# Introduction

Hydrocarbons in the environment .................................................. 2
Hydrocarbons and bioremediation ..................................................... 3
Enhanced hydrocarbon bioremediation (Role of surface active agents) .. 3
Hydrocarbon uptake ........................................................................ 5
Pesticides in the environment ............................................................ 5
Conclusion ...................................................................................... 6
References ....................................................................................... 7

## Development of a Bacterial Consortium for Remediation of Crude Oil Sludge ................................................................. 10

### 1.1 Introduction and Literature Review

1.1.1 Hydrocarbon pollution and its remediation ................................. 11
1.1.2 Nutrient and other abiotic requirements for petroleum pollution bioremediation ........................................................................... 13
1.1.3 Biological factors affecting biodegradation of hydrocarbons ......... 14
1.1.4 Petroleum pollution bioremediation: importance of consortia and other external agents ........................................................................ 15
1.1.5 Hydrocarbons, hydrophobicity and surfactants ............................. 16
1.1.6 Biosurfactants and hydrocarbon pollution bioremediation .......... 18

### 1.2 Methodology

1.2.1 Isolation and screening of hydrocarbon degraders ......................... 21
1.2.2 Characterization of the selected isolates ...................................... 23
1.2.3 Development of a consortium for degradation of crude oil sludge in shake flask conditions ......................................................... 27
1.2.4 Testing the efficiency of the developed consortium for Ratnagiri crude oil sludge degradation in soil under natural field conditions ................................................................. 28
1.2.5 Testing the efficiency of the developed consortium for degradation of crude oil sludge procured from IOCL, Faridabad, in soil under natural field conditions ................................................................. 31

### 1.3 Results and Discussion

1.4 References .................................................................................. 43

## Structural, Physicochemical and Biological Characterization of Rhamnolipid from Pseudomonas aeruginosa .................................................. 50

### 2.1 Introduction and Literature Review

2.1.1 Biosurfactants defined ............................................................... 51
2.1.2 Diversity of biosurfactants ......................................................... 52
2.1.3 Factors affecting rhamnolipid biosynthesis and secretion .......... 54
2.1.4 Biosurfactant producers: scope for new molecules .................... 56
2.1.5 Diverse uses of biosurfactants (Rhamnolipids) ......................... 57