# CHAPTER I

## INTRODUCTION

Microencapsulation is a process by which an active substance is incorporated inside a microcapsule in order to either protect it from the environment or to control the release of the active substances. Various encapsulation techniques, such as coacervation, ionic gelation, emulsion technique etc., spray drying (SD) and freeze drying (FD) techniques permit for an industrial support and can increase stability to the active substances [1-3].

In this study, polysaccharide gel from durian fruit hulls (DG) and sodium alginate (AG) were used as polymer for encapsulation. DG has a principal component structure similar to a pectic polysaccharide [4]. DG toxicity study showed safety for using high dose or long term in mice and rats [5, 6]. It also showed an antimicrobial property against several strains of bacteria by agar diffusion test [7]. DG can be used to prepare several types of wound dressings such as films, gels, freeze-dry and hydrogel dressing patches [8, 9]. DG film and gel wound dressings were examined a promotion of wound healing in pig skin [10]. Data showed faster and better wound healing process than traditional treatment of povidone iodine. DG film and freeze-dry dressing patches were investigated and showed more advantages for healing process in pig and dog skin wounds [9, 10]. It was also used to produce wound dressing patch and compared with commercial products. Sodium alginate, an anionic polysaccharide with linear chain copolymer, has a wide range used in microencapsulation technique for drug delivery systems. It also has biocompatibilty, biodegradability and nontoxic properties [11]. Since DG, a bioactive polymer with antimicrobial activity and wound healing effect, can promote the accelerating wound closure. So it is an interesting polymer to perform for an application in encapsulation process with sodium alginate.

Plant callus is a mass of undifferentiated cells. It is a soft tissue that forms over a wounded or cut plant surface, leading to healing. Plant callus cells may be made to differentiate into the specialized tissues of a whole plant. Some of its cells may organize into growing points, some of which in turn give rise to roots while others produce stems and leaves. It has an epigenetic factors which can affect the proliferation and differentiation of the cell [12, 13]. Plant callus culture is a way to grow a part of plant or to produce active metabolites from its callus in a controlled

environment and in a short period of time. The epigenetic factors, which supported plant cell differentiation, may exhibit the accelerating of wound healing. *Thunbergia laurifolia* Linn., which called Rang Chuet, is in a family of Acanthaceae. Its roots and leaves were used as antipyretics, detoxification and antihistamine [14]. Recently, a new constituent from *T. laurifolia* leaves was found as an antioxidant, rosmarinic acid (RA) [15]. Due to an antioxidant play an important role in wound healing which the oxidative stress can cause the delay of wound healing process by lipid peroxidation, protein and DNA modification [16]. The extract from callus of *T. laurifolia* leaves, found that consisted of an antioxidant RA, could be potentially used in a process of wound healing and for many of biomedical applications.

In order to protect the extract of *T. laurifolia* callus, microencapsulation of the callus extract with DG was studied using spray drying and freeze drying techniques. Since RA is one of an active metabolites produced from callus culture of *T. laurifolia* leaves, it can be used as a chemical marker for an analytical assay of the extraction from the callus. RA is unstable to heat and oxidation, it is also suitable to be used as a model substance for the extract to study their formulations and microencapsulation process. In this study, the DG wound dressing patch with encapsulated callus extract was developed as a model delivery system to support the release of bioactive substances including rosmarinic acid for accelerating wound closure.

**Purposes of the present study** :

1. To develop the rosmarinic acid microparticles as a model substance for plant callus extract.

2. To develop the microparticles containing *T. laurifolio* callus extract.

3. To investigate their physicochemical properties, entrapment efficiency, release study and stability of those microparticles.

4. To develop a wound dressing patch as a model delivery system for plant callus extract.