

CHAPTER 1

GENERAL INTRODUCTION

1.1 Statement and significance of the problem

Inflammation is the means by which the body deals with insult and injury. Insult may be caused: mechanically, chemically, and physically, by internal processes and by microorganisms. The major inflammatory responses are vasodilatation, increase of vascular permeability, cellular infiltration by chemotaxis and changes of biosynthetic, metabolic and catabolic profiles in many organs and finally activation of cells of immune system as well as complex enzyme systems of blood plasma. Redness, heat, swelling, and pain are associated with the inflammatory process. Redness and heat are caused by the increased blood flow. Swelling is the result of the increased movement of fluid and white blood cells into the area of inflammation. The release of chemical compounds and the compression of nerves in the vicinity of the inflammation process cause pain. They are commonly associated with several symptoms or diseases such as gout, pain, fever, arthritis especially rheumatoid arthritis (RA). When inflammation affects a joint, the cartilage can be damaged by neutrophils and lysosomal enzymes that enter the area. This leads to a vicious cycle of repeated injury and persistent inflammation. Anti-inflammatory drugs are effective medication for relieving symptoms. They can be divided into two groups, non-steroidal anti-inflammatory drugs (NSAIDs) and anti-inflammatory corticosteroids. Mechanism of action of each drug is different and suitable for different level of inflammation. Moreover, those drugs can also incur important adverse effect, especially gastrointestinal side effects. Furthermore, those drugs, which are chemicals, need to be imported from foreign country that will lead to the imbalance of trade. Accordingly, the natural compound with anti-inflammatory activity should be used instead of those chemicals. Thus, researchers are interested in the herbs which

have a high potential and can be developed to be health promotion products which will give a benefit in the industry in the future.

Tabernaemontana divaricata (Linn.) R. Br. is commonly known as Crepe jasmine [1-3]. It is a common garden plant in Southeast Asia and widely distributes in the northern part of Thailand. This plant belongs to the Apocynaceae family [2, 3]. *T. divaricata* has been mostly used as Thai folk medicine for treatment of fever or other purposes. Accordingly, many parts of *T. divaricata* such as leaves, root, bark, stem and flower have been previously reported for various biological activities. The types of phytochemicals are alkaloids [4-9] and non alkaloids [3]. Previous reports indicated that the plant extract had antipyretic and anti-inflammatory actions [3, 10]. Moreover, the anti-inflammation activity has been reported to relate with its constituents which were alkaloids.

According to above reviews, *T. divaricata* is useful and valuable for the further uses. However, the important problem of *T. divaricata* usage is the chemical instability as well as non-suitable physical appearances for clinical applications. Thus, the development and preparation technique need to be investigated and the advanced technology such as nanotechnology need to be studied to improve and increase the efficacy and safety for further uses.

In recent years, nanotechnology has been widely studied because it becomes sciences of innovation. The knowledge of the small particle has been continuously developed. The nanotechnology has been combined with many fields to apply for maximum benefit especially medical and pharmaceutical fields. Solid lipid nanoparticles (SLN) have been introduced as a novel drug delivery system for pharmaceutical drugs. They also represent a promising carrier system for cosmetic active ingredients due to their numerous advantages over existing conventional formulations. SLN could protect labile compounds against chemical degradation e.g. retinol and tocopherol [11], improve the treatment efficacy such as UV-blocking potential [12, 13], control release for topical delivery such as clotrimazole [14] and for lipophilic drugs. They can be used in order to increase the water content of the skin [15]. Moreover, they need no organic solvents in the production and simply to be produced in large scale for industries.

Therefore, this research is focused on development of topical application in a field of nanocream which was composed of *T. divaricata* extract as an active ingredient loaded into SLN. The characteristics and stability of TDE loaded SLN in nanocream were investigated as well as anti-inflammatory activity.

1.2 Aims of study

1.2.1 To develop the nanocream which is composed of *T. divaricata* extract as an active ingredient by the nanotechnology

1.2.2 To study factors influencing on physicochemical properties of *T. divaricata* extract nanocream

1.2.3 To evaluate the anti-inflammation of *T. divaricata* extract nanocream in the animal model