CHAPTER I

INTRODUCTION

The dermal delivery is to localize a drug within skin to enhance the local effect, and the transdermal delivery is to increase the penetration of a drug through the skin for a systemic effect (Carafa, Santucci, Lucania, 2002). Accordingly, the topical dosage forms should be designed depending on what the target sites. In case of dermato-pharmacotherapy for the moisturization of skin, the dermal delivery of active ingredients is desirable for local effect.

Recently, many facial products, which are used for increasing moisture and elasticity of skin, have been used and have a variable dosage from such as gel, cream, patch, and mask. Much attention has been paid to polymer gels as vehicles for drug delivery. One of those studies is adhesive polymer thin film for the use in dermal or transdermal delivery of drugs (Tan and Pfister, 1990). In this study, facial patches containing *Phyllanthus emblica* extract nanoliposomes were designed for increasing moisture and elasticity of skin. The purpose of the facial patch can be explained as the outer layer of the skin contains up to 72% of water and because the water loss from the skin to the air all the time. Therefore, the moisture of the skin will be higher if the facial patch can slow down the breathing of the skin, including increase the moisture and elasticity of the facial skin, which effect to reduce wrinkle on the face.

Phyllanthus emblica (also called *Emblica officinalis*) is commonly known as amla. It is a member of the family Euphorbiaceae. *P. emblica* is distributed in subtropical and tropical areas of Southeast Asia, particularly in China, India, Indonesia, the Malay Peninsula, Bangladesh, Nepal, Pakistan, Uzbekistan, Sri Lanka, and Thailand (Scartezzini and Speroni, 2000; Zhang et al., 2001; Zhang et al., 2004). In Thailand, it is known as "Ma Kham Pom". The plant is a tree of small or moderate size with a greenish-gray bark and greenish-yellow flowers, formed in axilla clusters. The feathery leaves are linear-oblong, with a rounded base and obtuse or acute apex. The tender fruits are green, fleshy, globose and shining, and changes to light yellow

or brick-red when mature (Summanen, 1999). The fruit, similar in appearance to the common gooseberry, is usually called "Indian gooseberry". Commonly edible and abundantly available fresh fruits of *P. emblica* are collected during the months of November through January (Ghosal, 1996).

There are a lot of advantages to use *P. emblica* extract for the oral and topical application because there are a lot of papers support their actions for example, antioxidant activity (Ghosal, et al., 1996, Dhir, et al., 1990 and 1991 Roy, et al., 1992), whitening activity, protective effect in hepatic injury (Pramyothin, et al., 2006), prevent gastric ulcer (Sandip, et al., 2000), killer cell and antibody dependent cellular cytotoxicity activities (Suresh and Vasudevan, 1994). Furthermore, *P. emblica* has a lot of vitamin C (Dhir, et al., 1991). The problem of *P. emblica* fruit is that it is not produced all the year but they bear fruit in the season, so *P. emblica* extract should be kept in dried fruit or powder.

Recent reports indicated the presence of gallic acid in the fruits of *P. emblica.* The gallic acid in this fruit is presented either in free form and bound tannin form (gallotannins and ellagotannins). The amount of free gallic acid presented in formulations which varied by the extraction process. During the extraction process tannins present in the fruit samples may hydrolyze to give free gallic acid or they may remain in bound form.

Liposomes have been evaluated by many researchers as delivery system for drugs, vitamins and cosmetic materials. Liposomes consist of amphiphilic lipid, having a polar head group and one or two long hydrophobic chains. They consist of one or several concentric lipid bilayers enclosing an aqueous core. Liposomes are used to overcome solubility problem in the delivery of active compounds and for improving topical absorption of poorly absorbed drug. Encapsulation of drug into liposomes can lead to the enhancement or prolongation of therapeutic efficacy of drugs, reducing toxicity (Grit and Crommelin, 1993; Singh and Das, 1998) and also increasing stability (Bergstrand, 2003; Brisaert et al., 2001).

There are many methods that use in preparing the liposomes for example mechanical dispersion (hand-shaken multilamellar vesicles, non shaken vesicles, pro-

liposomes, freeze-drying, micro-emulsification liposomes, sonicated vesicles, membrane extrusion liposomes, dried-reconstituted vesicles, freeze-thaw sonication method, pH-induced vesiculation, calcium-induce fusion), solvent dispersion (ethanol injection, ether injection), water-in-organic phase, double emulsion vesicles (cell-size vesicles, multivesicular liposomes, reverse-phase evaporation vesicles), and detergent solubilization.

Nanoparticles are solid colloidal particles with the size ranging from 1 to 1000 nm (Lockman *et al.*, 2002). It has more and more interested in the last decade, since these systems were found to be able to increase efficacy, stability and reduce toxicity of potent drug. Nanoparticles are able to adsorb and/or encapsulate drugs, thus protecting them against chemical and enzymatic degradation.

In this study, *P. emblica* extract was encapsulated in nanoliposomes in different ratios of liposomal membrane in the preparation. *P. emblica* extract was dissolved in the citrate-phosphate buffer solution pH 5.5. The physical characteristics were evaluated, i.e. size and particle size distribution and morphology. High Performance Liquid Chromatography (HPLC) has been used to determine the amount of gallic acid in *P. emblica* extract encapsulating in nanoliposomes. Franz diffusion cell was used for studying the release of gallic acid in *P. emblica* extract from the facial patch.

Finally, this research provides the development of facial patch containing *P. emblica* extract nanoliposomes. The knowledge from this study will be useful for the consumer who would like to use facial patch containing *P. emblica* extract nanoliposomes for increasing moisturizer and elasticity of the skin, and also help the researcher who would like to investigate in facial patch and nanoliposomes in pharmaceutical, cosmetics and neutraceutical products.

Objectives

The purposes of this study were as follows:

To study the method of preparation and characterizations of *P. emblica* extract nanoliposomes in terms of morphology (TEM), size, and entrapment efficiency

To formulate and determine the mechanical properties of facial-patch containing *P. emblica* extract nanoliposomes

To study the *in vitro* release of *P. emblica* extract nanoliposomes from facial-patch

To study the *in vivo* moisturizing and elasticity of the skin using facial-patch containing *P. emblica* extract nanoliposomes