OXIDATIVE STRESS AND DAMAGE BIOMARKERS IN CLAM *RUDITAPES DECUSSATUS* TO ASSESS POLLUTION IN THE SOUTH LAGOON OF TUNIS (TUNISIA)

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Abstract

The aim of this study was to assess the biological effect of the pollution in the south lagoon of Tunis in the clam *Ruditapes decussatus*, using a multi-biomarker approach. The results showed a high catalase, superoxide dismutase, caspase 3 activities and MDA level in clams collected from the navigation canal. These high values of the biomarkers confirm the presence of anthropogenic contaminants in the area of study, which essentially due to the industrial rejections.

Keywords: Bio-indicators, Bivalves, Pollution, Tunisian Plateau

Introduction. The south Lagoon of Tunis is a Mediterranean Lagoon located in the Southwest of the Gulf of Tunis. It is adversely affected by industrial contaminants from the industrial zone, urban untreated sewage from the city of Tunis and its southern suburbs and the important harbor activities. Bivalves are commonly used as sentinel species for monitoring coastal environments. *Ruditapes decussatus* (Linnaeus, 1758), the European clam is a characteristic bivalve of Tunis lagoon. This specie is considered as a good biological indicator of health status and contamination of the marine environment. Being a sedentary filter-feeding organism clams can accumulate environmental contaminants. The aim of this study was to assess the biological effect in a characteristic bivalve of this polluted lagoon. For that, a multi-biomarker approach was applied in Ruditapes decussatus clams collected from three different sites of on the lagoon. Biomarkers evaluated for this study were catalase, superoxide dismutase, LPO and caspase 3.
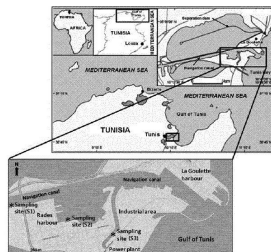

Fig. 1. Sampling sites for *Tapes decussatus* in the south lagoon of Tunis.

Material and methods. Bivalves were collected from an intertidal mudflat in September 2015 in three different sites in the south Lagoon of Tunis: the navigation canal (S1), the Rades harbour (S2) and the chemical industrial area (S3) (Fig.1). Control clams were collected from Louza (St) site which has been considered as a reference site [1]. The entire soft body of 10 animals was separated and homogenized in TRIS buffer. SOD activity was determined according to the method of [3] slightly modified by [4]. Lipid peroxidation was determined using the method of [5]. Results were expressed as nmol of MDA per mg protein. CSP 3-like activity was determined as described by [6].

Results and Discussion. In the present study, higher CAT activities were found in clams from S1, S2 and S3 (Fig.2), suggesting that animals had a high efficiency to cope with oxidative stress. In this context, it is suggested that increases in the activity of antioxidant enzymes may reflect an adaptation of animals to the chronic exposure to high/moderate levels of contamination, since this would confer increased protection from oxidative stress [7]. Higher SOD activity was found in clams from S1compared to clams from St, S2 and S3. The reduction in antioxidant enzyme activities recorded in clams is explained by the exposure of clams to both natural and anthropogenic factors [8]. Therefore, results obtained in the present study suggested a reduced antioxidant status of clams from S2 and S3. S1 showed the highest MDA level. The low level found at S2 and S3 might be explained by the compensatory or adaptative antioxidative responses. Only S1 showed a significant increase in CSP 3-like activity. This result might be explained by the damage cell in clams from S1. This hypothesis is supported by the high MDA level described previously in clams from S1. Conclusion This study suggests that catalase, superoxide dismutase, Lipid peroxidation and caspase 3 activities are indicators of stress in *Ruditapes decussatus*. Then, the results confirm the presence of anthropogenic contaminants in the area of study, which essentially due to the industrial rejections.
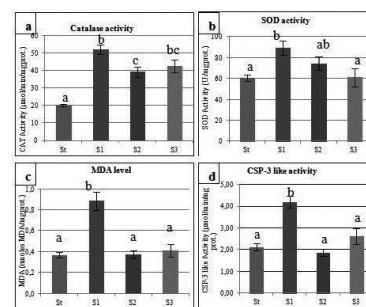

Fig. 2. CAT activities for *Tapes decussatus*.

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