

CHAPTER I

INTRODUCTION

Sweet pepper (*Capsicum annuum*), or known as bell pepper, is a non-pungent pepper that is widely consumed worldwide as fresh vegetable or cooked in many dishes. Due to its non-pungent flavor, this pepper can be consumed in large amount comparing with other chili peppers. This pepper exhibits various fruit colors, such as green, red, yellow or orange. Sweet pepper contains various bioactive compounds, such as ascorbic acid (vitamin C), carotenoids, flavonoids, tocopherols (vitamin E) and capsaicin [1]. In addition, this pepper was reported to exhibit many health benefits from their bioactive compounds [2, 3]. In addition to its unique sensation and decorative colors, chemical compositions and health benefits (such as antioxidants) may differ in colored sweet peppers [1].

This research is focused on anti-Alzheimer's disease (anti-AD) property in attempt to provide alternative AD prevention pathway from natural products. Since current anti-AD drugs possess several severe side effects that individually affect each patient, natural products that can be consumed daily such as sweet peppers may be a better choice for AD prevention. The causes of AD are not well understood; however, four recent pathways including oxidative stress induction, termination of physiological role of cholinergic synapses, β -amyloid formation and abnormality of tau protein are hypothesized for AD occurrences. Sweet peppers have not been reported to exhibit anti-AD property in exception of improving the impairments of learning and memory in the senescence-accelerated prone mouse (SAMP8) [4]. However, other cultivars of peppers and their bioactive compounds, including, myricetin, quercetin, luteolin and capsaicin, are reported to have cholinesterase inhibitory activities [5-8], β -site amyloid precursor protein cleaving enzyme 1 inhibitory activity (BACE1 or β -secretase) and anti- β -amyloid formation [9]. For example, methanolic extract of premature green sweet pepper (*Capsicum annuum* var. *acuminatum*) exhibited the highest acetylcholinesterase (AChE) inhibitory activity comparing with other peppers [5]. In

addition, ethanolic extract of green pepper (*Capsicum chinense* Jacq. cv Habanero) is reported to have higher butyrylcholinesterase (BChE) inhibitory activity than that of red pepper from the same cultivar. On the other hand, lipophilic extract of red pepper exhibited AChE inhibitory activity, but not BChE inhibitory activity [6]. Therefore, fruit colors of pepper and polarity of extraction solvents have an impact on cholinesterase inhibitory activities. These factors might be due to different types of bioactive compounds in pepper extracts.

However, the research regarding AD inhibitory activities through inhibition of enzymes, cholinesterase and BACE1 of colored sweet peppers extracted by different solvent systems have been found little information. Therefore, the biochemical properties against AD and phytochemicals of colored sweet peppers are of interest. In addition, the information will be useful for developing sweet pepper and their bioactive compounds to be functional food or nutraceuticals against AD occurrence.

CHAPTER II

OBJECTIVES

General objective

To study biochemical properties regarding anti-AD through three main hypotheses including oxidative stress induction, termination of physiological role of cholinergic synapses and β -amyloid formation of four colored sweet peppers.

Specific objectives

1. To investigate phytochemicals including flavonoids, phenolic acids, carotenoids and volatile compounds of four colored sweet peppers.
2. To study suitable solvent for extracting high anti-AD agents from four colored sweet peppers based on polarities of solvent, including hexane (non-polar), ethyl acetate (semi-polar) and 70% (v/v) aqueous ethanol (polar).
3. To determine the biochemical properties of four colored sweet pepper extracts against AD through hypotheses of oxidative stress induction, cholinergic pathway and β -amyloid formation.

Expected results and benefits

The results obtained from this study will provide information as follows:

1. The quality and quantity of flavonoids, phenolic acids, carotenoids and volatile compounds of four colored sweet peppers.
2. The suitable solvent for extracting TPC, antioxidant activity, cholinesterase inhibitory activities, and BACE1 inhibitory activity of four colored sweet pepper.

3. The effect of colors of sweet pepper extracted under different polarities of solvents on TPC, antioxidant activity, cholinesterase inhibitory activities, and BACE1 inhibitory activity.

The information received from this study will be beneficial for promoting sweet peppers as future functional food for potential prevention of AD. This knowledge will support the development of bioactive compounds of sweet peppers to be nutraceutical. Besides, this study may be a model for extraction system of bioactive compounds from other plants.