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Biosurfactant enhanced phytoremediation of crude oil contaminated soil using vetiver grass (chrypsopogon zizanioides)

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Polycyclic Aromatic Hydrocarbons (PAHs) are a group of compounds with multiple rings that form part of the petroleum crude oil and are considered harmful to human health. The United State Environmental Protection Agency (US EPA) have classified 16 PAHs as priority pollutants that can potentially cause cancer in human beings. These compounds normally enter the environment through oil spills that can negatively affect human health and the environment. The traditional methods used for soil remediation such as the engineering, thermal and chemical methods that involves excavation, heating and application of toxic chemicals often end up causing more harm to the environment. Thus, scientists are exploring the use of plants for the removal of pollutants from the soil known as phytoremediation in order to develop a cost effective, environmentally friendly and sustainable technique for soil remediation. This helps to overcome the issues identified in the traditional methods mentioned above as the treatment of pollutants occurs in situ without excavation and destruction of soil nor thermal heating or application of strong oxidising and reducing chemicals. This paper explains the results obtained from a study conducted on the phytoremediation of crude oil contaminated soil using Chrysopogon zizanioides under the influence of fertilizer and biosurfactants. In this research 70kg of soil was artificially spiked with 1kg of crude oil and allowed to weather for 100 days. Following this, the weathered soil was transferred into different terracotta pots for the purpose of greenhouse experiment. Thereafter, the seedlings of C. zizanioides were transplanted into the terracotta pots where some of the vegetated samples were treated with fertilizer and biosurfactants to promote the growth of the plant and solubilize the organic contaminants for easy absorption by the plants respectively. The result showed high reduction of 70% of the concentration of PAHs in samples treated with doses of both fertilizer and biosurfactants after a period of 8 months. The application of fertilizer and biosurfactants also promoted the growth of plants which resulted in high bioaccumulation of PAHs from the soil as compared to the control samples. However, the greatest yield in plant growth occurred in samples treated with fertilizer only which also resulted in the bioaccumulation of PAHs from the soil. In conclusion the use of fertilizer and biosurfactants is highly recommended to improve the process of phytoremediation by promoting the growth of plants and enhancing the bioaccumulation and potential dissipation of organic pollutants from the soil. The benefits of this research include the creation of a cost saving, environmentally friendly and sustainable technology for soil remediation. In addition, the bye-products of the harvested plants used for the phytoremediation of crude oil contaminated soils can potentially be used as raw

materials for the production of Biogas.