

(35)

**Effect of Cadmium and Zinc on Three Marine Diatoms, *Odontella aurita*, *Bellerochea malleus* and *Coscinodiscus centralis***

**Narayanan V. and Pitchai S.\***

*Centre of Advanced Study in Marine Biology, Annamalai University, India*  
\*sampathcas@gmail.com

**Abstract**

Diatoms are extremely convenient and widely used as assessment tools because they integrate and reflect the environmental changes. Biochemical approaches for the detection of environmental pollutants in microalgae, particularly diatoms are most important. Concentrations of chlorophyll, protein, carbohydrate and lipid in the toxicant induced culture are also used as proxy measures, but only when they can be shown to be linearly correlated with either cell number or biomass. The present study is planned to study the Chronic (7 days) bioassay and determine the toxic effect of Zn and Cd on chlorophyll 'a' content, protein, carbohydrate and lipid of marine centric diatoms adopting standard methodology by APDC-MIBK extraction method(metal analysis), Spectrophotometric method, Folin-ciocalteau method, Phenol-sulphuric acid method and Chloroform-methanol method respectively. The bioassay tests were conducted by subcultures with the cell density of  $0.39 \times 10^5$ ,  $0.8 \times 10^3$  and  $0.4 \times 10^5$  cells/ml of *O. aurita*, *B. malleus* and *C. centralis* respectively were exposed to different concentrations of cadmium and zinc for seven days, including control without metal. The results of the above experiments revealed that chlorophyll 'a' concentration reduced with increasing concentration of Zn and Cd which might be responsible for higher chlorophyll 'a' production relatively with lower concentration of Zn and Cd, compared to control. The protein content was gradually increased with increasing concentration of Zn and Cd, maximum of protein  $30.8 \pm 0.8$   $\mu\text{g/mL}$  and  $28.1 \pm 0.7$   $\mu\text{g/mL}$ ,  $34.8 \pm 0.5$   $\mu\text{g/mL}$  and  $35.6 \pm 0.8$   $\mu\text{g/mL}$ ,  $36.6 \pm 0.64$  and  $34.6 \pm 0.74$   $\mu\text{g/mL}$  observed at highest concentration of Zn and Cd respectively in *O. aurita*, *B. malleus* and *C. centralis*. Conversely, the protein was highly reduced during high concentration of both Zn and Cd. Similarly, the maximum lipid contents of  $46.8 \pm 0.56$   $\mu\text{g/mL}$  and  $47.5 \pm 0.67$   $\mu\text{g/mL}$ ,  $44.5 \pm 0.44$   $\mu\text{g/mL}$  and  $37.5 \pm 0.63$   $\mu\text{g/mL}$  and  $47.5 \pm 0.63$   $\mu\text{g/mL}$  and  $40.1 \pm 0.89$   $\mu\text{g/mL}$  observed at increasing concentration of Zn and Cd respectively in *O. aurita*, *B. malleus* and *C. centralis*. In both heavy metals, the lipid contents were decreased at higher concentration but increased production of lipid content was noticed at lowest concentrations. Zn and Cd showed maximum inhibition of the total carbohydrate content at high concentrations, the maximum carbohydrate content of  $24.8 \pm 0.8$   $\mu\text{g/mL}$  and  $23.7 \pm 0.7$   $\mu\text{g/mL}$ ,  $28.2 \pm 0.9$  and  $24.1 \pm 0.7$   $\mu\text{g/mL}$ ,  $27.3 \pm 0.93$   $\mu\text{g/mL}$  and  $19.9 \pm 0.68$   $\mu\text{g/mL}$  observed at increasing concentration of Zn and Cd in *O. aurita*, *B. malleus* and *C. centralis* respectively. The study concluded that the Chlorophyll 'a' and biochemical composition of candidate species were found to be influenced by selected metals.

**Keywords:** Chronic bioassay, Chlorophyll 'a', Marine diatoms, Toxicant, Biochemical composition