RECYCLING PETROCHEMICAL INDUSTRY WASTEWATER FOR CONSTRUCTED WETLAND DEVELOPMENT THROUGH PHYTOREMEDIATION TECHNOLOGY

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4. Enhanced Research Title and Objectives

4.1 Enhanced Research Title

Phytoremediation of Ex Mining Lake Water in Constructed Wetland Using Perennial Plants.

4.2 Objectives

The research objectives are:

4.2.1 To investigate the potential of locally available perennial plants for phytoremediation of lake water for the development of an aesthetic constructed wetland in UiTM (Terengganu), Bukit Besi Campus landscape.

4.2.2 To evaluate physical observation of plants in 28 days of exposure to lake water.

4.2.3 To determine the contaminants removal profile during 28 days of sampling day.

5. Report

5.1 Proposed Executive Summary

Phytoremediation is a broad term that encompasses the use of plants to reduce contaminants in the environment, such as in water, soil, or groundwater. The main advantages of phytoremediation over conventional treatment technologies, such as membrane filtration, wet oxidation, agitation in bioreactors, and granular-activated carbon adsorption, are that it provides habitats for animals, encourages biodiversity, and recovers ecosystems that are destroyed by human activity at a site.

The objective of this project is to determine the mechanisms of phytoremediation of VCM and PVC by *Scirpus grosus*. Petrochemical industries produce vinyl chloride monomer (VCM) and poly vinyl chloride (PVC) to fulfill the demand of various sectors such as pipes and fittings, wire and cable, hoses and tubes, footwear, bottles and etc. However, the effluent from the VCM and PVC production must be treated according to DOE standard before being discharged. In fact, the conventional methods that are commonly used during the waste water treatment process are costly, apply complicated operation and require high maintenance. This study contributes to the uses of green technology in the treatment of volatile compounds which has many advantages compared to the conventional physicochemical treatment technologies by using native plant species.

In this project, *S. grosus* that is a tropical aquatic plant is used to remove VCM and PVC by phytoextraction mechanism. Rhizobacteria which is grows at the root of *S. grosus* will be investigated in terms of its potential to detoxifying toxic forms of VCM and PVC.

It is expected that, rhizobacteria at *S. grosus* rhizosphere can provide high efficiency to phytoremediate VCM and PVC by releasing its chelating agents, acidifications and redox changes. In addition, phytoremediation is desirable for aesthetic appearance of UiTM (Terengganu), Bukit Besi Campus landscape as a recreation campus, surrounded by aquatic plants with large biodiversity.

5.2 Enhanced Executive Summary

Tasik Puteri is a recreational lake for few activities such as scuba diving, kayaking and swimming during the dry season. However, this lake was an iron ore mining site with the remaining contaminants and heavy metal of the lake can harm the people who directly get into contact with the lake water. The present study focused on investigating the phytoremediation potential of locally available perennial aquatic plants in the treatment process of water from Tasik Puteri, which was contaminated with mining effluent. The effluent was treated with water hyacinth *(Eichhornia crassipes)* and water lettuces *(Salvinia molesta* and *Pistia stratiotes)* in a constructed wetland for a period of 28 days. The effluent treatment efficiency was determined by measuring the effluent quality over the experimental period. Five water parameters such as the total iron (TI), total phosphorus (TP), chemical oxygen demand (COD), electrical conductivity (EC) and turbidity were examined using standard laboratory procedures. The results indicated that the three plants were able to remove the contaminants. After 28 days, the physical observation shows that the water hyacinth was healthier than the water lettuces. Considerable decrements in concentration were recorded in TI, TP and EC, but fluctuation in COD and turbidity value were observed. Comparison results by the plants indicated that after 28 days, water hyacinth was the most effective plant in removing phosporus, COD and EC of the mining lake with 97.3%, 70.5% and 22.2% removal, respectively. Furthermore, water lettuce (*P. stratiotes*) was the most effective plant in removing iron (96.0%) and the turbidity (50.0%) of the mining lake. *S. molesta* showed the lowest removal capability for all experimental parameters. In conclusion, water hyacinth and water lettuces had shown better capability in removing heavy metals and other contaminants with *E. crassipes* has the highest survivability in the lake water.

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