CHAPTER I
INTRODUCTION

Surface-active compounds or surfactants are amphiphilic compounds which can reduce surface and interfacial tensions by accumulating at the interface of immiscible fluids and increase the solubility and mobility of hydrophobic or insoluble organic compounds. Chemically synthesized surfactants are commonly used in the petroleum, petrochemical, food, and pharmaceutical industries as emulsifiers and wetting agents; nevertheless, some of them are not environmentally friendly. Therefore, the surface-active microbial products or biosurfactants, which are naturally produced from microorganisms such as bacteria, fungi, and yeast, have recently been considered as an alternative to synthetic surfactants. Biosurfactants have several advantages, including biodegradability, low toxicity, and biocompatibility (Kosaric, 2001, and Singh *et al.,* 2007).

Biosurfactants have shown potential use in many applications (such as agriculture, food processing, detergents, personal care products, cosmetics, pharmaceuticals, paint industries, bioremediation of hydrocarbon, and enhanced oil recovery) (Banat et al., 2000). However, large-scale production of these molecules has not been realized because of low yields in production processes and high recovery and purification costs (Muthusamy *et al.*, 2008). Therefore, it is necessary to develop an efficient and cost-effective bioprocess for the biosurfactant production (Wei et al., 2005).

The many bioprocesses are effective process in substantial increasing the biosurfactant production. In this regard, the two identical of sequencing batch reactors (SBRs) have been used in an experiment because fill-and-draw system of SBRs showed better reactor performance and greater biosurfactant production resulting in the enhancement of the microbial growth (Cassidy and Hudak, 2001).

One of the most surface active biosurfactants is rhamnolipid, a glycolipid-type biosurfactant which is produced by *Pseudomonas aeruginosa* strains. The major types of rhamnolipids are consisted of one or two molecules of rhamnose linked to one or two molecules of β-hydroxydecanoic acid, which are known as mono-rhamnolipid and di-rhamnolipid, respectively (Wei et al., 2005). *Pseudomonas aeru-*

ginosa strains are able to grow on various carbon sources, especially vegetable oils (like palm oil, olive oil, sunflower oil, and rape seed oil). However, palm oil can serve as the cheapest raw material in Thailand because of it abundantly availability.

Parkinson (1985) suggested that biosurfactant production by microbes is often but not invariably enhanced by the addition of hydrocarbon to the growth medium, and needs to be optimized by controlling such factors as carbon source, nitrogen source and concentrations, aeration and metal ions.

In this study, the production of rhamnolipid biosurfactant was carried out in two identical units of lab-scale aerobic SBRs. An indigenous bacterial strain was isolated from petroleum-contaminated soil in Thailand. The strain, identified as *Pseudomonas aeruginosa* SP4, was used to produce the biosurfactant. Palm oil, glucose, and mineral medium were use as carbon and nutrient source, respectively. The aim of this study is to optimize rhamnolipid production by using the different ratio of palm oil and glucose.