Biodegradation of some polycyclic aromatic hydrocarbons polluted soils contaminated with petroleum oil

Thesis
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By

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﴿ قالوا سبحانك لا علم لنا الا ما علمتنا

إنك انت العليم الحكيم ﴾

صدق الله العظيم

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I would like to say that scientific degrees are not the most important things in life, but beloved family, good friends, good times and happiness are.

With warm regards

Basant Nader Ahmed Rashad

Dedication

I would like to dedicate this work to my parents that seeded my curiosity and desire for knowledgement and thanking them for their unlimited effort, patience and invocation that is unquestionable honored.

Contents

List of abbreviations

Abbrev.	Full term
Anth	Anthracene.
ANOVA	Analysis of variance.
ARHD	Aromatic Ring-hydroxylatingdioxygenase.
ARISA	Automated rRNA intergenic spacer analysis.
B[a]A	Benz[a]anthracene.
B[a]P	Benzo[a]pyrene.
bp	Base pair
Blastn	Somewhat similar sequences.
BSA	Bovine serum albumin.
BSM	Basal salt medium.
CFU	Colony Forming Unit.
Conc	Concentration.
CTAB	Cetyltrimethylammonium bromide.
DOM	Dissolved organic matter.
EPA	Enviromental protection agency.
FAME	Fatty acid methyl ester.
GC/MS	Gas Chromatography/Mass Spectrometry.
GN	Gram negative bacteria.
GP	Gram positive bacteria.
HPLC	High Performance Liquid Chromatography.

HMW-PAHs	High molecular weight polycyclic aromatic hydrocarbons.
LB	Luria Bertani.
LC50	Lethal concentration at which 50% reduction in growth.
LMW-PAHs	Low molecular weight polycyclic aromatic hydrocarbons.
M	Mucoid.
MM	Minimal medium.
MSM	Minimal salt medium.
NCBI	National Center for Biotechnology Information.
NCRRT	National Center for Radiation Research and technology.
NDO	Naphthalene dioxygenase.
NM	Non mucoid.
NMR	Nuclear magnetic resonance.
OSPW	Oil sands process-affected water.
OUT	Operational taxonomic units.
PAHs	Polycyclic aromatic hydrocarbons.
PAHsDB	Polycyclic aromatic hydrocarbons degrading bacteria.
PAH-RHD	Polycyclic aromatic hydrocarbon ring-hydroxylatingdioxygenase.
PAH-RHD[GN]	Polycyclic aromatic hydrocarbon ring-hydroxylatingdioxygenase of gram negative bacteria.
Phe	Phenanthrene.
Pyr	Pyrene.
QRT-PCR	Quantitative real time – Polymerase Chain Reaction
RDA	Redundancy analysis.

RHD	Ring-hydroxylatingdioxygenase.
RHO	Ring-hydroxylating oxygenase.
RT	Retention time.
TCA	Tricarboxylic acid.
TPHs	Total petroleum hydrocarbons.
T-RFLP	Terminal restriction fragment length polymorphism.
μgL^{-1}	Microgram per liter.

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	MAM-P8 after 21 days of incubation.	

Abstract

Basant Nader Ahmed Rashad, Biodegradation of some polycyclic aromatic hydrocarbons polluted soils contaminated with petroleum oil, (M.Sc.), Faculty of Science, Ain Shams University.

Biodegradation of polycyclic aromatic hydrocarbons especially high molecular weight (HMW) which represents the first priority must be disposed as recorded by US Environmental protection agency. Eight bacterial strains designed as MAM-P1, MAM-P8, MAM-P13 and MAM-P14 (group A) were isolated from soil contaminated with crude petroleum oil from El Zytea-port, Suez Canal, Egypt. While bacterial strains MAM-P22, MAM-P25, MAM-P26 and MAM-P39 (group B) were isolated from soil contaminated with crude petroleum oil from Cairo Oil Refinery Company, Mostrod, Qalyubia, Egypt. These isolates were evaluated for their potential to grow on different concentrations of HMW-PAHs (Benz[a]anthracene, Benzo[a]Pyrene and Pyrene). All isolated bacterial strains were able to grow on different concentrations of HMW-PAHs mixtures which included [(benzo[a]Pyrene+Pyrene) and benz[a]anthracene+benzo[a]Pyrene+Pyrene)]. Strain