## CHAPTER I INTRODUCTION

## 1.1 Statement and significance of the problem

Current drug and cosmetic products in Thailand are usually imported from foreign countries because their quality and standard are higher than the product made in Thailand. Most of reliable products are under license of technology from abroad. Thailand is in a state that cannot be self-reliant, if the country is in a state of crisis such as war or the lack of food which can cause the shortages of goods and products to use inside the country. Therefore, it is necessary to produce our own products using raw materials available in the country which is able to rely on our own.

Thailand has rich and wide variety of herbs that can be used in the manufacture of pharmaceutical and cosmetic products. Popular products which are currently manufactured and available in the markets nowadays are of cosmetic treatments related to anti-aging such as antiwrinkle, antioxidant, and anti-melanin formation. Most of active ingredients used in such products are chemicals and imported from other countries which causes the products of high price and some ingredients might raise serious problems due to the chemical irritation and toxicity.

The use of active natural substances such as the active oils from natural herbs is the most important alterative way. It is well known that oils from plants are the greasy substance. Most of them are liquid at room temperature and immiscible or partial miscible in water. There are two types of oils; nonvolatile or so called fixed oil and volatile or essential oil [1, 2]. Fixed oils consist of triglycerides which are mostly used as edible oil for cooking (palm, sunflower, soybean) lubricants in industrial field (linseed, tung, castor), and fuel like biodiesel [3]. Some fixed oils have medicinal properties such as castor oil which has strong purgative action [4], and fish liver oil which is a source of vitamin A and D [5].

Plant essential or volatile oils are the aromatic compounds. They are the most important group of chemical molecules that make the oils some flavoring odor. Such molecules are composed of different hydrocarbon compounds called terpenes

The plant essential oils are generally extracted by hydrodistillation or solvent extraction. They are used as aroma therapeutic agent, perfume, cosmetic, flavouring agents in food and drug products. Many interesting biological activities of essential oils have been evaluated and revealed. They are reported to have antibacterial [6, 7], antiviral, antifungal [8, 9], insecticides [10], anti-inflammatory [11, 12], and antioxidants actions [13, 14]. Recently, the oil from citrus fruits and ginger were reported to have tyrosinase inhibitory action [15, 16].

The oil was used in many cosmetic products because of their skin protection, moisture retaining and biological effect. Most of the products are prepared in a conventional emulsion dosage form. Problems encountered in these products are the separation of oil and water, and the precipitation of the drug. Conventional oil in water (o/w) emulsion which the oil is dispersed in the water and the oil cannot be loaded in high quantity because of the unstable form obtained and separation of oil and water occurs after storage. The method of preparation is also complex and high energy is needed. Cosovency is the alternative way to fix the heat consumption when the emulsion is prepared [17]. The problem of drug precipitation could also be solved by using co-solvency. However, there is a problem with the primary solvent because

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most are organic liquids, which are highly toxic and evaporate quickly. In addition, the system is not safe to use and the product is unstable when the solvent evaporates. The oil will be separated from the system or drug will be precipitated again [18, 19].

Microemulsion is a thermodynamically stable dispersion of two immiscible liquids, usually water and oil, that can be merged with surfactants and/or cosurfactants [20]. Microemulsion can be considered as ideal liquid vehicles for drug delivery as they have most of requirements for this including the spontaneous formation, ease of formulation, low viscosity, high solubilization capacity and very small droplet size [21, 22]. There are several mechanisms to explain the advantages of microemulsion for transdermal delivery of drug. First, a large amount of drug can be incorporated in the formulation due to the high solubilizing capacity. Second, the permeation rate of the drug from microemulsion may be increased by modification of the affinity of drug to the internal phase through flavor partitioning into stratum corneum, using different internal phase, changing its portion in microemulsions may reduce the diffusional barrier of the stratum corneum by acting as permeation enhancer [23, 24].

Microemulsion can be applied for drug delivery vehicles due to their high solubilization potential for both lipophilic and hydrophilic drug. It was demonstrated that permeation rates of microemulsion were significantly higher than conventional emulsions (such as creams, lotions, etc.). Furthermore, conventional emulsions are not stable formulations, that affected the fluctuation of their bioavailability [25].

Microemulsion can solve the problems of the stability of the product completely. Because this technology can provide a product that is compatible with

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water (hydrophilic product) and can make oil incorporated into products in large quantities without causing the product to separate [26, 27]. In addition, this technology can also solve the problem of precipitation of the drug. It is reported that many microemulsion formulations can be loaded with drugs of low polarity, moderate polarity and high polarity in the preparation [28, 29, 30].

In the present study, the microemulsion technology is applied to the active selected plant oils for making a suitable drug delivery system. Many subjects such as physicochemical properties and phase behavior of the system composed of oil, water and surfactant system were explored. Moreover, factor influencing the microemulsions such as the type and amount of oil, surfactant, and co-surfactant were investigated. The oils from various Thai plant species including essential oils and one fixed oil, were used in this study. The best microemulsion formulation was selected as vehicle for loading of a certain water insoluble drug. The advantages of the developed microemulsions will be investigated and compared with conventional emulsion.

## 1.2 Purposes of the study

 To develop the nanodelivery system of oils from Thai medicinal plants that have antityrosinase or antioxidant activities by microemulsion technique
To study the factors influencing the formation, physicochemical properties

and stability of microemulsion

## 1.3 Education advantages

1. The nanodelivery system composed of Thai medicinal oil will be obtained from microemulsion technique.

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- 2. The stable and effective Thai medicinal oil microemulsion products obtained will be beneficial for Thai Spa and herbal business.
- 3. This research is the promotion for Thai medicinal oil utilization and application.

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