TREATMENT OF REVERSE OSMOSIS CONCENTRATE AND KITCHEN WASTEWATER BY PHYTOREMEDIATION TECHNIQUES

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Reverse Osmosis (RO) plants have been widely used in CKDu (Chronic Kidney Disease of unknown etiology) affected areas of the North Western Province as an effective drinking water treatment method. Wastewater released from RO plants concentrated with various contaminants presented in raw water is normally released to the environment without treatment. Constructed wetlands (CW) are low cost and effective technique in wastewater treatment. However, the use of CW in RO concentrate treatment is not much effective due to the availability of lower nutrient contents. Therefore, this study aimed to identify the potential of phytoremediation techniques to enhance the removal efficiency of pollutants in RO concentrate combined with kitchen wastewater. Four plant species; Vetiver (*Vertiveria zizaniodes*), Cattail (*Typha augustifolia*), Cannas (*Canna indica*) and Bulrush (*Scirpus maritimus L.*) were planted in plastic containers and soil without amendments was served as the control. RO concentrate from RO plant of the Faculty of Agriculture and synthesized domestic wastewater were fed in to the experimental pots for two months period at the rate of 0.6 Lh^{-1}. The hydraulic retention time was 42 hours. Water samples were collected from the inlets and outlets of each experiment unit by two week intervals and analyzed for pH, Electrical Conductivity, Total Dissolved Solids, concentration of Na^{+}, Ca^{2+}, Mg^{2+}, PO_4^{3-}-P, NH_4^{+}-N, NO_3^{-}-N, Pb, As and Cd. The experiment was conducted in a Completely Randomized Design with three replicates. Removal efficiencies (RE) of all pollutants increased with time and Cannas and Bulrush plants showed higher pollutant removal. Cannas and Bulrush plants reported REs of 73%, 73%, 47% and 71%, 71%, 38% for PO_4^{3-}-P, NO_3^{-}-N and NH_4^{+}-N respectively. Therefore it can be concluded that the pollutants in RO concentrate and kitchen wastewater can be efficiently removed by phytoremediation techniques. However further studies are required to identify the most effective plant species.

Keywords: Constructed wetlands, Phytoremediation, Removal efficiencies, RO concentrate