ABSTRACT

Dura mater is a protective layer that surrounds the brain and spinal cord. Damage to the dura mater caused by trauma, neurosurgical procedures, or infections can lead to cerebrospinal fluid leakage and other complications. This study aims to develop a biomaterial-based dural patch from bacterial cellulose (BC) reinforced with chitosan and Piper betle leaf extract. BC was synthesized using Acetobacter xylinum in a coconut water medium, soaked in a chitosan solution with varying concentrations of Piper betle extract (0%, 5%, 10%, 15%), and dried using the freeze-drying method. The material was characterized through FTIR analysis, swelling tests, degradation tests, and antibacterial tests. The results showed successful composite synthesis indicated by functional group interactions between BC, chitosan, and Piper betle extract. The highest swelling ratio was observed in the control sample (1002%) and decreased significantly in the 15% extract concentration (446%). Degradation tests revealed that the addition of Piper betle extract increased the degradation rate, with ANOVA results (p = 0.0429) indicating significant differences. Antibacterial tests showed an increased inhibition zone against S. aureus (0–5.4 mm) and E. coli (0–2.2 mm) with higher extract concentrations. These findings suggest that the BC-chitosan composite with Piper betle extract demonstrates potential as a dural patch with antibacterial properties, swelling capability, and degradation rates suitable for biomedical applications.

Keywords: *bacterial cellulose, betel leaf, chitosan, and dura mater.*