

Assessment of water mimosa (*Neptunia oleracea* Lour.) morphological, physiological, and removal efficiency for phytoremediation of arsenic-polluted water

ABSTRACT

Arsenic is considered to be a toxic and heavy metal that exists in drinking water and can lead to acute biotoxicity. Water mimosa (*Neptunia oleracea*) has been widely identified as a feasible phytoremediator to clean up aquatic systems. In the current study, the phytoremediation potential of water mimosa exposed to different concentrations of sodium heptahydrate arsenate ($\text{Na}_2\text{HAsO}_4 \cdot 7\text{H}_2\text{O}$) was tested. A number of plant physiological and growth responses such as height of frond, existence of green leaves, relative growth rate, relative water content, tolerance index, decrease in ratio of biomass and ratio of dry weight, chlorophyll content, photosynthesis rate, intercellular CO_2 concentrations, stomatal conductance, air pressure deficit, transpiration rate, proline and lipid peroxidation, as well as arsenic accumulation and removal efficacy were analyzed. The micromorphological analysis results confirmed water mimosa's tolerance of up to 30 ppm of arsenic treatment. The results obtained from the chlorophyll and gas exchange content also showed severe damage by arsenic at doses higher than 30 ppm. In addition, the highest arsenic accumulation and arsenic removal efficacy were observed at the range of 30–60 ppm. An analysis of proline and lipid peroxidation content confirmed water mimosa's tolerance of up to 30 ppm of arsenic. The scanning electron microscopy (SEM) and X-ray spectroscopy (EDX) analysis also confirmed the accumulation of arsenic as shown by the deformation of water mimosa tissues. The results showed that water mimosa is a reliable bioremediator for removing arsenic from aquatic systems.

Keyword: Phytoremediation; Arsenic; *Neptunia oleracea*; Removal efficiency; Arsenic accumulation