



Study of some Biochemical Parameters in liver of fresh water fish *Liza abu* (Heckel,1843) in Shatt Al-Arab River

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Abstract

This study aimed to assess the influence of the environment on fish health . Samples of *Liza abu* fish were collected from four sites near some pollution sources in Shatt Al-Arab river / south of Iraq . Determination of glycogen , proteins and lipids contene in liver and GOT and GPT enzymes activity in blood plasma were carried out .The results showed that the biochemical changes induced in the liver were mainly represented by decrease of the glycogen, proteins and lipids content, as will as , GOT and GPT enzymes of fishes from Khandic canal and Shatt Al-Arab river (site 3) compared with other sites. significant different Of biochemical parameters of fishes from near the Al-Najibya power sites 1, and near of the electric power sites 2 ,were recorded compared with Mashab station site 4.

Key words : *Liza abu*, Glycogen , Proteins , Lipids , GOT , GPT .

1- Introduction

Fish are generally considered as a good model organisms for monitoring of the aquatic environment, since they are present in virtually all aquatic environments, and many species have been found to be very susceptible to environmental pollutants (van der Oost *et al.*, 2003). In addition, fish play a central role in aquatic ecosystems. Hence,

understanding toxic responses in fish is of high ecological relevance. Biomarkers are currently used in environmental monitoring as “early warning” signals. A biomarker can be defined as a “change in a biological response (ranging from molecular through cellular and physiological responses) that can be related to exposure to or toxic effect of environmental chemicals” (Peakall,

1994). Fish population are susceptible to environmental impact caused by the introduction of exotic species, industrial waste, oil spills, pesticides and other agents that directly affect ecology and the survival of species. Methods diagnosis and monitoring the quality of life of these populations ought to be used (Alam and Morghan, 1995). In freshwater there was only few studies have been done using of biomarker as indicator to aquatic environment pollution (Pawert *et al.* 1998), however, the rivers is often carry high burdens from pollutants by the different pollution sources is locate near these rivers such as factories, agriculture areas, electric power stations and sewage water, however most pollutants often spill directly into water without any treatments (Al-Sabonchi 1998). Toxic effects of organic products regarded as pollutants upon the biochemical and physiological system of an organism can be assessed through the study of cellular and sub cellular morphological alterations (Meyer *et al.*, 1998). Some of the aquatic pollution is in the form of sub-lethal pollution, which results in chronic stress conditions that have negative effect on aquatic life (Mason, 1991). The stress response is characterized by physiological changes and the effect of pollutants on fish is assessed by acute and chronic toxicity tests (Heath, 1991).

Aim of study to used some the physiological parameter as biomarker of aquatic pollution in some local environmental.

2-Materials and Methods

Specimen Collection in October 2010 from Forty Adult of the freshwater fish, *Liza abu* were collected from four sites from Shatt Al-Arab river (Figure 1) :-

1- 10 fish were collected from site 1 near the Al-Najibya power in deer /Basrah / Iraq .

2- 10 fish were collected from site 2 is the near of the electric power station / Basrah / Iraq .

3- 10 fish were collected from site 3 near the meeting between the Khandic canal and Shatt Al-Arab river.

4- 10 fish were collected from site 4 Mashab station. The size and weight of the fishes were ranged from (14 ± 0.9) cm and (32.5 ± 1.95) gm respectively .

These Fishes were brought to the laboratory and kept overnight in water alive in glass aquaria (40 X 30 X 30 cm) .

Blood Sampling and Analysis

Fish were sacrificed and liver tissue was removed, the tissues were then blotted and weighed before homogenization. They tissues were homogenized using a glass homogenizer with chilled distilled water and were centrifuged at 10,000 rpm for 15 minutes. The GOT and GPT concentrations was determined in blood according of Reitman and Frankel (1957). Glutamate-

oxaloacetate transaminase (GOT) and glutamate-pyruvate transaminase (GPT) from the supernatant was determined according to Reitman and Frankel (1957). The Liver content of the Glycogen, Lipids and proteins were estimated by (Kemp and Andrienne 1954; Erichson 1993; Lovell , 1979).

