CHAPTER I
INTRODUCTION

The production of surface active compounds of biological origin is considered to be of prime importance because biosurfactants are gaining significance in various industries like petrochemical, bioremediation, agriculture, food, textiles, cosmetics, health care, etc. Although biosurfactants have several promising applications, their industrial importance is governed by the overall economic gain of production. Biosurfactants are difficult to produce in an economic manner due to significant upfront investments in facilities, a relatively long production cycle (Canter, 2004), high production costs (Fiechter, 1992b; Canter, 2004), overproducing strains of bacteria are rare (Fiechter, 1992b; Tahzibi *et al.*, 2004), etc. In this regard, process development of a continuous microbial process for biosurfactant production is a manifest necessity.

There are several methods to achieve the economic production of biosurfactants. Most biosurfactants applications would involve cosmetics, food, and pharmaceutical industries. Their industries are low volume, high-value categories which could absorb the higher cost of biosurfactants (Desai and Banat, 1997). The aseptic, mildness and performance of biosurfactants in their industries are importance. Furthermore, biosurfactant production from industrial wastewaters is a feasible alternative because of its reduction in environmental pollution, utilization of wastes and favorable economics.

Biosurfactants are surface active agents containing both a lipophilic and hydrophilic moiety that tend to partition preferentially at the interface between fluid phases with different degrees of polarity and hydrogen bonding such as oil/water interfaces. Due to these properties, biosurfactants reduce surface and interfacial tensions, and exhibit emulsification properties. Several biosurfactants have promising substitutes for chemical surfactants due to their diverse advantages over the chemical surfactants, such as lower toxicity, higher biodegradability, and better environmental compatibility (Tahzibi *et al.,* 2004). Biosurfactants are produced by a variety of microbes grown on hydrophobic substrate (Desai and Banat, 1997). However, there have been examples of the use of a water-soluble substrate for biosurfactant production by microorganisms (Karanth *et al.*, 1999). *Pseudomonas* species is well known for its ability to produce rhamnolipid biosurfactants with potential surface active properties when grown on different carbon substrates and therefore is a promising candidate for large scale production of biosurfactants (Tahzibi *et al.*, 2004).

This study involves the production of biosurfactants by continuous culture of *Pseudomonas aeruginosa* SP 4, which was isolated from a crude oil-contaminated soil, using fish steaming waste from canned fish processing or mineral medium as a nutrient source, with palm oil as sole carbon source. This experiment carries out using two identical units of 3 l lab-scale aerobic sequencing batch reactors (SBRs) under aseptic conditions for application in cosmetics, food, and pharmaceutical industries. Initially, two identical sequencing batch reactors were designed and constructed in which the *Pseudomonas aeruginosa* SP 4 was incubated with a working volume of 1.5 l. Then, the effluent COD and oil concentration, surface tension, effluent total suspended solids (TSS) and mixed liquor suspended solids (MLSS) were evaluated under different nutrients, oil loading rates, and cycle times to identify the optimal condition for biosurfactant production.