

CHAPTER 1

INTRODUCTION

1.1 Introduction

At present, solid wastes become a serious problem because of increased quantity of municipal solid wastes resulting from the population growth as well as the economic growth. Pollution Control Department (<http://www.pcd.go.th>(2007)) reported that, the quantity evaluation of municipal solid wastes of Thailand in 2006 were showed at 14.60 million tons or about 40000 tons per day. While, total amount of municipal solid wastes were about 14.85 million tons or about 40690 tons per day in 2007. They have been increased about 0.25 million tons compare to previous year (2007). However, solid wastes that can be collected and managed are only about 70 % of the total solid wastes (Pollution Control Department, 1993). Also, it is expected that total amounts of municipal solid wastes of the country will increase every year in the future (Pollution Control Department, 1998).

Technologies for solid waste disposal are in many methods, but there are only three acceptable methods, i.e. landfill, incineration and composting (Mahidol University, 1998). Each method has different benefit and limitation factors. Initially, landfill can be eliminated almost all types of solid wastes, and easy to operate. It is a low operating cost methodology. But it has major drawbacks of the gradual decomposition, the wasteful

of the area, it takes long time for decomposition, more leachate, and unpleasant odor. While the incineration has higher operating cost with air pollution problem. Composting is another solution to eliminate organic wastes which are the most proportioning (about 50 %) comparing with combustible wastes, recycle wastes and other wastes at the proportion of 20%, 10% and 20%, respectively (Mahidol University, 1998). In recent times, much importance is given to the composting of municipal solid wastes because of its eco-compatibility and easy operational procedures. Successful conversion of organic matter into simpler units of organic carbon and nitrogen is the basic functional process of composting. Composting helps in managing large quantities of organic wastes in a sustainable manner. It is one of the technologies of integrated waste management strategies, used for the recycling of organic materials into a useful product (Giglotti *et al.*, 2005). So, composting is one of the best solution to reduce the volume of organic wastes and return them to the soil to benefit growing plants (Garcia *et al.*, 1991; Crawford, 1985; Pascual *et al.*, 1999).

In the process of composting, the active component mediating biodegradation of the organic wastes is the resident microbial community during the different stages of decomposition (Peters *et al.*, 2000). Usually, microorganisms present in compost include bacteria, actinomycetes, and fungi (Buyer *et al.*, 1999; Epstein, 1997). During the process, different hydrolytic enzymes are released by microorganisms, which are involved in the depolymerization of different constituents of organic wastes (Kandeler *et al.*, 1999; Marx *et al.*, 2001). Important enzymes involved in the composting process include cellulases, β -glucosidase, lipases and proteases (Ayuso *et al.*, 1996; Mondini *et al.*, 2004). Cellulases and β -glucosidase are involved in the degradation of carbon compounds and provide energy for microorganisms. Lipases are responsible for

breakdown of plant and animal fats and waxes as well as microbial cell membranes (Finnerty, 1989). Protease hydrolyse long chain peptides into polypeptides. Although, The composting is one of the best appropriate solutions to minimize the organic waste. Nevertheless, composting has a problem with long composting time, or may have low quality if it is decomposed by natural process. Hence, the main concerns for organic wastes composting are the shortening of composting period and the improvement of compost quality. The development of microbial inoculum is a good way of attempt.

1.2 Research Objectives

- 1.2.1 To isolate and select effective cellulose-, amylose-, protein- and lipid-degrading microorganisms for composting of organic solid waste.
- 1.2.2 To produce compost inoculum from effective degrading microorganisms.
- 1.2.3 To evaluate the efficiency of the compost inoculum for short-term composting process.

1.3 Usefulness of the Research (Theoretical and/or Applied)

- 1.3.1 To reduce the amount of waste that needs to be disposed and converted into a useful product for agriculture.
- 1.3.2 Compost inoculum can reduce composting time.