

Phytoremediation of heavy metals (Pb, Zn, Fe, Cu, Mn) in controlled running water system by using vetiver grass (*Vetiveria zizanioides*)

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Abstract

This study was conducted to identify phytoremediation potential of vetiver grass (*Vetiveria zizanioides*) for removal of five heavy metals (Lead (Pb), Zinc (Zn), Iron (Fe), Copper (Cu) and Manganese (Mn)) in controlled running water system. Plants with different root length (10 cm, 20 cm and 30 cm) were exposed to a concentration of Pb, Zn, Fe, Cu and Mn (10 mg/L) in flowing water system (0.0012 m³/s) and harvested at different time intervals (24, 48, 72, 96, 120 144 and 168 h). The initial concentration (10 mg/L) depicted a decreasing trend from 24 h up to 168 h of the experiment. The highest amount of heavy metal uptake by the plant was Fe (95.8% removal) with the concentration left was 0.42 ± 0.004 mg/L by 168 h. This was followed by Zn with 75% removal (2.55 ± 0.03 mg/L left in the water), Pb; 50% removal with 4.97 ± 0.007 mg/L remain, Mn (33% removal and 6.70 ± 0.006 mg/L remain) and the least uptake is Cu (25% removal with remaining 7.46 ± 0.005 mg/L in the water). In general, removal of the heavy metals from water follow the order of Fe > Zn > Pb > Mn > Cu. Heavy metals were detected in the roots after 24-hours of exposure with level in roots were higher compare to level in the shoots. Based on the ANOVA, no significant different in uptake of Zn, Pb, Fe and Cu by different root length in the running water except for Mn. The morphological changes particularly the change in leaf colour of the plants (chlorosis effect) was observed specifically after 6 days of the experiment for plants with 10 cm root length and the chlorosis effect was seen at day 7 for plants with root length of 20 cm and 30 cm. This study shows Vetiver grass has great potential for phytoremediation of wastewater polluted with Pb, Zn, Fe, Cu and Mn in running water.

Keywords: Phytoremediation, heavy metals, vetiver grass (*Vetiveria zizanioides*).

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