

Water spinach, *Ipomoea aquatica* (Convolvulaceae), ameliorates lead toxicity by inhibiting oxidative stress and apoptosis

ABSTRACT

Background: *Ipomoea aquatica* (Convolvulaceae), an aquatic edible plant, is traditionally used against heavy metal toxicity in India. The current study intended to explore the protective role of edible (aqueous) extract of *I. aquatica* (AEIA) against experimentally induced Pb-intoxication. **Methods:** The cytoprotective role of AEIA was measured on mouse hepatocytes by cell viability assay followed by Hoechst staining and flow cytometric assay. The effect on ROS production, lipid peroxidation, protein carbonylation, intracellular redox status were measured after incubating the hepatocytes with Pb-acetate (6.8 μ M) along with AEIA (400 μ g/ml). The effects on the expressions of apoptotic signal proteins were estimated by western blotting. The protective role of AEIA was measured by in vivo assay in mice. Haematological, serum biochemical, tissue redox status, Pb bioaccumulation and histological parameters were evaluated to estimate the protective role of AEIA (100 mg/kg) against Pb-acetate (5 mg/kg) intoxication. **Results:** Pb-acetate treated hepatocytes showed a gradual reduction of cell viability dose-dependently with an IC₅₀ value of 6.8 μ M. Pb-acetate treated hepatocytes exhibited significantly enhanced levels ($p < 0.01$) of ROS production, lipid peroxidation, protein carbonylation with concomitant depletion ($p < 0.01$) of antioxidant enzymes and GSH. However, AEIA treatment could significantly restore the aforementioned parameters in murine hepatocytes near to normalcy. Besides, AEIA significantly reversed ($p < 0.05$ – 0.01) the alterations of transcription levels of apoptotic proteins viz. Bcl 2, Bad, Cyt C, Apaf-1, cleaved caspases [caspase 3, caspase 8 and caspase 9], Fas and Bid. In in vivo bioassay, Pb-acetate treatment caused significantly high intracellular Pb burden and oxidative pressure in the kidney, liver, heart, brain and testes in mice. In addition, the haematological and serum biochemical factors were changed significantly in Pb-acetate-treated animals. AEIA treatment restored significantly the evaluated-parameters to the near-normal position. **Conclusion:** The extract may offer the protective effect via counteracting with Pb mediated oxidative stress and/or promoting the elimination of Pb by chelating. The presence of substantial quantities of flavonoids, phenolics and saponins would be responsible for the overall protective effect.

Keyword: Water spinach; Aquatic edible plant; *Ipomoea aquatica* (Convolvulaceae); Oxidative stress and apoptosis; Heavy metal toxicity