amounts of ALP appearing in the blood. Our results show that ALP range was 71 to 174 u/l in *L. klunzingeri*.

LDH catalyzes the conversion of lactate to pyruvate. This is an important step in energy production in cells. Many different types of cells contain this enzyme. Some of the organs relatively rich in LDH are the heart, kidney, liver and muscle. The LDH level in red blood cells is 150-fold higher than that in plasma. As cells die, their LDH is released and eventually finds its way into the blood. This enzyme is also present in fish. In *L. klunzingeri*, we reported that LDH range is 165 to 2235 u/l. Glucose, triglycerides, cholesterol, urea, uric acid and creatinine are major degradation products and indicators of carbohydrate, lipid and protein metabolism (Kaplan et al., 1988). In *L. klunzingeri*, minimum and maximum sugar,

Table 1. Biological and biochemical parameters (mean and standard deviation) and range in *L. klunzingeri*.

Parameter	Total length (mm)	Forked length (mm)	Weight (g)	Sugar (mg/di)	Cholesterol (mg/di)	Triglyceride (mg/di)	ALP (u/l)	LDH (u/l)	Iron (mg/di)
Mean	129.24	119.13	25.35	110.37	177.28	96.82	117.62	1613.00	104.74
Std. deviation	9.76	9.18	5.30	28.46	40.75	23.40	34.49	345.34	19.08
Minimum	105.00	95.00	13.27	70.00	115.00	55.00	71.00	165.00	71.00
Maximum	151.00	140.00	48.77	155.00	241.00	136.00	174.00	2235.00	139.00

Table 2. Correlation between biological and biochemical parameters in *L. klunzingeri*.

Parameter	Total length	Forked length	Weight	Sugar	Cholesterol	Triglycerides	ALP	LDH
Forked length	0.971**							
Weight	0.829**	0.835**						
Sugar	0.032	0.031	0.090					
Cholesterol	0.007	0.014	-0.001	0.312**				
Triglycerides	-0.020	-0.027	-0.020	0.403**	0.943**			
ALP	-0.007	-0.016	0.051	0.952**	0.132	0.249*		
LDH	0.063	0.067	0.057	0.419**	0.923**	0.891**	0.247*	
Iron	-0.043	-0.038	-0.087	-0.907**	-0.470**	-0.548**	-0.847**	-0.561**

**Correlation is significant at the 0.01 level; *Correlation is significant at the 0.05 level.

triglycerides, cholesterol and iron were: 70 to 155, 55 to 136, 115 to 241 and 71 to 139 mg/di, respectively.

Blood parameters among fish species may be affected by sampling technique, analyses methods, age, habitat and diet (Sakamoto et al., 2001). Therefore, values reported here will be useful for the early detection, identification and monitoring of diseases and sublethal conditions in this species.

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