CHAPTER 1
INTRODUCTION

1.1 Statement and significance of the problem

Inflammation is a response of the tissue to get rid of any injury and return to normal function. If this response cannot eliminate the cause, the inflammation will occur continuously and become an important factor in many diseases such as diabetes, cancer, Alzheimer's disease and arthritis. These diseases influence daily life on overall health and quality of life by causing much pain, suffering and some diseases can lead to disability. For example, rheumatoid arthritis and osteoarthritis, many various anti-inflammatory drugs were used to relief symptoms since people were suffered from acute pain and inflammation from the diseases. However the number of patients who were impacted by side effect of drugs have increased continuously. As in arthritis and osteoarthritis cases, steroids and non-steroidal anti-inflammatory drugs (NSAIDs) are used mainly to relieve pain and inflammation but the side effects of oral steroids are osteoporosis, immunosuppression, effect to renal, gastro-intestinal ulcer and steroidal acne. For NSAIDs, the side effects are renal side effect and gastro-intestinal side effect. Moreover topical steroids and oral steroids for dermatitis treatment, patients always abuse for long term without side effect considering as thinner skin and systemic side effect.

The result of inflammatory response, one factor is caused by radicals that induce inflammatory process and lead to many diseases. The generated radicals during inflammatory response can destroy cells, tissues in the body and also stimulate inflammatory cytokines synthesis, cyclooxygenase-2 (COX-2) enzyme function that increase releasing prostaglandin. The process, especially lipid peroxidation, causes hydroxyl radicals ($OH^{\cdot}$) during inflammation process. The hydroxyl radical is an important radical, role in cells tissues and DNA destruction. By this pathology, there is an alternative treatment focus on antioxidant activity to treat inflammatory-related diseases. Especially herbal medicines which have been used as ethnobotanical medicine. These will lead to more researches on anti-inflammatory and antioxidant

activities.

Nowadays herbal medicine has been wide studied by using literature researches from the past to select the plant for research study. The selection of the herb, it has to consider to availability of raw materials, cost and having been used before or be still in used. However the evidence base of pharmacological activity of herbal medicine for product development are still needed.

Terminalia catappa Linn. (Hu-Kwang) is available in Thailand and tropical zone. The usage in Thailand is for shade plant, antibacterial in fighting fish, relieve inflammation of dermatitis and as a herbal tea for health meanwhile another country, the plant has been used as medicine. There is many reported note of Hu-Kwang as medicine for several diseases, one of them is anti-inflammation for arthritis, dermatitis and hepatitis. In reported note, there is a compress remedy for inflammatory areas. In India, Indonesia and Pakistan, people use this plant to treat rheumatoid arthritis. In Taiwan, it is boiled and drunk for hepatitis treatment. In the past, there were many researchers researched on pharmacological activity of *T. catappa* Linn. and there is more evidence base which confirm the usage as ethnomedicine. *T. catappa* Linn. leaf is found that its leaf possesses many pharmacological activities such as antioxidant, hepatoprotective effect (1), antihypertensive effect (2), antidiabetic (3), antibacterial and antifungal activity (4), antiviral activity (5), anticancer (6) and anti-inflammatory activity (7). The study on this plant will help Hu-Kwang to be well-known and acceptable. The study on anti-inflammatory activity of *T. catappa* Linn. was started in 1997 by Dunstan and colleagues. They did preliminary test of many plants and found that *T. catappa* Linn. inhibited prostaglandin biosynthesis and had a potential for further development. Furthermore there was a research on phytochemicals of ethanol extract of *T. catappa* Linn. leaf. It showed that the extract reduced inflammation in rat via intraperitoneal route (8).

Radicals, one factor involed with inflammation process, there is a report on total phenolic contents that can indicate anti-inflammatory activity. It was found that the water extract of *T. catappa* Linn. red leaves had total phenolic contents as gallic acid equivalent was 490.57-506.49 mg/g dry mass (9) and 0.1 mg/mL of the water extract scavenged hydroxyl radical about 79.3% which was similar to the yellow and

green leaves (10). For the usage of Hu-Kwang to treat any disease, the red leaves was more used than others and there was a report that the red leaves obtained more effective (11). Whereas the activity related to phytochemicals found in Hu-Kwang possess anti-inflammatory activity.

Accordingly, the development will focus on using the extract of the red leaves to be applied and developed topical anti-inflammatory gel preparation for inflamed skin, joint and muscle base on previous literature. The reported phytochemicals found in Hu-Kwang was used for extract estimation, preformulation, anti-inflammatory activity via cyclooxygenase (COX) inhibition and hydroxyl radical scavenging activity before product development step and to evaluate formulated product with releasing test in the final step.

This study was to develop alternative treatment from available herbal medicine with anti-inflammatory activity. Also Hu-Kwang will be more acceptable and being widely well-known. Furthermore, there will be variety products from Hu-Kwang in the markets. The results from this research will be useful for identification, specification of raw materials and a guide for product development from medicinal plants with promoting the conservation of traditional knowledge to be passed down.

1.2 Objectives

1.2.1 To study the pharmacognostic character of *T. catappa* Linn. red leaves and evaluate the biological activity of the extract.

1.2.2 To develop topical anti-inflammatory gel preparation from *T. catappa* Linn. red leaf extract and evaluate the formulated preparation.