

Synergistic and antagonistic effects of zinc bioaccumulation with lead and antioxidant activities in *Centella asiatica*

ABSTRACT

This study was carried out by using *Centella asiatica* grown using a hydroponic system under laboratory conditions to study synergistic and antagonistic effects of Zn bioaccumulation with added Pb and the changes in antioxidant activities in leaves and roots of *C. asiatica*. The antioxidant activities included superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX) and guaiacol peroxidase (GPX). The treatments Zn (2 ppm) + Pb (0.4 ppm) and Zn (4 ppm) + Pb (0.6 ppm) increased the accumulation of Zn in leaves by 14.06 and 16.84%, respectively, but decreased by 7.36% uptake in roots (Zn 4 ppm + Pb 0.6 ppm). This showed that Pb and Zn acted synergistically to Zn accumulation in leaves but antagonistically in roots. CAT and SOD activities in leaves were increased when Zn was added together with Pb. In roots, CAT, APX and SOD activities were increased but GPX was decreased. Owing to their sensitivities to Zn with Pb, SOD and CAT could be used as biomarkers to monitor the toxicity of Pb and Zn exposure in the leaves and roots of *C. asiatica*.

Keyword: Antagonistic; Antioxidant activities; *Centella asiatica*; Synergistic