

Barium levels in soils and *Centella asiatica*

ABSTRACT

In this study, *Centella asiatica* and surface soils were collected from 12 sampling sites in Peninsular Malaysia, and the barium (Ba) concentrations were determined. The Ba concentration [$\mu\text{g/g}$ dry weight (dw)] was 63.72 to 382.01 $\mu\text{g/g}$ in soils while in *C. asiatica*, Ba concentrations ranged from 5.05 to 21.88 $\mu\text{g/g}$ for roots, 3.31 to 11.22 $\mu\text{g/g}$ for leaves and 2.37 to 6.14 $\mu\text{g/g}$ for stems. In *C. asiatica*, Ba accumulation was found to be the highest in roots followed by leaves and stems. The correlation coefficients (r) of Ba between plants and soils were found to be significantly positively correlated, with the highest correlation being between roots-soils ($r=0.922$, $p<0.005$), followed by leaves-soils ($r=0.890$, $p<0.005$) and stems-soils ($r=0.848$, $p<0.005$). This indicates that these three parts of *C. asiatica* are good biomonitors of Ba pollution. For the transplantation study, four sites were selected as unpolluted [(Universiti Putra Malaysia (UPM))], semi-polluted (Seri Kembangan and Balakong) and polluted sites (Juru). Based on the transplantation study under experimental field and laboratory conditions, Ba concentrations in *C. asiatica* were significantly ($p<0.05$) higher after three weeks of exposure at Seri Kembangan, Balakong and Juru. Thus, these experimental findings confirm that the leaves, stems and roots of *C. asiatica* can reflect the Ba levels in the soils where this plant is found. Three weeks after back transplantation to clean soils, the Ba levels in *C. asiatica* were still higher than the initial Ba level even though Ba elimination occurred. In conclusion, the leaves, stems and roots of *C. asiatica* are good biomonitors of Ba pollution.

Keyword: Barium; *Centella asiatica*; Correlation coefficient; Transplantation; Biomonitor