CHAPTER I
INTRODUCTION

The conventional wound dressings, such as cotton and gauze, only absorb exudates and do not provide moist environment, resulting in stripping of the new regenerating skin and causing pain during the removal of the wound dressings from the skin. In addition, the conventional wound dressings are not flexible. Therefore, a new type of wound dressing materials has been developed. Modern wound dressings, including both synthetic polymers and biopolymers, have been improved in terms of the wound treatment efficiency by introducing new abilities to retain and create a moist environment around the wound (Boating *et al.,* 2008). Nevertheless, in the present day, biopolymers are of great interest because of their several advantages, such as environmentally friendly characteristics, biodegradability, biocompatibility, and non-toxicity, which are important factors in wound dressing applications.

Among various types of biopolymers, bacterial cellulose synthesized by *Acetobacter xylinum* in the form of ultrafine network of cellulose nanofibers has received more attention in recent year (Vandamme *et al.,* 1998). Due to this unique structure, bacterial cellulose has shown potential use in wound care treatment. For examples, it maintains moist environment, has high exudates absorption ability, allows gas exchange, closes wound coverage, allows easy and painless removal, possesses high mechanical strength, is high purity, shows no toxicity, and is biocompatible (Czaja *et al.,* 2007). Hence, bacterial cellulose is considered as an ideal wound dressing material. However, bacterial cellulose itself has no antioxidant property for enhancing wound healing process (Houghton *et al.,* 2005; Wei *et al.,* 2011). Recently, several studies have successfully prepared a combination of bacterial cellulose with other natural polymers, such as chitosan (Phisalaphong and Jatupaiboon, 2008; Zhijiang *et al.,* 2011), gelatin (Nakayama *et al.,* 2004), collagen (Zhijang and Guang 2011), aloe vera (Saibuatong *et al.,* 2010), and alginate (Phisalaphong *et al.,* 2008).

One of the most interesting biopolymers is silk sericin, a proteinaceous material removed during the degumming step of the silkworm silk fiber production.

Sericin is unutilized in textile industry and is considered as a textile industrial waste which extremely causes water pollution after being discharged into the environment (Zhang, 2002). Thus, several researches have been carried out to find the potential utilizations of sericin in a various fields, especially for the high value-added applications. Recently, sericin has been used as a coating material for biomedical applications. Due to its biocompatibility, non-toxicity (Aramwit and Sangcakul, 2007), antioxidant activities (Kato *et al.*, 1998; Dash *et al.*, 2007), antibacterial properties (Sarovart *et al.*, 2003; Senakoon *et al.*, 2009), moisturizing capability (Padamwar *et al.*, 2005), cell proliferation and cell attachment enhancement (Tsubouchi *et al.*, 2005; Teramoto *et al.*, 2008), sericin is a promising candidate for wound care applications. However, the important drawback of sericin is that it possesses amorphous structure, thus being quite fragile and not easily fabricated (Namviriyachote *et al.*, 2009). As a result, sericin-based materials have to be prepared by incorporated into other matrixes to support sericin itself.

In this study, sericin was incorporated into bacterial cellulose matrix in order to prepare a wound dressing material with the synergic beneficial properties of both polymers. The chemical structure and morphology of the bacterial cellulose containing sericin were characterized. The antioxidant activity, swelling behavior, water vapor transmission rate, amount of the incorporated sericin, sericin releasing profile, and cytocompatibility were also evaluated.