

## CHAPTER I

### INTRODUCTION

#### 1.1 Statement and significance of the problem

Over the last decades, nanotechnology has been intensively studied in many areas such as engineering, computer, electronic as well as cosmetic area. For pharmaceutical technology, drug delivery systems that developed in nanoscale are called “Nanoparticles”. The nanoparticles prepared from lipids materials have gained an increased attention in the pharmaceutical industry because of their ability to overcome deficiencies of traditional colloidal systems.[1] Several advantages of lipid nanoparticles have been demonstrated including no biotoxicity, high drug payload, suitable for incorporating lipophilic or hydrophilic substances, protection of incorporated compound against chemical degradation, possibility of controlled drug release and drug targeting for active compound, lack of organic solvent during the production and ease of large scale production.

Nanostructured lipid carriers (NLC) is the second generation of lipid nanoparticles developed after the first generation; solid lipid nanoparticles (SLN). [2] NLC are distinguishable from SLN by the composition of solid matrix. SLN consists of only solid lipids while NLC contained the blend of solid and liquid lipid. NLC are more advantages than SLN because they present a less ordered lipid matrix which may provide a high loading capacity and they also minimize or avoid some potential problems associated with SLN such as drug expulsion during storage, low drug

loading and high water content of SLN dispersion. [2, 3] Thus, this study chose the NLC as delivery system for nano-cosmeceutical products.

Skin aging is a progressive deterioration of physiological functions of skin resulting in undesirable appearances. There are several theories that related to skin aging which one of them is free radical theory.[4, 5] Free radicals attack our cell membranes and the accumulated radicals slow down cell function therefore reducing the body's self-repair capabilities, and leading to many diseases including wrinkles, sagging skin and aging spots. Wrinkle is the one important sign of skin aging that everyone does not desire. Antioxidative agents are believed to play a role in the prevention of cells from oxidative stress by scavenging free radicals and discontinuing lipid peroxidation chain reaction. [6, 7] Thus, many anti-wrinkle or anti-aging products with antioxidative agent as active compounds are launched into cosmeceutical markets. Meanwhile, the organic substances are progressively expanded in cosmeceutical products because people are more concerned that synthetic substances may negatively affect their health and also organic substances are believed to be safer. Thus, Thai herbal are also increasingly interested to research and develop for many purposes which one of them is for pharmaceutical/cosmetic area. Marigold (*Tagetes erecta* Linn.), the common well known plants in Family Compositae, was selected to be an active ingredients for anti-wrinkle product because of antioxidant property, marigold extract was reported in many studies and it was one of the widely and easily cultivate plants in Thailand.

Therefore, this research was emphasized to develop the nanostructured lipid carriers containing marigold flower extract and formulate into nano-cosmeceutical products. The antioxidant properties, stability and efficacy of the products were also

investigated. This study can also be a guideline to develop other products from Thai plants or herbs.

### 1.2 Objectives

1. To prepare nanostructured lipid carriers containing marigold flower extract.
2. To develop the nano-cosmeceutical product containing marigold flower extract
3. To evaluate the wrinkle reducing capacity of nano-cosmeceutical products of marigold flower extract.