

BIOMARKERS OF ENVIRONMENTAL CONTAMINANTS IN FIELD POPULATION OF GREEN MUSSEL (*PERNA VIRIDIS*) FROM KARNATAKA- KERALA COAST

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ABSTRACT

Coastal marine ecosystems all over the world are under unrelenting stress caused by urban development, hazardous or toxic substances, habitat destruction and natural toxins. Biomonitoring plays a vital role in governmental and industrial strategies to identify, assess, control and reduce these problems. Marine bivalves are widely used as sentinel organisms for coastal pollution biomonitoring programs. The inshore waters of Karwar and Mangalore (west coast of India), receives effluents from industries such as caustic soda plant, fertilizer plant, iron ore processing plant, thermal power plant, dyes and pigment processing plant, petroleum refinery etc. The Central Pollution Control Board of India has identified Karwar, Mangalore and Calicut as pollution 'hotspots'. The objectives of the study were 1) to biomonitor carcinogenic and mutagenic chemicals in the coastal environment using marine bivalves, and 2) to assess the impact of carcinogenic and mutagenic chemicals on marine bivalves. In the present study supported by International Foundation for Science (IFS), Stockholm, Sweden, we have used various cytogenetic techniques such as micronucleus test, hemic neoplasia, SOS chromotest (Ames test) and Comet assay by employing mussels collected from relatively clean (reference) and urban associated sites (contaminated) from Karwar, Mangalore and Calicut from the west coast of India.

Tissue concentrations of heavy metals were generally higher in mussels from the urban-associated sites like Calicut urban, Mangalore urban, Trasi, Jali, Harwada, Mudga and Bhatkal compared to mussels from the relatively clean sites like Ladies beach, Calicut rural, Someshwara etc. Generally concentration of toxic metals such as lead, cadmium and chromium observed in the whole tissue of mussels were with in the safe limit given for seafood. Mean heavy metal concentration in mussels exhibited the following decreasing order of concentration, Fe>Pb>Zn>Mn>Cd>Cu>Ni>Cr. The results of the SOS-Chromotest (Ames test) showed that carcinogenic and mutagenic chemicals are not present in the digestive gland of mussels collected from 25 sites along the west coast of India.

Cytogenetic techniques such as comet assay and micronucleus test and Ames Test have been used by several workers to assess the impact of environmental contaminants on marine mussels (Shugart et al. 1992; Steinert, 1999). However, this is the first field report on the biological responses (Ames Test, micronuclei formation, hemic neoplasia and DNA damage) to carcinogenic and mutagenic chemicals, in mussels and oysters collected from Indian waters. Generally, natural populations of mussels and oysters collected from the contaminated and relatively clean sites from Karwar, Mangalore and Calicut, from west coast of India were found to be healthy and their biological responses (biomarkers) to the carcinogenic and mutagenic

chemicals in the coastal environment were found to be below the detection limits of the techniques used in this study (Tables 1 & 2). The results of the SOS-Chromotest also showed that levels of genotoxic and carcinogenic chemicals in their tissue are below the detection limit employed in this study.

Table 1: Occurrence of micronuclei and prevalence of hemic neoplasia in green mussel *Perna viridis* sampled from “hotspots” along Karnataka- Kerala coast (west coast of India).

Site	Site Category	Test Organism	Micronucleus test (MN) (% occurrence)	Haemic Neoplasia (%prevalence)
Karwar	Reference	Green Mussel (<i>Perna viridis</i>)	0	0
	Contaminated	Green Mussel (<i>Perna viridis</i>)	0	0
Mangalore	Reference	Green Mussel (<i>Perna viridis</i>)	1	0
	Contaminated	Green Mussel (<i>Perna viridis</i>)	0	0
Calicut	Reference	Green Mussel (<i>Perna viridis</i>)	1	0
	Contaminated	Green Mussel (<i>Perna viridis</i>)	1	0

Table 2: Occurrence of DNA damage (comet assay) in green mussel *Perna viridis* sampled from “hotspots” along Karnataka- Kerala coast (west coast of India).

Site	Site Category	Test Organism	Comet Assay (% occurrence)
Karwar	Reference	Green Mussel (<i>Perna viridis</i>)	2
	Contaminated	Green Mussel (<i>Perna viridis</i>)	2
Mangalore	Reference	Green Mussel (<i>Perna viridis</i>)	2
	Contaminated	Green Mussel (<i>Perna viridis</i>)	1
Calicut	Reference	Green Mussel (<i>Perna viridis</i>)	1
	Contaminated	Green Mussel (<i>Perna viridis</i>)	2