

ABSTRACT

*Chitosan is a natural biopolymer with potential as a food packaging material due to its antibacterial properties, but its use is limited by its low solubility. Efforts to improve its antibacterial properties and solubility are carried out by modifying chitosan into carboxymethyl chitosan (CMC). This study aims to synthesize CMC and apply it as a food packaging membrane, as well as to evaluate its antibacterial properties and physical characteristics. The research method began with initial chitosan characterization, including determining its molecular weight and degree of deacetylation (DD). CMC synthesis was carried out by reacting chitosan and monochloroacetic acid under five different reaction conditions (producing CMC-1 to CMC-5). The synthesized CMC products were characterized using FTIR and UV-Vis spectrophotometers. CMC membranes were prepared by adding glycerol and gelatin. The antibacterial activity of CMC membranes was analyzed using turbidimetry and Total Plate Count (TPC) methods. Furthermore, the physical properties of the membranes were characterized by measuring their contact angle, tensile strength, elongation, and biodegradability. The results showed that the initial chitosan had a molecular weight of 299.991 g/mol with a DD of 59%. The best CMC synthesis was produced by the CMC-4 product (3 eq monochloroacetic acid, temperature 50 °C, pH 7) in the form of a yellowish coarse solid with a yield of 78.7% and a degree of substitution of 82%. Meanwhile, the CMC-1 membrane (0.5 eq monochloroacetic acid, temperature 50 °C, pH 7) produced physical characteristics in the form of a contact angle of 83.13°, a tensile strength of 0.72 MPa, and an elongation of 108%. The CMC-1 membrane showed effective antibacterial activity with a zone of inhibition percentage of 79.97% against *S. aureus* and 71.11% against *E. coli*, and a bacterial colony count of 2,600 CFU in the TPC test. The CMC-1 membrane was able to degrade completely on the 11th day. These characteristics indicate that the synthesized CMC membrane has strong potential as an environmentally friendly antibacterial membrane for food packaging.*

Keywords: Chitosan, Carboxymethyl Chitosan (CMC), Food Packaging Membrane, Antibacterial, Biodegradability.