PRODUCTION OF BACTERIAL CELLULOSE FROM LOW-COST MEDIA

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Abstract—Cellulose produced by the gram negative, aerobic bacterium of *Acetobacter xylinum* is chemically pure, free of lignin and hemicellulose, has a high polymer crystallinity and a high degree of polymerization, thus it has special properties and applications compared to cellulose from other sources. It has many potential applications in biomedical, biosensor, food, textile and other industries. We investigated the possibility of using low-cost agricultural products as a feedstock for the economical production of microbial cellulose. In this study the performance of four different medium: coconut broth (270 g/L), bean sprout extract (200 g/L), corn broth (260 g/L), pineapple extract (220 g/L), were evaluated. Results indicate that for all the medium after 8 days of fermentation, substantial amounts of cellulose were obtained (from 18 g/L to 26 g/L). The production cost based on the medium were compared and it likely that the corn broth medium is the best. (Abstract)

Keywords- bacterial cellulose, low-cost medium, coconut broth, corn broth

I. INTRODUCTION

Bacterial cellulose is a polymer synthesized by the bacterium *Acetobacter xylinum* (*A.xylinum*), which is a gram-negative, obligate aerobic required, and non motile bacterium [10]. The bacteria grow in the optimum pH from 5 to 6, but can tolerate low pH, in the temperature from 28 to 32°C, and can accumulate up to 4.5% v/w of acetic acid. In static culture conditions, the bacteria produce cellulose membranes onto the surface of culture media, as part of its normal metabolic activity [8]. *A. xylinum* absorbs glucose or some other sugars from the fermentation environment. In bacterial cells, the sugars are transformed and then polymerized into cellulose and is secreted into the environment through extracellular enzyme cellulose synthase complexes [13].

Bacterial cellulose consists of glucose monomers linked by β-1,4 links, which are similar to cellulose in plants; but its physical and chemical properties are different, such as higher crystallinity, higher degree of polymerization, higher tensile strength, and higher water absorbing capacity [13, 14]. These improved properties are mainly due to the fine network of pure cellulose fibers, which have the average diameter being about one hundredth that of plant-derived fibers [12,