CHAPTER I

INTRODUCTION

Biosurfactants are microbially produced surface-active compounds. They are amphiphilic molecules with both hydrophilic and hydrophobic regions causing them to aggregate at interfaces between fluids with different polarities. Generally the hydrophilic moiety of biosurfactants composes of amino acids or peptides, anions or cations, or mono-, di-, or polysaccharides. The hydrophobic portion is often made up of saturated, unsaturated, or hydroxylated fatty acids (Georgiou *et al.*, 1992), or composed of amophophillic or hydrophobic peptides. Biosurfactant has been produced from variety of microorganism such as bacteria, yeasts and fungi, which grow on water-immiscible substrates such as hydrocarbon. The most studies were focused on Rhamnolipid biosurfactant, produced from *Psudomonas aerginosa*, due to their excellent tensioactive and emulsifying properties (Mulligan, 2005; Maier and Soberón-Chávez., 2000). Although Biosurfactant has several outstanding properties, but the most problem was found in the extraction step is time consumption. Moreover, conventional method (extract biosurfactant by organic solvent) has the other disadvantages from using volatile organic solvent and chemical substances: costly, polluted air and toxic for health.

One very specific problem is time consumption during the extraction. Normally, crude biosurfactant has been extracted from culture broth by using centrifuge to remove bacterial cell for 20 min. In the next step , the supernatant was precipitated by hydrochloric acid and left overnight, then centrifuge again to collect the precipitated of biosurfactants (Pornsunthorntawee *et al.*, 2008). Hence, the several steps take a long time and difficult to process. Furthermore, in the last step, crude biosurfactant was extracted by using organic solvent, the cause of high cost and toxic for environment and health.

Foam fractionation is an example of a surfactant-based separation, a major class of separation know as adsorptive bubble separation techniques. Foam fractionation processes have been used to concentrate and remove surface-active agents from homogeneous aqueous solutions by physical of separation (Sripituk, 2006, Triroj

2005, Boonyasuwat *et al.*, 2005, Darton *et al.*, 2004, Boonyasuwat *et al.*, 2003). In this process, the solute species adsorbs at the gas-liquid interface between a dispersed phase (gas bubbles) and a continuous phase (bulk liquid) resulting in remove surfactants from solution. The foams at the surface are allowed to drain and once collapsed, to form a concentrated liquid that can be separated biosurfactant from culture medium. The outstanding features of this process, including rapid operation, high removal efficiency, low space requirements and low cost of operation. Therefore, these are the reasons for selecting the foam fractionation technique to solve the problem in extraction step for separate and concentrate biosurfactant.

The purpose of this work is use foam fractionation technique to separate and patial purify crude biosurfactant which was produced by *Pseudomonas aeruginosa* strain SP4, isolated from petroleum-contaminated soil in Thailand, and plam oil is used to introduced production of a biosurfactant. The effect of the air flow rate, column height, pore size of sinter glass disk, the solution volume and collecting time were investigated to determine the optimum condition for highest removal efficiency of biosurfactants. For comparison, we were also study in removal efficiency between foam fractionation technique and conventional method.

OBJECTIVES

1. To produced biosurfactant from cultivation of *Pseudomonas aeruginosa* SP4, isolated from petroleum-contaminated soil in Thailand, and palm oil is used as a carbon source.

2. To investigate optimum condition for highest removal efficiency of biosurfactant from culture broth by foam fractionation technique by varying operational parameters.

3. To compare the removal efficiency between foam fractionation technique and conventional method.

SCOPE OF RESEARECH

The scope of this research will cover the following:

1. The biosurfactant of *Pseudomonas aeruginosa* strain SP4, isolated from petroleum-contaminated soil in Thailand, and use palm oil to activate production of a biosurfactant.

2. The separation of biosurfactant from *Pseudomonas aeruginosa* SP4 culture broth by foam fractionation technique.

3. The effect of air the air flow rate, column height, pore size of sinter glass disk, the solution volume and foam collecting time will be examined in order to determine the optimum condition for highest removal efficiency of biosurfactant from culture broth.