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Biosorption of lead using immobilized cells of *Aspergillus niger*

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Fungal strain- *Aspergillus niger* was isolated from effluent of chemical and pharmaceutical industry using SDA agar. Pretreatment of live cells of *Aspergillus niger* was carried out. This dried biomass was immobilized in Ca-alginate beads. Ability of Pb biosorption with immobilized *Aspergillus niger* biomass was premeditated in the present study. Effect of Initial metal ion concentration, concentration of adsorbent and contact time doses on Lead (Pb) removal was determined. The concentration of lead in the filtrate was then analyzed by atomic absorption spectrophotometer. Suitable conditions for *Aspergillus niger* to take up Pb were shown to be at 50ppm lead as initial metal ion concentration using 2.4 grams of fungal beads as the adsorbent. The optimum contact time was found to be 150 minutes. Based on optimization results, biosorption and desorption processes were carried out. Biosorption experiment revealed that *Aspergillus niger* showed 74.61 per cent Pb removal. Desorption using EDTA retrieved 77.78 per cent Pb from the beads. Immobilized biomass offers many advantages including better reusability; high biomass loading and minimal clogging, increased substrate uptake and yield improvement, easier product recovery, thus reducing cost for equipment and energy demands.

Key words : Biosorption, Lead, Aspergillus niger, Atomic absorption spectrophotometer, Desorption

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INTRODUCTION

Heavy metals are widespread pollutants of great environmental concern as they are non-degradable and thus persistent. The presence of heavy metal ions from the transition series, *viz.*, Cu, Fe, Ni, Pb, etc. in the environment is of major concern due to their toxicity to many life forms. Unlike organic pollutants, the majority of which are susceptible to biological degradation, metal ions degrade into harmful end products.

In developing countries like India, wastewater treatment is of utmost importance. The degree of treatment may range from a main process for seriously polluted industrial waste to a polishing process for removing the trace concentrations which remain after the main treatment. New technologies are required that can reduce heavy metal concentration to environmentally acceptable level at affordable costs. Therefore, much attention has been given to the removal of metal ions by microorganisms due to its applications in environment protection and recovery of toxic or strategic heavy metals.

Mobilization of heavy metals in the environment due to industrial activities is a serious concern due to the toxicity of these metals in humans and other life forms. Removal of toxic heavy metals from industrial waste waters is essential from the stand point of environmental pollution control. Among the toxic heavy metals, mercury, lead and cadmium called the big three are in the limelight due to their major impact on the environment (Saleh *et al.,* 2009).

Alternative process is biosorption, which utilizes various certain natural materials of biological origin, including bacteria, fungi, yeast, algae, etc. These biosorbents possess metal-sequestering property and can be used to decrease the concentration of heavy metal ions in solution from ppm to ppb level. It can effectively sequester dissolved metal ions out of dilute complex systems with high efficiency and quickly, therefore it is an ideal candidate for the treatment of high volume and low concentration complex wastewaters (Wang and Chen, 2009).

Dead biomass in industrial application offers certain advantages over live cells. Systems using live cells are likely to be more sensitive to metal ion concentration (toxicity effects) and adverse operating conditions (pH and temp). Constant nutrient supply is required for systems using living cells and recovery of metals is more complicated from living cells. Dead biomass can be procured of industrial sources as a waste