CHAPTER 1

Introduction

1.1 Historical Background

Pesticide is a broad term that classifies a wide range of synthetic compounds with biocide activity used to remove weeds, fungi and insects to increase agricultural productivity. Organophosphate pesticides (OPs), is a subclass of pesticides which are most comprehensively applied in agriculture, due to their high efficiency for eliminating insects, relative low persistence under natural conditions, easy preparation and low cost. The widespread use of OPs causes residues and metabolites in food, water and soil currently represents one of the major issues of the environmental chemistry [1].
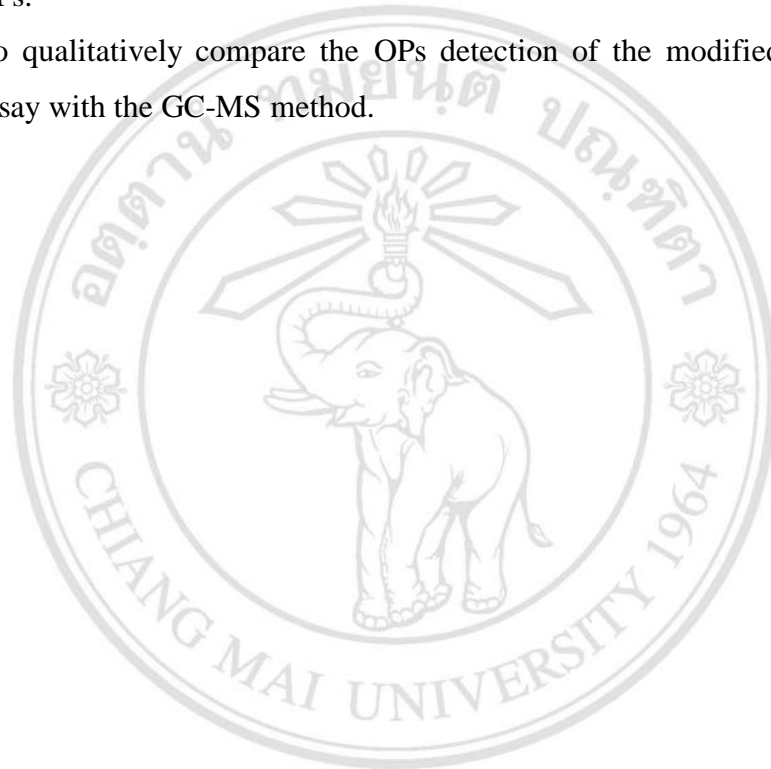
In recent years, numerous methods have been developed for the detection and monitoring of OPs in environmental and biological samples with precise outcomes including nuclear magnetic resonance (NMR) spectroscopy, chromatography, enzyme activity inhibition methods and immunoassays [2]. However these methods, requires highly expensive instruments, complicated and time-consuming pre-treatments, well trained operators, which limits their applications for on-site screening of these compounds, for immuneassays, successful detection of low levels of OPs is challenged by lack of OPs specific antibodies, long analysis time and extensive sample handling with multiple washing steps also limit the applications.

With the emergency of nanotechnology, the use the enzymatic biosensors as a tool for OPs detection have gained considerable attention due to the advantages of simplicity, rapidibility, reliability, low cost devices and on field detection [3]. These nanobiosensors are based on the inhibition effects of OPs on acetylcholinesterase (AChE) activity, or the catalysis of organophosphatehydrolase (OPH) and OPs hydrolysis. The amalgamation of the enzymatic reactions with various methods of monitoring enzymatic products has allowed the development of enzyme based devices for sensitive and rapid determination of acetylcholine (ACh), AChE and its inhibitors

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[4-5] In this work, a novel, mixed iron oxide nanoparticles (NPs) based on colorimetric assay for detection of some OPs has been developed and was compared qualitative with the standard GC-MS method.

1.2 Research Objectives

1.2.1 To study the catalytic properties of mixed iron oxide NPs for OPs detection.

1.2.2 To modify colorimetric assay using mixed iron NPs for detection of some OPs.

1.2.3 To qualitatively compare the OPs detection of the modified colorimetric assay with the GC-MS method.