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Lipid peroxidation and enzymatic activity levels in *Corbicula fluminalis* from two sites of Shatt Al-Arab

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***Abstract*—A suite of biomarkers including Lipid peroxidation (LP), activities of Superoxide dismutase (SOD) and Catalase (CAT) enzymes were studied in gills and digestive glands of *Corbicula fluminalis* from two sites of Shatt Al-Arab (Qurna & Al-Maaqil regions). The values of LP, SOD and CAT were higher in gills as well as in digestive glands in *Corbicula fluminalis* from Al-Maaqil as compared with that animal from Qurna region, these indicators gave the impression that AL-Maaqil region was exposed to pollutants which lead to rising antioxidant levels in clam Corbicula fluminalis.**

Keywords—Lipid peroxidation; Superoxide dismutase; Corbicula fluminalis

I. INTRODUCTION

Mussels are filter-feeding invertebrates able to bioconcentrate many chemical pollutants. Beside estimation ofxenobiotic concentrations within their tissues, responses of biochemical parameters Biomarkers have been measured to assess early effects of pollution on seawater ecosystems in biomonitoring programs to freshwater ecosystems. In this sense, several freshwater bivalves, such as *Unio tumidus* [1], *Dreissena polymorpha* [2] or *Corbicula fluminea* [3] have proven to be potential bioindicators. The Shatt Al-Arab passes two major industrial agglomerations, the Iraqi port of Basrah and the Iranian port of Abadan before emptying into the Gulf. Several grey literature reports indicate that the City of Basrah is a major source of a cocktail of pollutants from power stations, paper industry, oil refineries, petrochemical industry, chemical fertilizer companies and the sewerage system, which eventually discharge into the Shatt Al-Arab waterway. Trace metal pollutants [4], hydrocarbon [5, 6] and pesticides [7, 8, 9]. overfishing application of pesticides [10, 11, 12, 13] were encountered in the waters of Shatt Al-Arab. While an organism is subjected to chemical, physical and biological (i.e. pathogen infection) stress, sudden shortage of oxygen causes abnormal oxidative reactions in the aerobic metabolic pathways, resulting in the formation of excessive amounts of singlet oxygen [14] and other reactive oxygen species (ROS). ROS can impair lipids, proteins, carbohydrates and nucleotides [15], which are important parts of cellular constituents, including membranes, enzymes and DNA. Organisms have antioxidant enzymes that can intercept ROS protecting molecular targets against oxidative injury. Superoxide dismutase (SOD; EC 1.15.1.1) is a kind of metal enzyme, which occurs in virtually all O_2 respiring organisms. SOD plays an important role in defending against superoxide anion toxicity and radioactive risk [16]. Catalase is a common enzyme found in nearly all living organisms that are exposed to oxygen, where it functions to catalyze the decomposition of hydrogen peroxide to water and oxygen [17].

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II. MATERIALS AND METHODS

Adult specimens of the *Corbicula fluminalis* (with median average length 60 – 70 nm), were collected from Gurna region (31° 0'19.07"N 47°26'28.10"E) and Al-Maaqil region (30°33'26.61"N 47°48'11.19"E) Fig 1. The animals were transported to the laboratory in freshwater from the collection site and they were hustled out of water then stored in deep freezer until they were submitted for experiments. A sample 0.5g of foot and digestive glands were homogenized in 2ml (1:4 W: V) of 0.05mM phosphate buffer at pH 7.5 by using tissue grinder. The homogenate was centrifuged at 5000 X g for 30 min. The supernatant obtained was used for the determination of lipid peroxidation and other enzymatic assays. Lipid peroxidation was evaluated by the formation of the pink color, occurred during the reaction of thiobarbituric acid (TBA) with malondialdehyde (MDA) as described by Burtis & Ashwood, (1999) [18]. SOD activity was determined by the use of riboflavin/NBT (nitrobluetetrazolium) method [19], in this

Fig. 1. Sampling sites

assay, the SOD activity in the sample can be expressed as RU(riboflavin/NBT assay unit)/ml. Catalase (CAT) activity was measured by the decrease in absorbance due to H_2O_2 consumption [20], enzyme activity was expressed as the rate constant of first reaction (K)/U.

All data estimations were carried out by statistical analysis SPSS program, ver. 17, Anova -test ($p < 0.05$).

