CHAPTER I

INTRODUCTION

1.1 Statement of Problems

Shrimp culture has become one of the highly profitable aquaculture industries in Thailand. The increasing number of shrimp farms in agricultural areas where potentially damaging compounds are heavily used has become a great concern. These chemicals may cause biological damages to the shrimp and result in massive losses of shrimp production which could compromise the sustainability of the shrimp culture industry. Biological monitoring can, therefore, provide a useful tool to estimate the health risk of the shrimp.

In the early phase of environmental monitoring, most studies consisted of the measurement of physical and chemical variables, and biological variables were occasionally incorporated. Routine measurements included temperature, salinity, oxygen concentrations, nutrients and some chemical contaminants are useful on the levels of contamination but provide no information on effects of the contaminants on organisms. Therefore, the effects of more complicated chemicals such as pesticides on biochemical and molecular level of aquatic animals have come to attention.

At very low level below the limits of routine measurements, many kinds of pesticides can cause chronic effects on the neurodevelopment and neurobehavioral functioning of aquatic organisms. Methods that could provide early warning of effects on organisms caused by the wide variety of pesticides are required. Recently, utilization of biological diagnostic tool or biomarker as indicator for detecting the contaminants such as pesticides has increasingly become an important part of environmental monitoring programs in many developed countries. To develop sensitive and precise diagnostic tools for assessing the effect of pesticides, investigation on the toxicity and intensified study at a molecular level of target organism are needed.

Chlorpyrifos is an organophosphate insecticide widely used as active ingredient in agricultural and urban pest control products because of its wide range insecticidal property. Like most organophosphate pesticides, chlorpyrifos is a neurotoxin. Animals killed or paralyzed by exposing to chlorpyrifos is due to the inhibition of acetylcholinesterase (AChE), resulting in the disruption of nervous system. Presently, the information on the adverse effects of chlorpyrifos to *P. monodon* and response mechanisms of the shrimp during the exposure is still limited. Therefore, the study on molecular responses of the shrimp in the sub-lethal effects caused by chlorpyrifos pesticide is needed. The distinct biochemical changes detected in the pesticide-exposed shrimps will be useful for the development of sensitive and precise diagnostic tools with a predictive capability to assess the toxic effects of organophosphate pesticides to the shrimp. This will result in a better pond management and sustainable shrimp production.

1.2 Objectives

The objectives of this study are to:

- determine the toxic effects of chlorpyrifos in *P. monodon*,
- determine the biochemical responses in *P. monodon* exposed to chlorpyrifos,
- develop appropriate biological markers for detecting sub-lethal effects of chlorpyrifos on *P. monodon*.

1.3 Scope of Study

Toxicity studies were focus on acute toxicity, neurotoxicity, and genotoxicity of chlorpyrifos on cultured shrimps at approximately 20-25 g of body weight. Biochemical responses were investigated on the molecular level of hepatopancreas from the shrimps exposed to lethal and sub-lethal concentrations of chlorpyrifos. Potential biomarkers obtained from the study will be used for the determination of chlorpyrifos contamination in shrimps from laboratory tanks and culture farms.

1.4 Anticipated Benefits

Molecular responses in shrimp exposed to sub-lethal concentration of chlorpyrifos insecticide can be applied as biomarkers for the detection of chronic effects of chlorpyrifos in shrimp and application for pesticide monitoring program.