

Heavy Metals Removal from Sewage Sludge by Ornamental and Non-Ornamental Plants – Review

Fatini Ahmad Muniran & Nurul Nadiah Mohd Firdaus Hum*

Structured Abstract

Background: Increase in sewage sludge production caused by increase in population density rises issue on its disposal in economic and environmental views. It is suggested that the sludge can be used for land application in agricultural field as fertilizers but there is presence of heavy metals in the sludge that may cause harmful effect on the environment and human health. Application of physical, chemical and biological treatment methods to reduce the sludge volume, pathogen and heavy metals content where mechanical equipment is utilized, are not economically friendly. Thus, a cheaper biological method; phytoremediation, is proposed where plants are being utilized to remove heavy metal content from the sludge before being used as fertilizers in agriculture. This review discusses about phytoremediation of sludge to remove heavy metals by using ornamental and non-ornamental plants.

Methods: Academic databases such as Google Scholar, ScienceDirect and Scopus AI were used as search engine tools to find related articles published between year 2020 to 2025. Some of the keywords used were “phytoremediation”, “sludge”, “heavy metals removal”, “ornamental plants” and “non-ornamental plants”.

Findings: Woody, herbaceous, shrubs and grasses were utilized to remove heavy metals content from soil amended with sludge or pure sludge. Phytoextraction, phytostabilization or/and phytovolatilization mechanism were used by the plants for the removal of targeted heavy metals which commonly Cd, Zn, Cu, Cr, Pb, Ni, Mn and Fe. Plants characteristics beneficial and enhances efficient heavy metals removal are high biomass yield, fast growth and able to tolerate stress condition.

Conclusion: In conclusion, most common type of plant being used for this study is herbaceous plant since it produces high biomass yield in short period of time. Heavy metals are usually phytoextracted and phytostabilized by the plant. *Saccharum munja* L., with presence of *Brevundimonas* sp. was found to successfully removed all targeted heavy metals at high efficiency via phytoextraction compared to other plant species.

Keywords: phytoremediation, sludge, heavy metals removal, ornamental plants, non-ornamental plants

* Correspondence: nurulnadiyah@uitm.edu.my

School of Chemistry & Environment, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam