The Universe in a Nutshell: Bacterial Cellulose Membrane Using Macadamia Byproduct

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Synthetic polymers are responsible for environmental damages. Bacterial cellulose is an alternative biopolymer highlighted for its unique physicochemical properties. Macadamia nut’s consumption has increase and its processing generates 75% byproduct. Therefore, the hypothesis was to investigate the macadamia nut byproduct reusing to synthesize bacterial cellulose membranes. Biosynthesis was performed in a static culture medium using as inoculum a fermentative beverage byproduct - a symbiotic culture of bacteria and yeast. In preliminary tests, I used different carbon sources. I performed a complete factorial design 2^2 with surface response methodology to evaluate the variables monosaccharide and macadamia byproduct flour concentrations in the optimization of biomembrane (BM) synthesis. They were dried at 35ºC and characterized with mechanical properties, moisture, solubility, coloration, thickness. I also calculated the biological efficiency. The Analysis of Variance was used to analyze the significance at 95% reliability. All BM presented a thickness of less than 1 mm and great mechanical properties, with tensile strength up to 22,72MPa, elongation at break until 22,02%, and Young's modulus varying from 15,47 to 2185,65MPa. These results follow the American Society for Testing and Materials norms. The statistical analyzes were significant at 95% reliability on all parameters. Bacterial cellulose membrane has a huge potential to reshape our daily lives and industry since it is a versatile biopolymer. Application is being investigated in biomedical, electrical, cosmetical, food and pharmaceutical fields. This research proved the hypothesis was correct. Agroindustrial byproducts can be used in biotechnological processes to produce alternatives to synthetic polymers.

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