UNIVERSITI TEKNOLOGI MARA

SUSTAINABLE PHYTOREMEDIATION SYSTEM FOR MACRONUTRIENTS REMOVAL FROM DOMESTIC WASTEWATER

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Phytoremediation system employed aquatic macrophytes to reduce, remove and/or to extract the load of macronutrient contaminants. However, there are very limited studies that focusing on ability of local aquatic macrophytes in removing and accumulating macronutrients. Furthermore, it is still lack in post-harvesting management of the macrophytes where the phytoremediated macrophytes were directly disposed to the landfill site. Therefore, the objectives of this study were to identify local aquatic macrophytes that capable in removing macronutrients from domestic wastewater by using phytoremediation system, and subsequently capacity of local aquatic macrophytes in accumulating and distributing the macronutrients from domestic wastewater into their structures were determined. This study also initiatively produce the phyto–organic fertilizers (PhytoLizer) originating from phytoremediated aquatic macrophytes through the windrow composting process. The research works conducted in this study were divided into three (3) Phases. Phase 1 focusing on the identification of macrophytes' performance in removing macronutrients from domestic wastewater. Phase 2 focusing on the accumulation and distribution of macronutrients in macrophytes structures. Phase 3 focusing on the management of phytoremediated macrophytes in post-harvesting period and development of organic fertilizer (PhytoLizer). The results indicated that macrophytes have the capability to remove 94.38% of total nitrogen, 60.00% of nitrate and 88.66% of total phosphorous remarkably from the domestic wastewater. Conversely they also have the capability to accumulate and translocate the 52.40% of potassium and 41.71% of sulfate throughout their body structures. Besides, PhytoLizer showed ability to maintain macronutrients throughout the composting period. Thereby PhytoLizer surpassed the minimum macronutrients requirement practiced by the commercial organic fertilizer which included green manure bases. In conclusion, the results of this study are significant for integrated sustainable approach for phytoremediation of domestic wastewater which would satisfy the aspects of macronutrient criteria wholly. Henceforth phytoremediation process becomes an alternative way to compete with the other green technologies for national development.

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