CHAPTER 1

INTRODUCTION

Apart from obvious biological importance, lipases have been received as being one of the most important class of industrial enzymes. Similar to other enzymes such as cellulases and proteases, lipases have potentially been used for industrial applications, i. e., in the diary industry, in oleochemical industry, in pharmaceutical industry, in synthesis of desired substances and in household detergents. By using whole lipolytic microbial cells or lipases isolated from various lipase-producing microorganisms, lipases are valuable enzymes for Lipid biotechnology. For example, some bacteria such as ***Acenetobaeter*** strain (Shabti and Wang, 1990) and ***Bacillus subtilis*** (Kakinuma et. al., 1969) were used to produce some biosurfactants by biotransformation. Moreover, lipases and whole cells of lipase producing microorganisms, have also been used in environmental application for treatment of lipid waste, which increases the serious problem to the environment. By those reasons, microbial lipases having relatively high activities or some certain properties, have received the most attention for commercial attraction. Microbial lipase, when compared to animal or plant lipases, are excreted in a large quantities by inexpensive production (Macrae and Hammond, 1985). However, the amount of lipase, which posses satisfactory operating characteristics, is still limited. An example of the limitations is stability of lipase activity when this enzyme is added in laundry detergent powders, i. e., in alkaline condition and resistant to anionic surfactants (Xia et. al., 1996).

Although a large number of microbial lipases have been screened for various industrial applications mentioned above, lipases, which have certain properties as well as high activities in alkaline pH, are still needed as additive in detergent manufacturing. Unlike fungal or yeast lipases, most bacterial lipases are more stable at alkaline region.

In Thailand, some researchers in this area were performed, however, most of them are emphasized on isolation of microorganisms at neutral pH such as yeast (Ammaranon, 1996). Thus, isolation of alkaline lipase producing bacteria may be one of interesting procedures in order to receive probably lipases with high activity and stability at alkaline pH. This thesis was carried out, initially by screening bacterial strains at pH 9.0, isolation and selection, growth condition and study on some certain properties of crude alkaline lipase. Two of 350 bacterial isolates were selected and continuously studied the possibility to use either whole cell or lipase enzyme isolated from them for appropriate applications. The further studies should be performed to improve properties of enzymes resulting in development of enzyme technology in Thailand.

1.1 OBJECTIVES

1) To screen, isolate and select alkaline lipase producing bacterial in pure cultures;
2) to investigate the effect of pH and temperature on growth of selected bacterial strains;
3) to examine the effect of pH and temperature on activity of crude enzymes from selected bacterial isolates; and
4) to measure the substrate specificity of crude alkaline lipases from selected bacterial strains.

1.2 SCOPES OF STUDY

In this thesis, alkaline lipase producing bacteria were isolated from at least 30 soil samples obtained from oil or hydrocarbon contaminated area and natural sources. Selection of the pure culture of the highest alkaline lipase producing bacteria was conducted and the two selected bacterial strains were further studied such as growth of them and activity of crude alkaline lipase from them influenced by some environmental factors, i. e., pH and temperature and substrate specificity.

1.3 PLACE

All experiments in this research were conducted at room 306, Department of General Science, Faculty of Science, Chulalongkorn University, Bangkok, Thailand.

1.4 ANTICIPATED BENEFITS

This research may provide available results for some application as following:

1) The primary data relating to properties of alkaline lipase and alkaline lipase producing bacterial isolates;
2) the application guideline for household detergents by further study on alkaline lipase activity in the presence of anionic surfactants;

3) the application guideline for alternatively environmental application by using whole cells of alkaline lipolytic bacteria in treatment of lipid waste;
4) the advanced researches may be conducted further to receive higher yields of alkaline lipases by genetic engineering; and
5) the research to develop enzyme technology that is appropriate to be consumed in Thailand.

1.5 COMPONENT OF THE THESIS

This thesis comprises five chapters including this introduction. Chapter 2 gives the literature survey concerning the properties of lipids, microbial lipase enzymes, catalytic reactions of lipases, lipase producing bacteria and application of lipases. In Chapter 3, materials and methodology in whole procedures were described. The results could be found in Chapter 4 and the Chapter 5 is the discussion and conclusion.