Study on Production of Bacterial Cellulose Membrane by Isolated Gluconacetobacter sp. Wu3M and Kinetic Model of Product

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ABSTRACT

Bacterial cellulose production from Gluconacetobacter specie is a unique biopolymer in terms of its structure, mechanical strength and chemical stability. In this study, we isolated the strain with high production bacterial cellulose capability from coconut milk and identified according to 16S rDNA gene sequences as Gluconacetobacter sp., called Gluconacetobacter sp. Wu3M (NCBI JX088028). In order to study the effects of different culture parameters on Gluconacetobacter sp. Wu3M to determine which conditions provided optimum BC production, four factors were investigated, including acetic acid concentration, culture surface area, wall of tray, inoculate volume. The results of study showed that BC membrane product was increased by adding the 0.25% reagent grade acetic acid. On the other hand, although a large surface area was important for good BC product, the yield (g BC/L medium volume) was lower. The BC produced was 1.64 g/L at the surface area of 22×30 cm2 by a static cultivation during 5 days of cultivation. A simple model was proposed using the Logistic equation for growth, the Luedeking-Piret equation for BC production and substrate consumption. The kinetic model showed the BC production is growth-associated model. Preparation antibacterial film by dry BC film was immersed in a nano-silver solution and benzalkonium chloride solution. Detailed studies on the antibacterial activity of these antibacterial films were carried out for Bacillus subtilis and Escherichia coli. The result of study showed, that BC antibacterial films were obtained especially against B. subtilis and E. coli..

Keywords : Bacterial cellulose, Gluconacetobacter sp. Wu3M, Kinetic model, purification, antibacterial film.

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