CHAPTER I
INTRODUCTION

Nowadays, more than 3000 types of wound dressing materials are available in markets. There are two main types of wound dressing materials, i.e. traditional wound dressings and advanced wound dressings. Traditional wound dressings such as cotton and gauze are primary wound dressings that are commonly used in wound care treatment. However, traditional wound dressings cannot provide moist environment to a wound, resulting in stripping off the new regenerated skin and causing pain while removing the wound dressing off the skin. On the other hand, advanced wound dressings can maintain moist environment to a wound and provide optimal conditions for wound healing and cell growth, leading to the increasing of the rate of epithelialisation (Bhuvanesh G., 2010).

Biopolymers have been considered as potent materials for wound dressing application because they are environmentally friendly, biodegradable, biocompatible and non-toxic, (Czaja W., 2006)

Bacterial cellulose (BC) pellicle consists of linear polymers made of glucose molecules linked by β(1-4) glucosidic linkages. BC pellicle is produced by bacterium *Acetobacter xylinum* in the form ultrafme 3D network of cellulose nanofibers. *Acetobacter xylinum* is a gram negative, rod shaped and strictly aerobic bacterium (Sherif M. K. *et al.*, 2014). BC pellicle has great potential in wound dressing application due to its unique properties such as non-toxicity, biocompatibility, hydrophilicity, high crystallinity, high tensile strength in wet state, high purity and high water absorption capacity (Czaja W.*et al.*, 2006). In addition, BC pellicle can provide moist environment to a wound and consequently promotes the wound healing process. In a large scale production for commercial purpose, the production of BC composite reinforced with cotton fabric can provide several advantages such as the better uniformity of thickness of BC pellicle on the fabric and the reduction in tearing of BC pellicles during production, sterilization and packaging processes. However, an interaction between the fabric and BC pellicle is a key factor for the production of BC/cotton fabric composite because the separation of BC pellicle from cotton fabric may occur due to the poor attachment of BC nanofibrils on the cotton fabric.

In this study, dielectric barrier discharge (DBD) plasma treatment and cell immobilization techniques were employed in order to obtain a good attachment between cotton fabric and BC pellicle. Before cultivation in culture media containing *Acetobacter xylinum*, cotton fabrics were pre-treated by either using DBD plasma or immersing in organic acid solutions. In the next step, the inoculum was dropped onto the pre-treated fabrics in order to deposit the bacterial cells into the pre-treated fabrics by absorption immobilization. The bacterial cells absorbed into the fabrics were further crosslinked by using glutaraldehyde as a crosslingking agent in order to achieve stronger attachment between the bacterial cells and the fabrics by crosslink immobilization. After cultivation, the effects of surface pre-treatment of the fabrics and methods of cell immobilization on the production yields of BC, morphology, cytotoxicity, cytocomplatibility, water absorption, water vapor transmission rate and interaction between BC pellicle on cotton fabric of the BC composites reinforced with cotton fabrics were evaluated.