THE USE OF CANE BAGGAGE IN PREPARATION BIOCOMPOSITE OF NANOCELLULOSE-CHITOSAN-GLYCEROL DEPOSITED SILVER NANOPARTICLES AS WOUND DRESSING MATERIAL

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ABSTRACT

Enzymatic preparation of nanocellulose from sugarcane bagasse (Saccharum officinarum) and its modification with silver nanoparticles using bioreductors from red betel leaves (Piper crocatum) and brown algae in this study aims to determine the characteristics of nanocellulose, silver nanoparticles, as well as the effect of modifying nanocellulose from sugarcane bagasse with the addition of nanoparticles silver, chitosan, and glycerol on the antimicrobial activity of nanocellulose. Nanocellulose preparation was carried out using an enzymatic method then followed by ultrasonication. Nanocellulose characterization was carried out by determining wavelength using UV-Vis, determining functional groups using FTIR, measuring nanocellulose using SEM, and crystallinity using XRD. Synthesis of silver nanoparticles using the ultrasonication method with red betel leaf bioreductor and stabilizer in the form of 0.05% starch solution. Characterization of silver nanoparticles was carried out by determining the wavelength using UV-Vis and the particle size using PSA. Characterization of the antimicrobial activity test on modified microcellulose was carried out by determining the clear zone against the bacteria Staphylococcus epidermidis and Pseudomonas aeruginosa, and the fungus Candida albicans. The statistical tests used are Two Way Anova and DMRT (Duncan) test. Nanocellulose has characteristics, namely a wavelength of 300 nm, has sharper C-O glycosidic bonds than cellulose, has a C=O stretch, and lignin/hemicellulose and C=C lignin aromatic rings begin to disappear. Based on characterization using SEM, it shows that microcellulose has a size of 1 µm and based on characterization using XRD it has a crystallinity of 79.05%. Silver nanoparticles have a wavelength of 424 nm, a diameter of 88.6 nm. Modification of nanocellulose with the addition of silver nanoparticles showed the best inhibition against Staphylococcus epidermidis, Pseudomonas aeruginosa, and Candida albicans. The research stages that have been carried out include preparation of nanocellulose from sugarcane bagasse waste, preparation of silver nanoparticles using brown algae using the ultrasound method, as well as characterization of nanoparticles using UV-VIS, Particle Size Analyzer (PSA), and antimicrobial activity testing. Next, the application of metal nanoparticles and chitosan was carried out as well as a silane compound coating on the nanocellulose product. The resulting product is then further characterized to determine its application, including functional group analysis, thermal properties, mechanical properties, antimicrobial activity tests, and contact angle measurements. Several characterizations of nanocellulose, nanoparticles and their composites were carried out at research partners (UNS). The results of UV-Vis, PSA and and XRD, sugarcane bagasse nanocellulose produces absorption at wavelengths of 281 nm and 658.50 nm with a size of 466 nm and diffraction angles at 2θ of 16.3° and 22.18°. Silver nanoparticles produce absorption at a wavelength of 421.50 nm with a size of 86.8 nm and diffraction angles at 2θ of 32.32° and 46.28°. The highest antimicrobial activity was obtained on nanocellulose with the addition of chitosan and silver nanoparticles. The highest mechanical properties were obtained in nanocellulose with the addition of chitosan and glycerol. The highest contact angle value was obtained on nanocellulose with the addition of chitosan and glycerol as well. Technology Readiness Level is 3.

Kata Kunci: *Antimicrobial, Red Betel Leaves, Brown Algae, Enzymatic, Nanocellulose, and Silver Nanoparticles.*