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RESEARCH PAPER

Bio-Adsorption of Copper (II) by Aquatic Weed Plants *Hydrilla* and *Pistia*

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ABSTRACT

Heavy metals are some of the major environmental pollutants released into water as a result of industrial processing. These are toxic and non-biodegradable. The contaminated waters and soils pose major environmental, agriculture and human health problems worldwide. These problems may be partially mitigated through "Phytoremediation". A biotechnological process over-ruling chemical technologies. Phytoremediation is also most applicable for aquatic pollution because of its cost effectiveness, aesthetic and long term applicability. In the present study bio-adsorption studies were carried out in both *Hydrilla* and *Pistia* sp. with three different initial Copper (II) concentrations (*i.e.* 5ppm, 10ppm, 15ppm). Triplicates were maintained in each concentration by using 3 L capacity plastic tubs. Water samples were collected every 24hr interval over a period of 10 day exposure. Samples were analyzed using Atomic Absorption Spectrophotometer (AAS). *Pistia* showed the maximum removal percentage of copper on day 9 and *Hydrilla* on day 7 of exposure at 5 ppm concentration. Increase in the concentration decreased the removal percentage in both plants. Morphological observations and plant growth also varied at varying concentrations and exposure duration. Heavy metal removal efficiency was higher ($P<0.05$) with *Hydrilla* than with *Pistia* at lower concentrations, however, the removal efficiency was more with *Pistia* at higher concentrations.

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Environmental pollution is one of the most hazardous ecological crises to which humans are subjected today. Population explosion coupled with rapid industrialization has led to the contamination of natural resources with harmful pollutants like pesticides, heavy metals, toxic chemicals, etc. The heavy metals, which are toxic and non-biodegradable, are the major environmental pollutants released into water as a result of industrial processing. The polluted waters and soils cause major environmental, agricultural and human health problems. The toxicity due to metal ions is due to their ability to bind with protein molecules (Kar and Sahoo, 1992) and prevent replication of DNA and subsequent cell divisions. Rapid industrialization has further aggravated the problem through indiscriminate discharge of untreated and partially treated industrial effluents thereby increasing the concentration of Cd, Pb, Zn, Cu and Mn in the near by water bodies (Totawat, 1993). These heavy metals are toxic because they cause DNA damage and their carcinogenic effects in animals and humans are probably caused by their mutagenic ability (Knasmuller *et al.*, 1998; Baudouin *et al.*, 2002). Recently biotechnology has opened doors to unique uses of different eco-friendly technologies overruling chemical technologies. Most of the chemical and engineering technologies have almost failed to remove pollutants. These problems may be partially solved by a new and emerging biotechnological process called "Bioremediation".

In "bioremediation" procedures "Phytoremediation" is the most applicable and advantageous method to clean up aquatic environment. Ilya Raskin (1994) defined phytoremediation as "a process in which plants are used for environmental remediation that involves removing organics and metals from soils and water". Of late phytoremediation is attracting increasing attention from scientists and regulators because it appears to be cheaper than chemical and engineering oriented methods and may also offer immediate and long-term environmental benefits. Since last decade phytoremediation has emerged as a new, low-tech, cost effective technology that uses plants and their associated microbial flora for environmental clean up (Raskin *et al.*, 1994; Salt *et al.*, 1995a; Salt *et al.*,1998).

Plants are reported to have the capacity to withstand relatively high concentrations of metals or organic chemicals without being affected by toxicity. They can also take up and transform organic chemicals to less toxic metabolites in some cases. At sites contaminated with heavy metals, plants are used either to stabilize or remove the metals from the soils and ground water through three mechanisms: (1) Phytoextraction: The use of metal