Statistical analysis

The result of present study were analyzed according to ANOVA and CRD

test at the significant level ($p < 0.05$) AL-Zogbi and AL-Tlafa(2000). The similarity between stations was calculated according to Jaccard similarity coefficient, using SPSS software (version 11, 2001), statistical, and peanel correspondence analysis (PCA) Assessment relationship between Biochemical factors with study stations correlation used program canoco (TerBrak,1995).

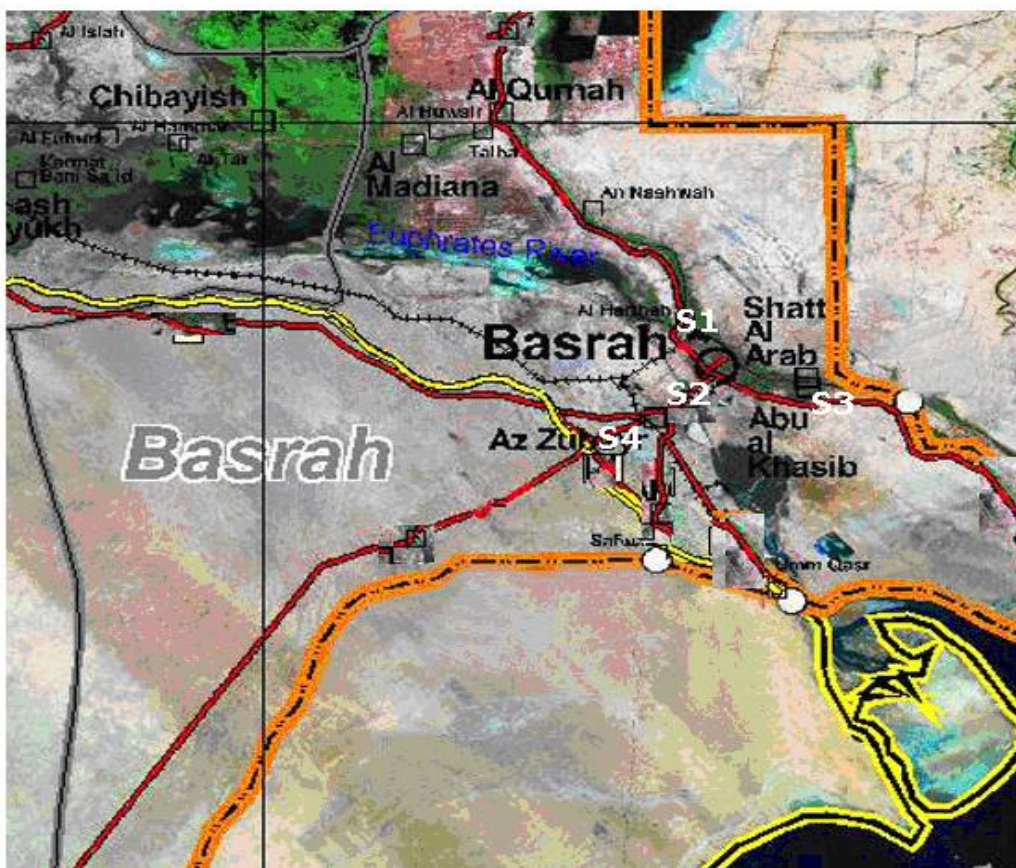


Figure (1) sample station in Shatt- Al Arab River

3- Results

The glycogen , proteins and lipids content in liver showed that there was significant between individuals collected from the different areas (table,1) in liver glycogen of fish was recorded the lower value for site 3 was showed significantly increase ($P \leq 0.05$) in liver glycogen compared with other sites, while site 2 was recorded the higher values.

Content of liver proteins in site 1 was showed significantly decrease ($P \leq 0.05$) compared with other sites , while did not found any significantly different ($P \geq 0.05$) between sites 2 and 4 , However the lower rates for proteins content was showed in site 1 while the higher rates was recorded in site 4.

Content of liver lipids in site 3 was showed significantly decrease ($P < 0.05$) compared with other sites , while other sites, don't showed significant different between them ($P > 0.05$),however content the lower was show in site 3 , while was in site 4 the higher values compared with other sites.