III. Results and Discussion

Levels of antioxidant markers (lipid peroxidation (LP), superoxide dismutase (SOD) and catalase (CAT)) were studied in gills and digestive glands of the clam *Corbicula fluminalis* from two sites (Qurna & Al-Maaqil regions). The LP concentration was significantly higher in digestive glands than in gills with clam from Qurna ($P<0.05$), while the LP was increased from 4-3 times ($P<0.05$) in gills as well as in digestive glands of clam from Al-Maaqil region as compared with that from Qurna, but there are no significant differences in LP between gills and digestive glands were found in clam from Al-Maaqil Fig. 2. The present study was revealed an increase in activity of SOD and CAT ($P<0.05$) in gills and digestive glands in clam from Al-Maaqil region when compared with corresponding animal from Qurna region Fig. 3 and 4. Exposure of aquatic organisms to pollutants can promote an increase in the rate of ROS/RNS production, thus the assessment of oxidative stress-related parameters in specific sentinel organisms could be included in environmental pollution monitoring studies to predict the impact of pollutants present in the environment [21, 22, 23]. The results of this study confirm that increasing of antioxidant level in clam *Corbicula fluminalis* collected from Al-Maaqil region in relation to that from Qurna region. many of studies revealed that the exposure of clams to pollutants were the main reason of increasing antioxidant levels as response to oxidative stress [24[, all these indicators gave the impression that AL-Maaqil region was exposed to pollutants which lead to rising antioxidant levels in clam *Corbicula fluminalis*. Reference [5] estimated that Shatt Al-Arab River transports about 48 tons of oil residues to the Gulf annually. The sediment of the Shatt Al-Arab and immediate offshore environment of the northern Gulf displays a wide range of concentrations between 0.4 to 44.0 µg/g petroleum hydrocarbons (expressed as Kuwait crude oil equivalents) [8]. Hydrocarbons may enter the river system at low levels from domestic and industrial effluents, agricultural runoff, navigation and transportation, and also from atmospheric fall-out [25]. Reference [26] reported an average deposition rate of aeolian dust in the NW Gulf to amount to one mm/per year. A few studies were conducted on the distribution of petroleum residues and PAHs in the sediments of the Shatt Al-Arab River and the NW Gulf [27, 28], These studies indicate elevated levels of PAHs in the surficial sediments of the Shatt Al-Arab River and in the northern Gulf due to oil refinery activities in Iraq, port facilities, shipping operations and dredging of navigational channels. Reference [27] reported mean petroleum hydrocarbon concentrations (> 20 µg/g), near port areas (Basrah, Abadan and Fao) and in the Iraqi side of Khor Abdulla (mean of 22 µg/g Kuwait crude oil equivalents). Several agricultural and industrial developments and facilities exist along the Shatt A-Arab river banks [29], Their waste waters are a source of metal pollution. Trace metals are also contributed to the river through aeolian dust. There are diverse views on the level of pollution in the Shatt Al-Arab sediments [29]. Organochlorine pesticides enter the Shatt Al-Arab River through drainage from farmed lands of the Tigris and Euphrates basin, either adsorbed onto particulate matters or dissolved. Eventually, most contaminated particles settle to the Shatt Al-Arab sediments and only minor amounts are transported to the Gulf. Reference [7] reported that Hor Al-Hammar Lake and associated marshes in southern Iraq was sprayed with DDT and Aldrin-Dieldrin during 1950 and 1976, in their study they observed high concentrations of DDT residues. Reference [30] confirmed that residues of DDT were found in the oyster *Pinctada magratifera* which were collected from the coast of Kuwait and attributed that to the input from the Shatt Al-Arab River.

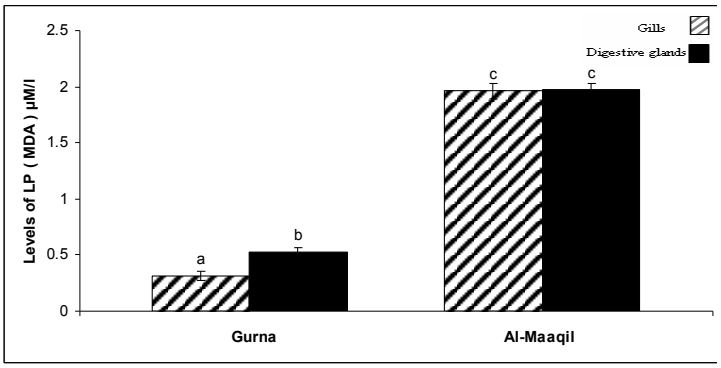

Fig. 2. Levels of lipid peroxidation in the gills and digestive glands of Corbicula fluminalis from Qurna and Al-Maaqil regions. Values indicate the mean±S.D. (n=10). Different letters indicate significant differences ($p<0.05$).

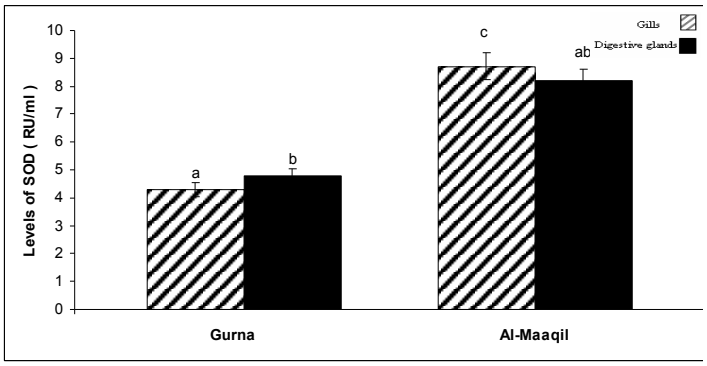

Fig. 3: Superoxide activity in the gills and digestive glands of Corbicula fluminalis from Qurna and Al-Maaqil regions. Values indicate the mean±S.D. (n=10). Different letters indicate significant differences ($p<0.05$).

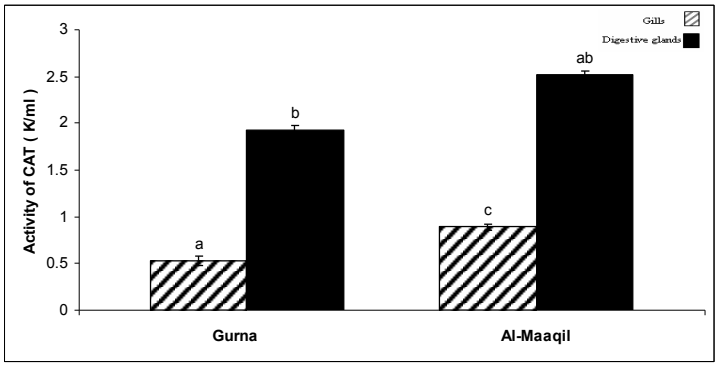

Fig. 4. Catalase activity in the gills and digestive glands of Corbicula fluminalis from Qurna and Al-Maaqil regions. Values indicate the mean±S.D. (n=10). Different letters indicate significant differences ($p<0.05$).

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