

Phytoremediation potential of *Dipterocarpus chataceus* planted on sewage sludge contaminated soil

ABSTRACT

As the population of developing countries continuously grows, the need for efficient wastewater management is vital. Wastewaters are typically channeled to wastewater treatment facilities, where it is treated and sewage sludge is produced. Sewage sludge has no value and is disposed of on land, sea or air (incineration). However, these methods can harm the environment, costly, time consuming and require expertise knowledge. An environmentally-friendly and cost effective method of disposing sewage sludge, is by using it as a soil amendment. This is because it has high organic content, which can improve plant growth. However, high levels of heavy metals are also present in sewage sludge, which can harm both plants and humans. Hence, these metals need to be removed before the sewage sludge is suitable to be used as a soil amendment. The objective of this study is to assess the potential of *Dipterocarpus chataceus* to uptake and translocate heavy metals found in sewage sludge. *D. chataceus* seedlings were planted on six different planting media; T0/ Control (100% soil), T1 (20% sewage sludge and 80% soil), T2 (40% sewage sludge and 60% soil), T3 (60% sewage sludge and 40% soil), T4 (80% sewage sludge and 20% soil) and T5 (100% sewage sludge) for the duration of 16 weeks. *D. chataceus* showed the best growth in the T1 growth medium, while the lowest was in T5. The highest concentration of heavy metal was in the roots of the *D. chataceus* plant. Cadmium (Cd), copper (Cu) and zinc (Zn) was stored primarily in the stem of the *D. chataceus* plant, followed by the leaf and finally the roots. Similar to iron (Fe), lead (Pb) was stored mainly in the roots of the *D. chataceus* plant. Translocation Factor (TF) was high ($TF > 1$) for Cd, Cu, Pb and Zn. However the BCF value was below 1 for all these metals, meaning that it wasn't a suitable phytoremediator of these metals. The BCF values was high ($BCF > 1$) for Fe, but below 1 for TF, making *D. chataceus* a potential phytostabilizer of Fe. *D. chataceus* was able to grow optimally in lower concentrations of sewage sludge (20% sewage sludge) and also able to phytostabilize Fe in these concentrations. However, more studies need to be conducted, especially in field conditions, in order to optimize the potential of the *D. chataceus* plant as a phytoremediator.

Keyword: *Dipterocarpus chataceus*; Phytoremediation; Heavy metals; Sewage sludge