The similarity dendrogram between the sites for biochemical factors for the infected fishes that were taken (figure, 2)

shows two main groups. Group I consists Site2 and Site4 of a similarity level 98% , Group II, also consists Site1 and Site3 of a similarity level 98%, The cluster analysis explains the sites and Similarity level with Glycogen , proteins and lipids content in fish liver of *Liza abu* in sites.

The result showed significant positive correlation between site 2 and 4 while Lipids content show positive significant correlation with site 2 $r=0.11$,while wee king positive correlation in site 4 $r=0.09$.

Proteins percentage also appeared wee king positing correlation with site 2 $r=0.12$ and significant positing correlation with site 4 $r=0.20$.

The Glycogen showed significant Negative correlation with site1 $r=0.1$, while don't appear any significant correlation with site 3 and 4 (Figure .3).

Table (2) showed the GOT and GPT activity enzymes in blood plasma Of fish collected from sites 1 , 2 , 3 and 4 .

Levels of GOT and GPT enzymes in site 1 and 3 were significantly differences($P < 0.05$) compared with the other sites .

Table (1) Glycogen , proteins and lipids content in fish liver of *Liza abu* collected from different sites on Shatt Al-Arab River

Parameters	Stations			
	Sites 1	Site 2	Site 3	Site 4
Glycogen mg\g	3.58	3.88	1.77	2.99
	±	±	±	±
Proteins %	0.08	0.07	0.05	0.05
	50.75	66.43	53.8	69.8
Lipids %	±	±	±	±
	6.4	3.0	2.98	3.05
	2.85	3.11	2.05	3.25
	±	±	±	±
	0.098	2.05	0.048	0.06

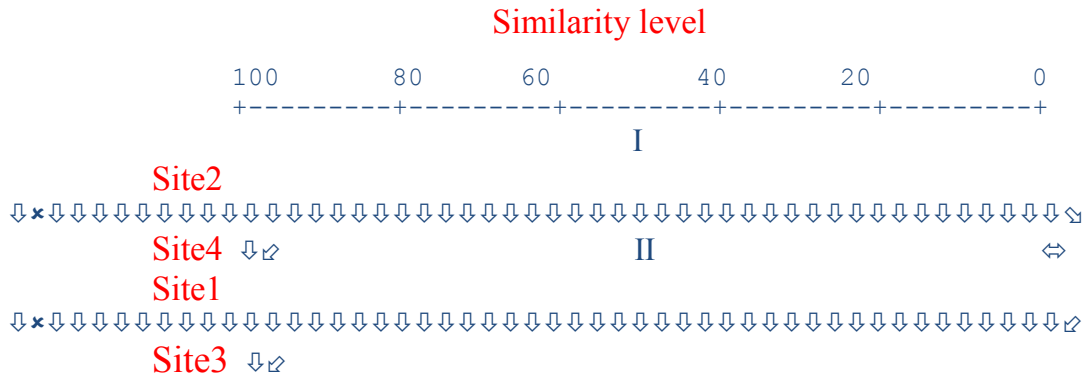


Fig.(2) Similarity dendrogram between sites with Glycogen , proteins and lipids content in fish liver

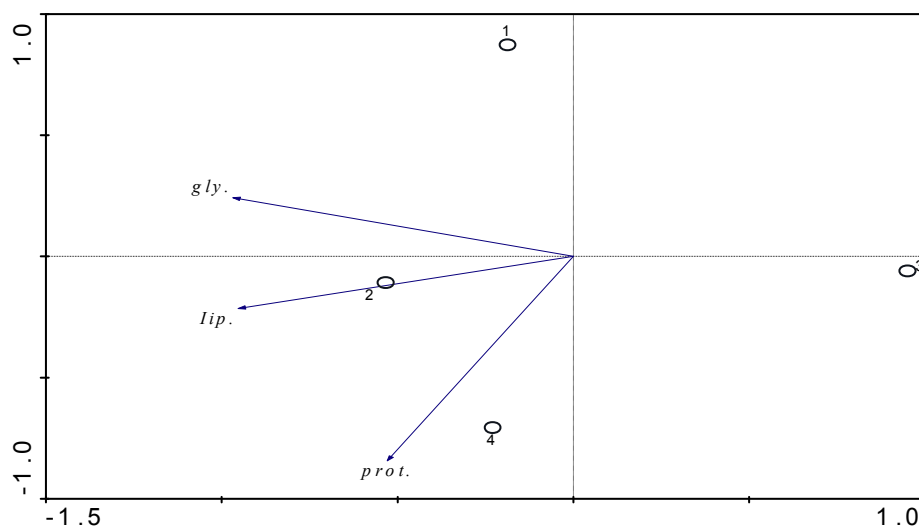


Fig.(3) principal correspondence analysis for Assessment relationship of correlation between Glycogen , proteins and lipids content in fish liver of *Liza abu* and study sites

Table (2) GOT and GPT levels in blood plasma of *Liza abu* collected from different sites on Shatt Al-Arab River.

parameters	Stations			
	Site 1	Site 2	Site 3	Site 4
GOT	4.99 ± 0.88	4.00 ± 0.56	6.76 ± 0.77	4.00 ± 0.81
GPT	11.65 ± 0.94	9.88 ± 1.21	15.99 ± 1.50	11.10 ± 1.2

4-Discussion

In present study show in rates of Physiological parameters in fish *Liza abu* collected from sites 1 , 2 , 3 and 4 , however , site 2 and 3 were recorded the higher and lower rates respectively in glycogen ,and

may be certain correlation relationship PCA with station 3 ,4 don't appear any significant correlation, proteins and lipids of liver , while , GOT and GPT enzymes were showed the lower and higher rates respectively compared with other sites .

Any pollution, either physical or chemical, cause changes to the quality of the receiving waters (Nchumbeni *et.al* 2007; Sanders, 1997). and the addition of toxic substances which can have either acute or chronic effects on aquatic organisms (Roy,2002 ; Sanders, 1997). According to Mason (1991), heavy metal pollution is one of the five major types of toxic pollutants commonly present in surface waters. The important environmental pollutants are those that tend to accumulate in organisms, those which are persistent because of their chemical stability or poor biodegradability, and those which are readily soluble and therefore environmentally mobile (Steven *et.,al* 1972; Sanders, 1997). Heavy metals possess all of these characteristics and are one of the major contributors to the pollution of South Africa's natural aquatic ecosystems (Sanders, 1997). The liver have a play amajor role in detoxification lipids soluble compounds, so that it will be affected by many pollutants which it will cause rapid changes in hepatocytes, also it will cause damage in normal function (Rez, 1986), many of physiological and biochemical parameters is effected by pollution levels in aquatic environmental ,such as the GOT and GPT enzymes consider very sensitive toward the aquatic contaminations for that many of studies used of as biomarkers or bioindicator for determination the pollution in aquatic environmental (Mason ,1991) In fact, the

stressor which it result by the exposure to different contaminations may cause increase in glycogenolysis process because the need to excess energy demands (Hamilton *et al.*, 1998), while , the decrease of protein content may be caused by the increase of proteolysis process after the directly contact with aquatic pollutants (Alam and Morghan, 1995), however , the decrease of lipid content usually result of cytotoxicity because of directly effect of aquatic pollutants on plasma membranes in hepatocytes, which will results damage in oxidation and hydrolysis process and oscillation in lipids content (Viarengo, 1989) .the present study showed the site 3 is more pollution compared with other sites.

5- References

- Alam, M. K. and Morghan, O. E. (1995) . Acute toxicity of heavy metals to common carp (*Cyprinus carpio*) . J. Environ. Sci. Health , Part A 30(8) : 1807-1816.
- AL-Sabonchi, A. A. (1998) . Benthic algae as biological indicator for pollution in the Shatt- Al-Arab River and some of its canal . Ph.D. Thesis , Collage of agriculture , University of Basrah , PP: 108 .(in Arabic).
- AL-Zogbi ,Mohamed Jalal and AL-Tlafaha, Abbas(2000) Significant system SPSS understanding significant data analysis .158pp. .(in Arabic).

- Erickson, M. C. (1993) Lipid extraction from channel catfish muscle: Comparison of solvent systems. J. Food Sci., 58: 84-89 .
- Hamilton, D. P. ; Malik, D. S. and Sastry, K. V. (1998) . Effects of zinc toxicity on biochemical composition of muscle and liver of murrel (*Channa punctatus*) . Environ. Inter. 24(4): 433-438 .
- Heath,A.G.(1991). Physiological effects of contaminate. Dynamics on fish. Ib. aquatic toxicology-J. Biochem 213p.
- Kemp, A. and Andrienne, J. M. K. V. A. (1954) .A calorimetric micro method for determination of glycogen in tissue. Biochem. J., 56: 646-648 .
- Lovell, R. T. (1979). Formulating diets for aquaculture species.J. Food sci, 51: 29-32 .
- Meyer, M. S. ; Johnson, L. L. ; Collien, T. K. ; Stein, J. E. and Varanasi, U. (1998). Toxipathic hepatic lesion in subadult English sole (*Pleurinectes vetulus*) from Puget sound, Washington, USA: Relationship with other biomarker of contamination Exposure. Marine Environmental Research,45:(1):47–67
- Mason, J.M. (1991) A direct measure of the uptake efficiency of axenobiotic chemical across of gills of rainbow trout.comp.Biochemi,Physiol.77(3):85-99.
- Nchumbeni, H. ; Reza, D.B.G. and Bhavita, C. (2007). Effect of Arsenic on the enzymes of the Rohu carp, *Labeo Rohita* (Hamilton, 1822). Raff. Bull. Zool., 14: 17 – 19 .
- Peakall,A.S.(1994) Cardiovascular and respiratory changes during heat stress in rainbow trout (*Salmonella. gairdneri*). Journal Biology.69:243-255p.
- Pawert, M.; Muller, E.; and Triebakon, R. (1998). Ultrastructural changes in fish gills as biomarker to assess small stream pollution. Tissue Cell, 30: 617-626. .
- Reitman, S. and Frankel, S. (1957) . Calorimetric method for determination of serum alanine and asparatate aminotransferase . Amer. J. Path., 28 : 56-62.
- Rez, G. (1986) . Electron microscopic approaches to environmental toxicity . Acta. Biol. Hung., 37 : 810 .
- Roy, S. S. (2002). Some toxicological aspects of chlorpyrifos to the intertidal fish *Boleopthalmus dussumieri*. Ph.D. thesis, University of Mumbai, India. 52-71 Pp.
- Sanders, B. M. (1997). Stress proteins in aquatic organisms : an environmental perspective. Crit. Rev. Toxicol. , 23 : 49 – 75 .
- Steven,E.D.;Bennion,G.R.;Rendall,D.J.and Shelton,G.(1972) Factors affecting arteries pressure and flow blood from

- the heart in intact unrestrained lingcod *Ophiodon elongates*. Comp. bioch. physiol. 45:681-695.
- TerBraak.C.J.F(1995)Ordination.In:R.H.G.Jongman,C.J.F.terbraak,O.F.R.VanTorge rn(eds),Data Analysis in Community and Landscape Ecology. Cambridge University press.91-173.
- Van Der Oost, H; Paker, H.M; Smith, A.A (2003) Partical clinic biochemical 4th (William,H.ed) Medical book Ltd, London 40-45pp.
- Viarengo, A. (1989) . Heavy metals in marine invertebrates: Mechanisms of regulation and toxicity at the cellular level . Rev. Aquat. Sci. , 1: 295-317

دراسة بعض القياسات الكيموحيوية في كبد اسماك الخشني (*Liza abu* (Heckel,1843) المصادرة من مياه شط العرب

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الخلاصة

هدفت الدراسة الحالية في تقييم تأثير المتدفقات الصناعية في مياه شط العرب على مستوى التقييم الصحي لأسماك المياه العذبة *Liza abu* المصادرة من أربعة مناطق تقع قرب بعض من مصدر التلوث الصناعي في نهر شط العرب – جنوب العراق. تم قياس مستوى كلايوجين وبروتين ودهون الكبد فضلا عن مستوى تركيز إنزيمي GOT و GPT كان قد اختبرت وقد سجل خلالها انخفاض بعض المتغيرات المدروسة في المحطة الثالثة التي تكون بين نهر الخندق وشط العرب مقارنة مع المواقع الأخرى . بينما سجلت المحطتين الأولى القريبة من معمل الورق والثانية القريبة من محطة النجيبية الكهربائية بعض التغيرات المعنوية مقارنة مع محطة السيطرة الرابعة محطة المسحب.