

## **Uptake of heavy metals by *Jatropha curcas* L. Planted in soils containing Sewage sludge**

### **Abstract**

Problem statement: The chemical pollution of soil has become a major source of concern and has posed serious health problems within the last few years in many developed nations. A variety of organic and inorganic pollutants, including heavy metals, are being mixed in with the cultivated soil and water. Sewage sludge was one of the major sources of enrichment of heavy metals. These pollutants are eventually transported to the natural vegetation and cultivated crops and concentrated in food chains, with possible detrimental effects on human health and wild-life. Thus, soil contaminants need to be cleaned up to improve environmental safety. Approach: Research was conducted to elucidate the potential of *Jatropha curcas* L. to clean toxic heavy metals derived from sewage sludge. *J. curcas* seedlings were planted on six different planting media T0 (100% soil-control), T1 (80% soil and 20% sewage sludge), T2 (60% soil and 40% sewage sludge), T3 (40% soil and 60% sewage sludge), T4 (20% soil and 80% sewage sludge) and T5 (100% sewage sludge) for a period of three months. The growth performance, including height and diameter, of *J. curcas* was measured using diameter tape, while the basal diameter was measured using a vernier caliper every two weeks. Plant samples were collected after harvest and soil samples were collected before and after planting. The ICP-MS was used to determine the concentration of heavy metals in the planting medium and plant parts. Results: According to the growth parameters, the composition of 60% sewage sludge mixed with 40% soil was suitable for achieving optimum *J. curcas* growth. This plant was able to remove heavy metals (Zn, Pb, Cr, Cd and Cu) effectively from the medium containing 100% sewage sludge and after harvesting, the concentrations of Zn, Pb, Cr, Cd and Cu in T5(100% sewage sludge medium) were decreased by 67.7, 78.3, 77.2, 78.5 and 75.0%, respectively from the initial values. The highest levels of Zn (29.5 mg kg<sup>-1</sup>), Cu (0.44 mg kg<sup>-1</sup>) and Cd (8.35 mg kg<sup>-1</sup>) accumulation were found in the roots, whereas the highest Pb and Cr concentrations were observed in the leaves and stem,

respectively. Conclusion/Recommendations: The roots of *J. curcas* were found to be suitable for the uptake of heavy metals in sewage sludge, especially Zn. Cr was also adsorbed effectively by the leaves. Thus, *J. curcas* was a suitable plant to use as a phytoremediator to clean heavy metals, in particular Zn, Cu and Cr. However, a study determining, the short term effects of the large scale use of sewage sludge on trees /- field crops/-leafy vegetables and environmental its impact needs to be carried out.