UNIVERSITI TEKNOLOGI MARA

BIOREMEDIATION OF HYDROCARBON CONTAMINATED-SOILS USING LOCALLY ISOLATED P.AERUGINOSA WITH ORGANIC AND INORGANIC FERTILIZERS

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ABSTRACT

Oil contaminated wastewater is the most concerned pollution because it is harmful to the flora and fauna. Oil spills is the major source for oily wastewater. This oil spills will contaminate the marine sediments, soils and water. Biodegradation method is the most used method because it using microorganisms to degrade the hydrocarbon into less contaminated forms. This is because biological method is environmental friendly and cost effective. The microorganisms will degrade the contaminants in soil by using the hydrocarbon as the energy source. The discharge of oil into the ocean which have low concentrations of inorganic nutrients regularly deliver a lot of carbon/nitrogen or carbon/phosphorus ratios, or both, which are bad for bacterial development. Besides that, the lack of nutrients for microorganisms also can affect the biodegradation of hydrocarbon. Thus, this research aim to study the effect of organic and inorganic fertilizer addition to the growth rate of locally isolated *Pseudomonas Aeruginosa*. Next, is to investigate the effectiveness of inorganic nutrient (NPK and urea) and organic nutrient (SW and ESP) to stimulate the natural bioremediation process of hydrocarbon contaminated soils. The soil samples that taken from Port Dickson beach will be isolated and identified by using cetrimide agar. *Pseudomonas Aeruginosa* that was isolated from soil samples taken from Port Dickson beach were used in degradation of different hydrocarbon (kerosene and diesel) polluted soils added with inorganic (NPK and Urea) and organic (SW and ESP) fertilizers and in some of their mixture. The incubation period ranged from 0-18 days. Throughout the experiment, the TPH and bacterial growth was determined. Results showed that bacterial population is increasing throughout the experiment until day 15 due to the presence of essential nutrients. Bacterial counts is increasing as the microorganisms consumed hydrocarbon for carbon and energy, residual hydrocarbon decreased was stimulated by the fertilizer and percentage degradation increased. *Pseudomonas Aeruginosa* degraded kerosene and diesel better in the existence of NPK and urea fertilizers. More than 90% of the hydrocarbons were degraded with each incubation period. Bacterial population after 15^{th} day it begins to drop because of the secretion of toxic secondary metabolites that may cause harm to microbes itself. Furthermore, *Pseudomonas Aeruginosa* degrade kerosene oil better than the diesel oil.

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INTRODUCTION

1.1 RESEARCH BACKGROUND

The amount of oil used is getting increasing with the industrial development. For the reason that, the producing of oil is getting higher due to high demand. Sometimes due to technical and management reasons, a lot of oil is brought into the water, which formed great environmental pollution. Oily wastewater has been known as one of the most concerned contaminated sources. Source of oily wastewater is very broad and it is mainly generated from crude oil production, oil processing, petrochemical, metallurgical, mechanical industries and maritime transport. According to statistics, every year at least 500 to 1000 million of oil is discharged to water through a variety of ways, which not only cause water pollution, but also proves to be a waste of oil resources (Hui, L. et. al., 2014).

Besides that, oil spills also produce waters containing oil. Usually the data of oil spills in marine environment is vary every year and statistic regarding them is inadequate due to unpredictable reports of lesser case globally. According to data collected by ITOPF (The International Tanker Owners Pollution Federation), oil tanks spilled have dropped amid the most recent 45 years, so that in 2010-2014 there was an normal around 1.8 oil spills per year (Mirjam.K, 2015).

The hydrocarbons that can be found in petroleum are for the most of part alkanes, cycloalkanes, and numerous aromatic hydrocarbons, whereas the other organic compounds contain nitrogen, oxygen, and sulfur, in addition of minimum quantity of metals such as iron, nickel, copper and vanadium. The hydrocarbons that can be found in oil can affect the human, flora and fauna. Organic toxic waste that can be found in oil can cause environmental harms for marine life, plant, animal, and equally mutagenic and carcinogenic for human being. Therefore, hazards on the environment and human health of oil pollutants have caused great concerns.