CHAPTER I
INTRODUCTION

Curcumin or 1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione is a naturally occurring substance that imparts the yellowish pigmentation to turmeric (*C. longa.* L.). It is widely known for several biological properties including antioxidant (free radical scavenging activity), antimicrobial, anti-inflammatory activity, and wound healing of curcumin. In the ancient time, Egyptians used curcumin to preserve mummy wraps, since it inhibits the growth of bacteria and mould (Han *et al.*, 2005). It was also observed that curcumin is capable of scavenging oxygen free radicals such as superoxide anions and hydroxyl radicals, which are the initiators of lipid peroxidation (Pulla Reddy *et al.*, 1992). However, curcumin has some drawbacks for clinical applications due to its poor solubility in aqueous solutions, as well as a photodegradation under light exposure. It was also found that curcumin is unstable and decomposed rapidly at *in vitro* physiological condition, phosphate buffer and serum-free medium, pH 7.2 (Wang *et al.*, 1997). According to these disadvantages, many attempts have been done to increase the stability and safety usage of curcumin. Tonnesen *et al.*, (2002) and Tomren *et al.*, (2007) reported on solubility, stability, activity and complexation of curcumin with cyclodextrin. Several biomaterials have been used as matrixes for curcumin. In 2005, Sowasod *et al.* investigated the encapsulation of curcumin in chitosan nanospheres for cosmetic application. Curcumin have also been incorporated in cellulose acetate to provide a slow release (Suwantong *et al.*, 2007).

Chitin is an alternative biomaterial that composed of β(1→4) linked 2-acetamido-2-deoxy-β-D-glucose units (or *N*-acetylglucosamine units). It has many advantages such as non-toxicity, biodegradability, and biocompatibility. Chitin provides many useful and advantageous biological properties, namely hemostatic activity, anti-infectional activity, and a property to accelerate wound healing (Minagawa *et al.*, 2007). It also promoted cell attachment and spreading of normal human keratinocytes as well as fibroblasts (Noh *et al.*, 2006). Moreover, chitin can be degraded by lysozyme presented in the body, and subsequently generates harmless products (Kurita *et al.*, 2000). β-chitin is an interesting choice to be used as a carrier

for curcumin, since it is more susceptible for solvents, and exhibits higher chemical reactivity compared to α-chitin as confirmed by several modification (Kurita *et al.*, 1993). Hence, β-chitin has a high potential to be used as a starting material for developing new applications. In this study, chitin sheets incorporated with curcumin were fabricated by the paper-making process using a water-based system. The releasing profile of curcumin from chitin sheet as a function of curcumin content, as well as the stability of ethanol-soluble curcumin together with curcumin incorporated in chitin sheet at neutral buffer solutions were determined. The surface morphology, the interaction between chitin and curcumin, and cytotoxicity were also investigated.