

CHAPTER 1

INTRODUCTION

At present, many people in the world have more place importance on health promotion and the trend of natural products use is increasing. In 2002, the herb marketing values of the world were more than seven hundred thousand million baths especially herb products for health ([Office of industrial economic, 2003](#)). The researches on natural products for health are more increasing every year in the world because most people concern their health. Nowadays, United state, Germany and Japan import many kinds of herbs from competed country of Thailand. In Asian region such as China, India and Vietnam, because these countries have quality controlled and research development of natural products. The most forms which are imported from these Asian countries are raw material and herb extracts. Then the great power countries will change these extracts to health products such as nutraceutical, food supplement and alternative medicine for good health. However, Thailand is a country which has biodiversity of herbs, so there are many kinds of medicinal plants growing. It has possibility, if they are researched and developed for good quality controlled and marketing on herbal products. Thailand will be a country as candidate of herbal products for health in world market.

Cleistocalyx nervosum var. *paniala* (Ma-kiang) is a perennial tree belonging to the Myrtaceae family. It is found growing in scatter locations in some villages of the northern provinces of Thailand such as Chiang Rai, Chiang Mai, Lamphun, Lampang and Mae Hong Son. Ma-kiang fruit is sour and slightly astringent with scant smell. The rich purplish red color of Ma-kiang is characterized by an anthocyanin profile. Anthocyanins have been reported to produce health benefits through a range of biological activities ([Andersen, 2006](#)). Local Thais consume it as fresh fruit drink, wine, jam and nectar. The previous report of a study on acid content in Ma-kiang found that the percentage of malic acid and citric acid as 0.12-0.19 % and 1.57-1.82 % respectively ([Liawruangrath et al., 2005](#)). The study on storing in post harvest process of fresh fruits found anthocyanin content, antioxidant activity and reducing capacity of the ripe berries of *C. nervosum* var. *paniala* were stable at 0 °C. These values were reduced when it stored at 4 °C and 10 °C, but total phenolic content

were stable in all conditions (Khemsawat et al., 2006). The method of preparation of extract by decoction or water extract was found that the anthocyanin, total phenolic content, ascorbic acid and antioxidant activity tended to decrease. Lowest value obtained from LTLT (low temperature long time) at 75 °C for 15 min, high temperature short time (90 °C for 1 min) exhibited good biological activity (Sirimerngmoon et al., 2006). Surprisingly, there are no report on biological activity study of its extracts and compounds especially cytotoxic and antioxidant activities in different methods. No report on the different methods of extraction was investigated.

The aim of this research is to investigate the best method for preparing the *C. nervosum* var. *paniala* extracts to get the best biological activities for nutraceutical product. Antioxidant, cytotoxic activity against cancer cell lines will be investigated and quality controls of active compounds and its stability of extract will be determined. The outcome of this research should be the guidance method of extraction of Ma-kiang fruits which high biological activity for good health.

Overall objective

Study on the suitable methods to prepare of *Cleistocalyx nervosum* var. *paniala* extracts for nutraceuticals.

Specific objectives

1. To determine the antioxidant activity of *C. nervosum* var. *paniala* extracts from different methods.
2. To determine the cytotoxicity of *C. nervosum* var. *paniala* extracts from different methods.
3. To determine anthocyanin, total phenolics, cyanidine-3-glucoside, gallic acid, catechin, quercetin, kaempferol and ascorbic acid content in *C. nervosum* var. *paniala* extracts from different methods.
4. Isolation and characterization the antioxidant compounds by bioassay-guide fractionation method.
5. To determine nutritive values of *C. nervosum* var. *paniala* chosen extracts and its stability.