Abstract

Chitosan has been widely utilized as an antibacterial agent; however, its antibacterial activity can be enhanced through chemical structure modification and composite formation with silver (Ag). This study aimed to synthesize and characterize 6-deoxy-6-L-lysine Schiff base chitosan-benzaldehyde/Ag and chitosan-furfural/Ag composites and evaluate their antibacterial activity. The synthesis was carried out through the formation of chitosan Schiff bases with benzaldehyde and furfural, followed by tosylation, substitution with L-lysine, and composite formation with Ag. The products were characterized using UV–Vis, FTIR, and SEM–EDX mapping, and their antibacterial activity was evaluated using the Total Plate Count (TPC) method. The results showed that the chitosan-furfural Schiff base exhibited a higher degree of substitution (79.55%) than the chitosan-benzaldehyde Schiff base (37.40%). The final products, 6-deoxy-6-L-lysine Schiff base chitosan-benzaldehyde and chitosan-furfural, were obtained with yields of 56.19% and 87.60%, respectively. All Ag composites were successfully synthesized with yields ranging from 31.56% to 82.70%. Antibacterial testing at a concentration of 2500 ppm demonstrated that all samples exhibited higher antibacterial activity than pure chitosan. The highest antibacterial activity was observed for the 6-deoxy-6-L-lysine Schiff base chitosan-furfural/Ag composite, which achieved 90% bacterial growth inhibition on the seventh day. These results indicate that chitosan modification through Schiff base formation, L-lysine substitution, and Ag composite formation significantly enhances its antibacterial activity.

Keywords: chitosan, Schiff base, L-lysine, silver particles, composite, antibacterial.