CHAPTER I

INTRODUCTION

This chapter contains four parts including the rationale for the study, the objectives of the study, the expected outputs of the study and the expected outcomes of the study. The details of each part are the following:

The rationale for the study

In recent years, skin whitening products and anti-aging products have become and continue to be the best selling skin care products in Asia. Nowadays, the whitening agents and anti-aging agents from natural sources are applying an increasing popular in cosmetic products because it is believed safety and efficacy [1]. However, natural products can be preparing either from crude extract or purified compounds. Comparing the manufacturing procedure of pure compounds with those for crude extract, the latter is cheaper and easier to be prepared with less time consuming. The extracts of pomegranate peel containing ellagic acid are one of the most recognized natural sources widely used in cosmetics for centuries.

Pomegranate (*Punica granatum* L.) is one of the ancient fruit that has been used in folk medicine in many countries [2, 3]. Pomegranate peel is a rich source of hydrolysable tannin (punicalin, punicalagin), gallagic acid, gallic acid and ellagic acid (EA) [4-6]. It has been reported as possessing strong antioxidant and antityrosinase activity [7, 8]. Thus, the pomegranate peel extract shows high potential for cosmetic application. EA, the component of pomegranate peel, is a naturally occurring phenolic compound found in variety of plants such as strawberries, raspberries, green tea, tara and pomegranate. It has been reported as possessing strong antioxidation activity and inhibits skin pigmentation resulting from ultraviolet (UV) irradiation. It is believed that ellagic acid suppresses tyrosinase activity [5, 9]. However, stability issues of ellagic acid have not been successfully overcome [10]. Therefore, further investigations for effective delivery system need to be carried out in order to improve chemical stability of the active ingredient.

Many researchers suggested the way to stabilize the sensitive compounds. The drug delivery encapsulations that apply from pharmaceutical applications such as emulsions, liposomes, microemulsions, solid lipid nanoparticles (SLNs) and nanostructured lipid carriers (NLCs) are interesting. SLNs are the first generation of lipid nanoparticles that combine the advantages and avoid the disadvantages of other carriers. However, there are some problems for SLNs such as limited drug loading capacity, adjustment of drug release and drug expulsion during storage and high water content of aqueous SLNs dispersion [11]. Therefore, in order to solve these problems, NLCs are the second generation of the lipid nanoparticles, the particles are produced using blends of different types of solid lipids or blends of solid lipids and liquid lipids (oils). When compared to SLNs, NLCs show a higher loading capacity of active compounds and reduced drug expulsion during storage [11, 12]. In addition, NLCs have an occlusive property and can enhance penetration of active ingredient. According to the advantages of NLCs as discussed above, pomegranate peel extract loaded NLCs were employed as a delivery carrier to promote the pomegranate peel extract stability and enhance penetration of the active ingredient.

Objectives of the study

1. To extract the pomegranate peel rich ellagic acid from pomegranate peels and determines the percentage of ellagic acid content.
2. To determine *in vitro* antioxidant and antityrosinase activities of EPP.
3. To evaluate the formulation factors that affecting on the physicochemical properties of EPP loaded NLCs and ellagic acid incorporation efficacy.
4. To determine *in vitro* release profile of EPP loaded NLCs.
5. To investigate *ex vivo* permeation study of EPP loaded NLCs.
6. To evaluate the stability of lyophilized EPP loaded NLCs and cream containing EPP loaded NLCs.

Expected outputs of the study

The expected outputs are to obtain the EPP that possessed potent antioxidant and antityrosinase agents and to obtain of EPP loaded NLCs that could enhance ellagic acid stability, enhance skin penetration and controlled drug release.

Expected outcomes of the study

Cream containing EPP loaded NLCs developed from this study can be used as a facial cream product from natural sources in order to increasing value in cosmetic product.