ISOLATION AND IDENTIFICATION OF INDIGENOUS BIOSURFACTANTS PRODUCING BACTERIA FROM MOTOR OIL

RESEARCH MANAGEMENT INSTITUTE (RMI)
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR
MALAYSIA

BY :

ANG CHUNG HUAP
CINDY TAN SOO YUN
MILLAA-ARMILLA BINTI ASLI

DECEMBER 2012

Contents

1. Letter of Report Submission

BAHAGIAN A : MAKLUMAT KETUA PROJEK	
Nama	ANG CHUNG HUAP
Alamat Pusat Tanggung Jawab (PTJ)	FAKULTI SAINS GUNAAN UiTM SARAWAK
Tajuk Projek:	ISOLATION AND IDENTIFICATION OF INDIGENOUS BIOSURFACTANTS PRODUCING BACTERIA FROM MOTOR OIL
BAHAGIAN B : MAKLUMAT PROJEK PENYELIDIKAN	
No Rujukan Projek RMI :	600-RMI/ST/DANA 5/3/Dst (88/2011)
Tarikh Mula Projek :	1 APRIL 2011
Tarikh Tamat Projek :	31 MAC 2012
BAHAGIAN C : HASIL PENYELIDIKAN	
Penerbitan Berindeks (Tajuk dan Penerbit)	DALAM PROSES PENULISAN MANUSCRIPT
Harta Intelek (No Patent/No IP)	
Pelajar yang di latih (Nama, KP, Kod Program)	
Tandatangan Ketua Projek :	Tarikh :31/12/2012
Pengesahan RMI :	Tarikh :

5. Report

5.1 Proposed Executive Summary

A biosurfactant is a type of complex bio-based material that is produced by microorganisms which have the ability to lower the surface and interfacial tensions of liquids. Being amphiphilic molecules, the polar moiety (hydrophilic) consists of carbohydrate, amino acid or phosphate group. Meanwhile, the hydrophobic (nonpolar) parts are usually long carbon chains and fatty acids. They accumulate between fluid phases, can form micelles and thereby enhance the solubility of poorly soluble compounds in water. Various microbial surfactants have been successfully produced using different types of water soluble and insoluble carbon sources including crude petroleum and motor lubrication oils. This study aims to screen and identify indigenous bacterial strains isolated from motor oil contaminated soil samples which are capable of synthesizing microbial surfactants.

Motor oils consist of aliphatic and aromatic hydrocarbons such as naphthalene, benz(a)anthracene, benzo(a)pyrene, and fluoranthene. Furthermore, used motor oils also contain heavy metals such as zinc, magnesium, barium, lead, aluminium, chromium, copper, iron, nikel, silicon, and tin. All these elements can cause severe environmental pollutions when used motor oils leaks onto earth surface. The biosurfactants producing bacteria will be identified using standard morphological method and DNA sequencing method. DNA sequencing of bacterial 16S rRNA region amplified by universal primers will provide an accurate identification result within shorter time. In addition, biosurfactants produced by the indigenous bacteria will also be tested for additional potential usages such as surface tension reduction and antimicrobial properties. The biosurfactants are favoured than chemical surfactants owing to their low toxicity, biodegradability, mild production conditions that use cheap waste substrates and are versatile at extreme salinity, temperature and pH. Major applications of biosurfactants include enhanced oil recovery, degradation of hydrocarbons and removal of pesticides as well as in the healthcare and food processing industries.

5.3 Introduction

Different mechanisms had been developed by microorganisms through evolution in order to thrive in harsh environments such as soil and water polluted by petroleum hydrocarbons.

For example, the ability to produce biosurfactants, had allows many microbes especially bacteria to utilize petroleum hydrocarbon as main carbon source for cellular metabolism. In general, biosurfactants (mainly composed of lipids and amino acids) are surface active agents secreted by microbes such as bacteria. It acts as an emulsifying agent capable of reducing the surface and interfacial tensions between molecules at surface and intersurface respectively. By secreting biosurfactants, bacteria can solubilise and breaking down hydrocarbons contaminants into compounds that useful for their growth and cellular functioning.

Owing to its low toxicity and stability at extreme conditions (such as extreme temperatures or extreme pH), interest in biosurfactants had been steadily increased over the years. Apart from bioremediation of crude petroleum, biosurfactants were also applied in the industries for enhanced oil recovery, formulation of herbicides and pesticides, paper making as well as ceramic processing. The antimicrobial properties exhibits in some bacterial biosurfactants also had attracted the attentions to broaden its application in the healthcare and cosmetics industries.

Preliminary identification of indigenous bacterial strains which are capable of secreting potential biosurfactants in this study will ease the establishment of bacterial consortium for the large scale biosurfactants production for future studies. The data obtained from this study will be used to optimize the bacterial growth and increase the yield of biosurfactants without affecting the quality of end-products in future.