Bacterial degradation of various lubricant oils and their environmental impact

Thesis

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BY

Ali Mohamed Ali Saeed
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Supervisors

Prof Dr. Ahmed Osman Mostafa
Prof. of Biochemistry,
Biochemistry Department,
Faculty of science,
Ain Shams University.

Dr. Khaled Zakaria El-Baghdady
Lecturer of Microbiology,
Microbiology Department,
Faculty of science,
Ain Shams University.

Dr. Abeer E. M. Zakaria
Lecturer of Microbiology,
National Center of Radiation
Research and Technology (NCRRT).

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DEPT. OF MICROBIOLOGY

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Prof Dr. Ahmed Osman Mostafa
Prof. of Biochemistry
Biochemistry department,
Faculty of science,
Ain shams University.

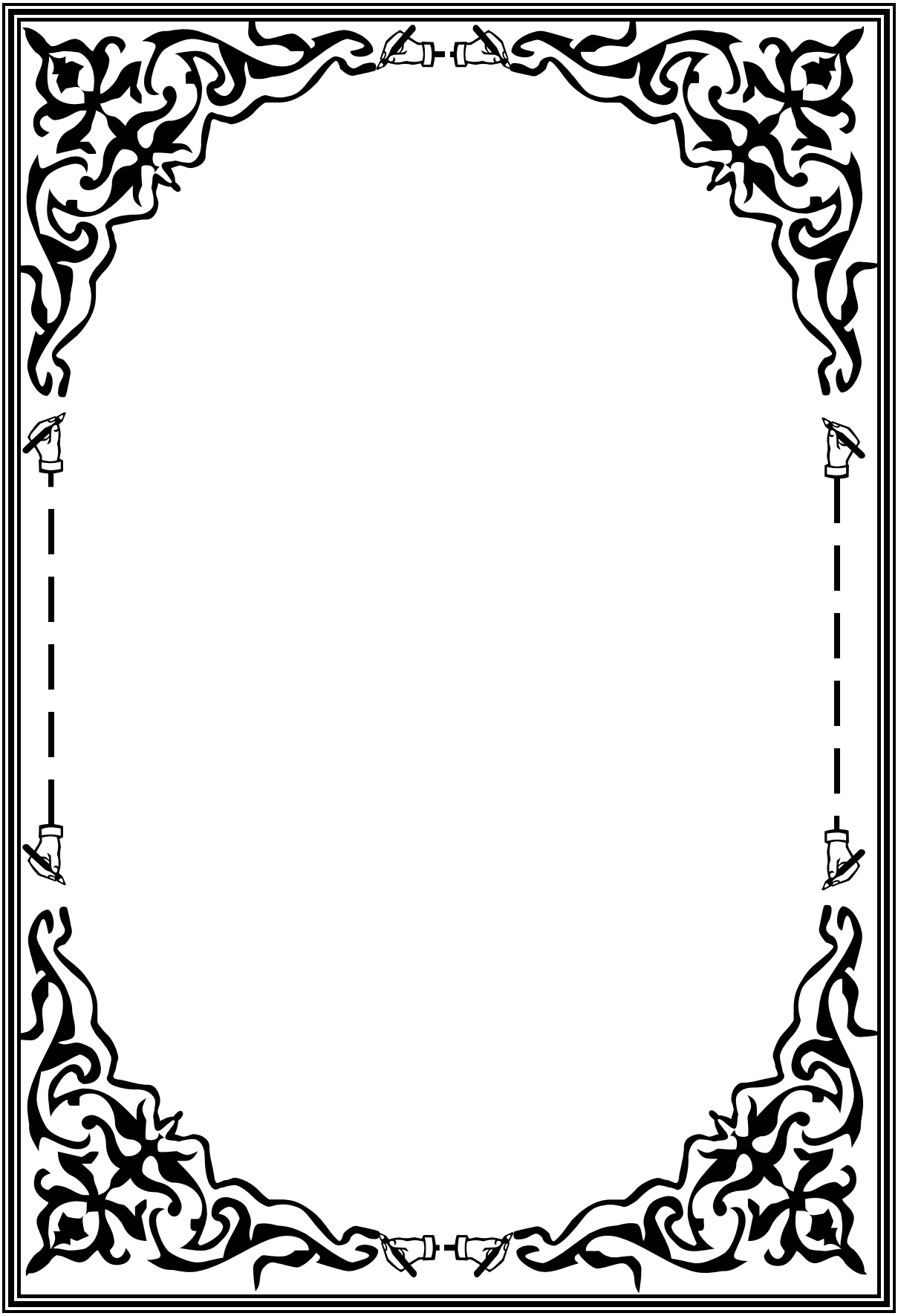
Dr. Khaled Zakaria
Lecturer of microbiolgy
Microbiology department,
Faculty of science,
Ain shams University.

Dr. Abeer E. M. Zakaria
Lecturer of microbiology
National Center of Radiation
Research and Technology (NCRRT).

Department of Microbiology
Faculty of science
Ain shams University
(2010)

This dissertation has not been previously submitted for any degree at this or at any other university

Ali Mohamed Ali Saeed



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Eighteen oil degrading bacterial isolates were isolated from four different soil samples. Among them, 7 potent oil degrading bacterial isolates were selected on MSO medium (Mineral Silica-gel Oil medium).

Among the 7 selected isolates, 2 isolates LD10 and LD12 identified by 16S-rRNA genes as *Gordonia amicalis* and *Acinetobacter junii* respectively. These isolates showed maximum percentages of degradation on 3 used lubricant oils (Mobil, Mobil 1 and Caltex). However, consortia demonstrated better degradation than the isolates separately. Synthetic Mobil 1 was more degradable than Mobil and Caltex.

Several environmental conditions including incubation periods, pH, oil concentration, inoculum sizes, nitrogen & phosphorus concentrations and aeration were studied to enhance lubricant oils biodegradation by consortium (Clover cultivated field). The optimum environmental conditions obtained from this study showed better degradation for the used lubricant oils which was confirmed by FT-IR analysis. The degradation percentages reached 34.6 ± 2.3, 45.2 ± 1.4 and 43.9 ± 0.7 for Mobil, Mobil 1 and Caltex respectively. FT-IR analysis of control and residual oil indicated the oxidation of oil which confirmed the modification of the original oil by microbial treatment.

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ABBREVIATIONS

ATSDR	Agency for Toxic Substances and Disease Registry
BMM	Basal mineral medium
C	Caltex lubricant oil
CC	Caltex control
CFU	Colony Forming Units
EEC	European Economic Community
EDTA	Ethylenediaminetetraacetic acid
EPA	Environmental Protection Agency
FT-IR	Fourier Transform Infrared analysis
g	Gram
LD	Lubricant Degrading bacteria
M	Mobil lubricant oil
M1	Mobil 1 lubricant oil
MC	Mobil control
M1C	Mobil 1 control
mg	milligram
ml	Milliliters
mM	Millimolar
µg	microgram
MSO	Mineral Silica-gel Oil medium
PAHs	Polyaromatic hydrocarbons
PCR	Polymerase Chain Reaction