



## Induction of non-protein thiols and phytochelatins by cadmium in *Eichhornia crassipes*

Rama Pal<sup>a</sup>, Ravinder Kaur<sup>b</sup>, Deepika Rajwar<sup>c</sup>, and Jai Prakash Narayan Rai<sup>d</sup>

<sup>a</sup>ICAR-Indian Institute of Soil and Water Conservation, Research Centre, Agra, India; <sup>b</sup>Water Technology Centre, IARI, New Delhi, India; <sup>c</sup>ICAR-Central Soil Salinity Research Institute, Karnal, India; <sup>d</sup>G.B. Pant University of Agriculture and Technology, Pantnagar, India

### ABSTRACT

Impact of root Cd concentration on production of cysteine, non-protein thiols (NP-SH), glutathione (GSH), reduced glutathione (GSSG), and phytochelatins (PCs) in *Eichhornia crassipes* exposed to different dilutions of brass and electroplating industry effluent (25%, 50%, and 75%), and synthetic metal solutions of Cd alone (1, 2.5, and 3.5 ppm) and with Cr (1 ppm Cd + 1 ppm Cr, 2.5 ppm Cd + 3 ppm Cr, and 3.5 ppm Cd + 4 ppm Cr) was assessed in a 45 days study. Different treatments were used to understand and compare differential antioxidant defense response of plant under practical drainage (effluent) and experimental synthetic solutions. The production of NP-SH and cysteine was maximum under 2.5 ppm Cd + 3 ppm Cr treatments *i.e.*, 1.78  $\mu\text{mol/g}$  fw and 288 nmol/g fw, respectively. The content of GSH declined whereas that of GSSG increased progressively with exposure duration in all treatments. HPLC chromatograms revealed that the concentrations of PC2, PC3, and PC4 (248, 250, and 288 nmol-SH equiv.g<sup>-1</sup> fw, respectively) were maximum under 1 ppm Cd, 1 ppm Cd + 1 ppm Cr, and 2.5 ppm Cd + 3 ppm Cr treatments, respectively. PC2, PC3, and PC4 concentrations increased with Cd accumulation in the range 812–1354  $\mu\text{g/g}$  dry wt, 1354–2032  $\mu\text{g/g}$  dry wt and 2032–3200  $\mu\text{g/g}$  dry wt, respectively. Thus, the study establishes a direct proportionality relationship between concentration/length of phytochelatins and root Cd concentrations, upto threshold limits, in *E. crassipes*.

### KEYWORDS

Cadmium (Cd); cysteine; glutathione (GSH); *Eichhornia crassipes*; heavy metals; non-protein thiols (NP-SH); phytochelatins (PCs)