CHAPTER 1

INTRODUCTION

1.1 Introduction

Nowadays agricultural countries including Thailand need large amounts of insecticides, pesticides and fertilizers to increase agricultural production. The use of these chemicals causes environmental pollution, health problems and also economic issues. Furthermore, high chemical residues have a negative impact on insects, fish and crustaceous by inhibition or destruction of the acetylcholinesterase enzyme. Acetylcholinesterase (AChE) is a key enzyme which catalyzes the hydrolysis of the neurotransmitter, acetylcholine to inactive choline and acetate in the nervous system of animals and insects (Oehmichen and Besserer, 1982; Wang *et al*., 2004). In the case of insects, accumulation of acetylcholine in the nerve synapse causes paralyzation of the muscle and leads to death.

The *Stemona* genus is a well known natural herb and has been widely used as an insecticide in Thailand. This plant is distributed mainly in Southeastern Asia and Northern Australia (Duyfjes, 1993; Pilli and Ferreira de Oliveira 2000; Brem *et al*. 2002). It is a climbing plant with an extensive rhizome. The roots of various *Stemona* species are used in traditional Chinese, Japanese, and Thai medicine to treat respiratory diseases and are used as antifungal, insecticides, anti-cancer and antitussive agents (Jiangsu New Medical College, 1986; Pilli and Ferreira de Oliveira, 2000; Limtrakul *et al*., 2007). Moreover, the insecticidal activity shown by the root

extracts of *Stemona* plants has been associated with the acetylcholinesterase (AChE) inhibitory activities (Baird *et al*., 2009).

Inhibition of this enzyme serves as a strategy for the treatment of Alzheimer's disease (AD), senile dementia, ataxia, myasthenia gravis and Parkinson's disease (Atta-ur-Rahman and Choudhary, 2001). A large number of AChE inhibitors (AChEIs) are used in both medicine and agriculture. However, the use of AChEIs in humans still causes suffering from adverse side effects. Consequently, the search for new AChEIs from natural plant products with higher efficacy and fewer side effects is under current investigation in many laboratories.

In this study of investigation of AChE inhibitors from *Stemona* plants which may have less side effects and are of low-cost is a great interest not only for agricultural use but also for medicinal purpose. Isolation of the chemical constituents, determination of their structures and assessment of their biological activities is therefore of considerable importance.

1.2 Research objectives

1. To purify and determine the active compounds from *Stemona* species.
2. To evaluate their efficiency of anti-insect properties.
3. To determine their activities as AChE inhibitors.
4. To investigate the antimicrobial activity and antioxidant activity of the root extracts of *Stemona* spp.