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Research Paper :

Biosorption of Cd^{2+} from aqueous metal solutions by cyanobacterial biomass

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ABSTRACT

This paper provides information on biosorption of Cd^{2+} by the cyanobacterium *Aulosira fertilissima*. Over all pattern of Cd^{2+} sorption rate seems to be dependent on the level of Cd^{2+} present in the external medium and length of exposure to metal. Cd^{2+} sorption was rapid during first five minutes thereafter the process slowed down and finally reached to saturation. A growth promoting pH (8.0) resulted more Cd^{2+} uptake than pH 6.0 and 10.0.

KEY WORDS : Calcium, Cd^{2+} sorption, Metal, Metal toxicant, *Aulosira fertilissima*

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Metal is an unique class of toxicants since they can not be broken down to non-toxic forms. Environmental contamination by toxic heavy metals, as a function of human activities, is a serious problem due to their biomagnification, accumulation in food chain and continuted persistence in terrestrial and aquatic ecosystem (Chen and Pan, 2005). The metallic ions of the salt carry a positive charge and are attracted to the part when they reach in the negatively charged part, provides the electron to reduce the positively charged ions to metallic form (Gajendra, 1996). Metal ions *viz.* Zn^{2+}, Cu^{2+}, Fe^{2+} etc. are essential micronutrient for plant and animals metabolism but when in excess can become extremely toxic (Tayler *et al*., 1989).

During recent years different mechanisms are developed for the removal of heavy metals from aqueous solutions. Biosorption techniques employed for metal removal has been found to be highly selective due to passive accumulation in cells and surface binding to various functional groups present on cell wall (Phoenix *et al*., 2002, Yee *et al*., 2004). Uptake and accumulation of heavy metals by algae, bacteria, fungi, mosses, macrophytes and higher plants are on record (Ali *et al*., 1999; Jasmine and Sasikumar, 2006; Michalak *et al*., 2007; Banarjee *et al*., 2008; Shanthi and Kumari, 2009; Munir *et al*., 2010). The metal accumulation by microbes is possible by a rapid binding of cations to negatively charged group on the cell surface and the subsequent metabolism dependent intracellular cation uptake (Singh *et al*., 2001; Banarjee *et al*., 2008). Therefore, the present study is most important in assessing the role of naturally occurring cyanobacterium *Aulosira fertilissima* in reducing the toxicity of Cd^{2+} and the role of pH in regulating sorption of heavy metals.

EXPERIMENTAL METHODOLOGY

Aulosira fertilissima, obtained from Biological Research Lab., Department of Botany and Biotech., Kutir P.G. College, Chakkey, Jaunpur (U.P.), India, was cultured in BG-11 medium at pH 8.0 and temperature 28.0 ± 2^0C under illumination of 2500-3000 lux cool theorescent light intensity for 14:10 hr light and dark rhythum.

Cd^{2+} sorption experiment:

Exponentially grown cells of *Aulosira fertilissima* from 8 days old stock culture were centrifuged, washed repeatedly with triple glass distilled water and inoculated into 100 ml sterile pre cooled growth medium containing 6-12 mgl^{-1} Cd^{2+} (as $CdCl_2$, Loba Chemicals, India) separately. Cd^{2+} uptake experiments were carried out at 28 ± 2^0C. Algal samples were withdrawn and centrifuged to recover the cell pellet. The repeatedly washed pellet was dried and added to 1 ml HNO_3 : HClO mixture (10 : 1 v/v) ensure digestion and release of associated metal