E2-27 A search for aquatic plants for heavy metal pollution control

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A series of laboratory experiments were carried out to study the absorption of heavy metals such as lead (Pb), cadmium (Cd) and chromium (Cr) by aquatic plants from a growth medium and to determine their suitability to remove heavy metals from industrial effluents.

Two fast growing plants, hydrilla and salvinia were selected for the study. A series of solutions were prepared using modified Hoagland's solution spiked separately with 3.00, 6.00, 9.00, 12.00 & 15.00 ppm of Cd, Cr, Pb. 5g of each plant were grown in the solutions for 2 weeks. The growth media and the plants were analysed for metals at the beginning of the experiment, after one week and after two weeks by atomic absorption spectroscopy. A plant sample was prepared for analysis as follows: 0.200g of the dried sample was ash digested in a furnace at 450°C for 2 h or until the ash turned white. An adequate amount of aqua regia was added to dissolve the ashed plant material. The resultant solution was filtered and was made up to 25.00 cm^3 with distilled water.

Results showed that salvinia grown in a separate nutrient solution containing either Pb or Cd or Cr absorbed, all the three metals appreciably. Lead was absorbed preferentially (0.31%), to that of Cd (0.20%) and Cr (0.27%). Hydrilla also absorbed all the three appreciably and to a comparable level: Pb (0.25%), Cd 0.18%) and Cr (0.21%). (percentages are the mean dry weight). Further experiments indicated that, salvinia showed a successful survival up to 21 ppm in the nutritive medium and the maximum metal tolerance level for Cd and Cr was less than 15 ppm. Beyond these concentrations, plants turned yellow. When salvinia and hydrilla were grown in the nutritive medium containing a mixture of Pb, Cd & Cr, each of concentrations 15, 12; 9, 6 & 3 ppm, for salvinia most absorbed metal was Pb, followed by Cr and then by Cd. Hydrilla grown in mixed metal solutions containing 12, 9, 6, 3 ppm each of Pb, Cd & Cr, the most absorbed metal was Cr, followed by Pb and finally by Cd.

On comparing the analytical data for the concentrations of the metal in the growth medium with those of plants, it was observed that there is a quantitative

relationship between the metal uptake by the plants and the metal concentration in solution. For salvinia, correlation coefficient was found to be 0.95 ± 0.05 for uptake of Cr, 0.954 ± 0.05 for Pb and 0.899 ± 0.05 for Cd for 5 data points.

This study shows that both hydrilla and salvinia can be used to remove Pb **(II)**, Cd **(II)** & Cr **(III)** from industrial effluents.