PREFACE

Heavy metal pollution, especially Hg$^{++}$ is an environmental problem of worldwide concern due to their potential health hazard to human as well as wild life even at very low concentration. Hg$^{++}$ bearing industrial effluents from various industries like chlor-alkali, paint, pulp and paper, oil refining, electrical, rubber processing, fertilizer, pharmaceutical and battery manufacturing industries are the main sources of mercury contamination to the water bodies. Traditionally used methods for decontaminating mercury bearing industrial effluent includes precipitation, evaporation, adsorption, ion exchange, reverse osmosis etc which are highly expensive and generate unmanageable secondary wastes. Search for a conventional alternative method for removing mercury from wastewater gives rise the idea of applying the metal sequestering properties of microorganisms known as biosorption. Biosorption offers several advantages over traditionally used methods including cost-effectiveness, efficiency, minimization of secondary sludge, possibility of metal recovery and biomass regeneration. Bacteria, actinomycetes, cyanobacteria, algae, fungi and yeasts have been tested for metal biosorption with very encouraging results. When choosing the biomass for metal biosorption experiments, its origin is a major factor to be taken into account. Biomass can come from i) industrial waste which should be obtained free of charge ii) organisms easily available in large amounts in nature iii) Organism of quick growth, especially cultivated or propagated for biosorption purposes.

As Hg$^{++}$ is a highly toxic metal, Hg$^{++}$ resistant bacteria (Bacillus circulans MTCC3161), Yeast (Saccharomyces cerevisiae), Fungi (Aspergillus niger and Rhizopus arrhizus) were developed in our laboratory which are more Hg$^{++}$ tolerant than their parent strain. The biosorption capacities of the resistant strains were compared with their respective parent strains in this present study to select the most promising biosorbent for Hg$^{++}$ removal. The most potent Hg$^{++}$ resistant organism is selected for biosorption study. Selection of the suitable strain for Hg$^{++}$ biosorption is spelled out in detail in Chapter I. Selection of suitable maintenance medium for the selected strain is described in Chapter II. Optimization of the physical parameters responsible for Hg$^{++}$ biosorption
experiment is studied in detail in Chapter III. In Chapter IV selection of suitable carbon and nitrogen source and their suitable concentration is optimized. Chapter V describes the optimum amount of different macro and micro nutrients required for the selected organism. Effect of different natural and commercially available complex nutrient on biosorption of Hg^{++} is studied extensively in Chapter VI. Effect of different concentration of amino acids, vitamins, metabolic inhibitors and antibiotics are studied in Chapter VII. Chapter VIII deals with the effect of various surface active agents on biosorption of Hg^{++}. Biochemical changes of the biosorption medium and the organism during the biosorption experiment is studied in Chapter IX. Studies on biosorption of Hg^{++} by dead cell and optimization of physical parameters are mentioned in Chapter X. Chapter XI deals with the regeneration of Surface bound Hg^{++} from the microbial biomass after the biosorption experiment. Instrumental analysis of the microbial biomass before and after biosorption experiment to evident the biosorption of Hg^{++} by the microbial biomass is described in detail in Chapter XII.

Date: 30.12.11

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