

OXIDATIVE STRESS INDICES IN NATURAL CLAM POPULATIONS, *VENERUPIS DECUSSATA* AS BIOMARKER TO EVALUATE POLLUTION IN TWO COASTAL MEDITERRANEAN LAGOONS (TUNISIA)

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Abstract

New results concerning five biomarkers of oxidative stress, malondialdehyde (MDA), advanced production produce (AOPP), glutathione peroxidase (GPx), glutathione (GSH) and ascoebic acid (Vit C), in *Venerupis decussata* digestive gland collected in summer 2014 from two Tunisian lagoons, located in the southern part of the Mediterranean Sea coast, are reported. All oxidative stress biomarkers measured were higher in *V. decussata* sampled from Boughrara lagoon than those from Tunisia Northern lagoon. These results indicate that *V. decussata* constitutes a useful tool on biomonitoring of aquatic pollution and the Boughrara lagoon was more polluted than Tunisia Northern lagoon.

Keywords: Bio-indicators, North-Eastern Mediterranean

Introduction

Biomarkers are required to assess the biological effects of pollutants on marine organisms in order to monitor ecosystem status. Highly productive areas, such as coastal lagoons, are among the most extensively modified and threatened ecosystems, especially for Mediterranean lagoons [1], affected by anthropogenic pressures, with very long water residence time. To assess the environmental quality of Mediterranean southern lagoons (Tunisia), biomarkers were measured in native clams *V. decussata* from two selected sites: The Boughrara lagoon site (S1) (N33°32'34.20" - E10°40'56.37"), located in southern coastal of Tunisia characterized by urban effluents [2], while the Northern lagoon site (S2) (N36°49'4.31" - E10°13'5.94"), located in the northern of Tunisia is subjected to various impacts from the channel area [3].

Materials and methods

Clams of similar sizes (29–35 cm shell length) were sampled monthly from both sites in summer 2014. In the laboratory, 30 individuals (per month and per site) were used for stress analyses. In fact, clams were scarified for excision of the digestive gland (DG), for the purpose of biomarker analyses and stored in liquid nitrogen at -80 °C prior to the assays. The biochemical parameters were tested with Kruskal-Wallis test (ANOVA) after normality analysis (Shapiro test).

Results and discussions

This paper provides evidence of the anthropogenic contamination in two Tunisian lagoons on the marine clams *V. decussata*. Pollutants induced a situation of oxidative stress on clam collected from Boughrara lagoon, resulting in a transient significant increase in MDA, AOPP levels and antioxidant enzymes, as evidenced by an increase of GPx level ($p > 0.05$). Conversely, remarkably low levels of non-enzymatic antioxidants such as GSH and Vit C (Table 1), observed at *V. decussata* from North lagoon indicate that animals may use these compounds to counteract stress in the digestive gland, which is a major metabolic function tissue involved in xenobiotic uptake and oxyradical-generation [4]. Our data confirm the pollution status of Boughrara lagoon, due to the presence of continuous discharge of wadis, fishing port and industrial activities [5] and the abundance of toxic phycotoxins [6]. According to others studies, North lagoon was also considerate as polluted site [7] but with lesser degree compared to Boughrara lagoon.

Tab. 1. Oxidative stress variation in clam's digestive gland sampled from Tunisia coastal lagoons (Boughrara [S1]; North lagoon [S2])

	MDA	AOPP	GPx	GSH	Vit C
June					
S1	157,02±13,48 ^a	0,03±0,00	1,28±0,06	5,42±0,22 ^a	24,10±2,58
S2	48,42±2,13 ^b	0,03±0,00	1,38±0,09	1,87±0,11 ^b	18,28±1,31
July					
S1	79,10±6,86	0,10±0,00 ^a	3,39±1,00	4,65±0,16 ^a	16,42±1,53
S2	47,82±2,84	0,01±0,00 ^b	1,90±0,63	1,04±0,10 ^b	11,93±1,58
August					
S1	148,34±13,25	0,10±0,01 ^a	1,86±0,57	5,46±0,27 ^a	21,56±2,47 ^a
S2	86,89±2,13	0,01±0,00 ^b	0,64±0,04	1,91±0,10 ^b	12,20±0,85 ^b

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