



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

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Thesis Title: Biosorption of Pb(II) by bacterial strain *Bacillus badius* AK isolated from rotary drum compost of water hyacinth

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**SHORT ABSTRACT**

Composting of biological waste is mainly governed by the diversity of microorganisms working intermittently or in succession in order to carry out the biochemical reactions for their metabolism. The rotary drum composting is relatively a faster method as compared to the conventional pile (windrow) composting method. The water hyacinth (*Eichhornia crassipes*) being a free-floating aquatic weed is creating nuisance in waterbodies, composting is found to be one of the most effective method of management and utilization of this weed. From the previous studies it was found that the total content of metal has increased to a significant amount in final compost of water hyacinth. Therefore, current study was performed to detect the microbial succession in the rotary drum composting of water hyacinth along with the stability and maturity analysis in form of different trials. Major microbial communities in the best trial (6:3:1) of water hyacinth compost were observed Bacteria. Therefore, in this thesis work rotary drum compost of water hyacinth was used as a source for isolation of bacteria. Twelve bacterial isolates were isolated and identified, which majorly belonged to the *Bacillus* and *Enterobacter* genera. The biosorption study of heavy metals such as lead (Pb(II)) and cadmium (Cd(II)) were performed with isolated bacterial strain *Bacillus badius* AK. Live (non-pretreated) and dried (pretreated) bacterial cells were utilized for biosorption of Pb(II) and Cd(II). Batch biosorption study of live (non-pretreated) biomass of *Bacillus badius* AK demonstrated maximum biosorption of Pb(II) at biomass concentration of  $1.7 \times 10^{16}$  CFU/mL. The specific growth rate and maximum specific growth rate of bacterial cells under the influence of Pb(II) were determined as 0.05/h and 2.54/h. respectively. The rate of biosorption in batch study with dried (pretreated) biomass of *Bacillus badius* AK was observed to be high in the first 30 min. The maximum adsorption capacity was 138.88 mg (Pb(II)) /g (dried biomass). Biosorption of Cd(II) by dried biomass of *Bacillus badius* AK was found to have maximum biosorption capacity of 131.58 mg (Cd(II))/g (dried biomass). The continuous column mode operation of dried biomass of *Bacillus badius* AK in biosorption of Pb(II) was observed with higher breakthrough capacity as compared to the batch process. The dried (pretreated) biomass of *Bacillus badius* AK has much potential as a biosorbent for removal of heavy metals such as Pb(II) and Cd(II) from aqueous solution at lab scale. Additionally, it is an economical and promising substitute of biosorbent for heavy metal removal as compared with the existing conventional methods of biosorption.