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A Radiotracer study on assessment of heavy metal accumulation in water hyacinth (*Eichhornia crassipes)*

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SUMMARY

The use of specially selected and engineered metal accumulating plants for environmental clean up is an emerging technology called phytoremediation. The present study was to understand the mechanism of metal accumulation in water hyacinth by a radiotracer technique. Water hyacinth samples were treated with solutions containing 0.5 mci of $ZnCl_2$ for a period of five days. The treated root and shoot samples were assessed for % absorption of radioactivity, disintegration rate and specific activity. These factors tend to decrease progressively in the root samples and increase significantly in the shoot samples as time proceeds revealing that heavy metal (Zn) is first absorbed in root and then translocated to shoot regions.

Key words : Phyto remediation, Water hyacinth, Metal accumulation, Per cent absorption of radioactivity, Specific activity

Recently, there has been growing interest in the use of metal-accumulating roots and rhizomes of aquatic or semi aquatic vascular plants for the removal of heavy metals from contaminated aqueous streams. Phytoremediation, a process of using plants to remove contaminants from the environment, is an alternative approach and an efficient and economical method of contaminant removal to current remediation strategies (Prasad, 2007). Water hyacinth is a promising candidate for phytoremediation of waste water polluted with Cu, Pb, Zn, and Cd.

MATERIALS AND METHODS

Water hyacinth was collected from a local natural pond at Singanallur, Coimbatore. Before the start of the experiment the plants were cleaned properly using tap water to remove particles from their roots and leaves. The aquatic plants were treated with the metal ion solutions of 0.5 mci of zinc ($ZnCl_2$) and in another treatment they were exposed to water containing 20 ppm of $ZnCl_2$. The treated plant samples exposed to heavy metals were harvested after 24, 48, 72, 96 and 120 h and weighed. Two grams of the harvested root and shoot samples were dry ashed in silica crucible and transferred to a scintillation vial. The vial was then placed in Tellurium activated Na I crystal well type gamma ray spectrometer (type GRS 23B of Electronics Corporation of India Ltd, Hyderabad). The radioactivity of the sample was determined by differential counting keeping the single channel analyser at optimal window and lower level settings. The gross count per 100sec (cps) was noted and net count rate / 100 sec was calculated by subtracting the background count.

Disintegration rate was derived from net count rate by the expression:

$$\text{Disintegration rate (dps)} = \frac{\text{Net count rate(cps)}}{\text{\% efficiency of the instrument}} \times 100$$

The specific activity which denotes the activity / unit mass volume was obtained by the expression:

Specific activity (Bq / «g of Zn) = dps / Zn content

Percent absorption of radioactivity by root and shoot samples were calculated by the following expression:

Per cent absorption of radio activity =
Activity in plants (cps) / Activity in container x 100

The zinc content of the treated root and shoot samples with 20 ppm $ZnCl_2$ were then estimated by atomic absorption spectrometry (Black, 1965). 0.5g of each sample was digested with triple acid mixture over sand bath until a clear digest was obtained. The digested solution was fed to atomic absorption spectrophotometer (Spectra 20 of Varian, Australia)

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