

ABSTRACT:

This research work offers a simple and environmental friendly method for creating metal-polymer composites of nanocellulose that have stronger antibacterial properties. Through a multi-step chemical process, nanocellulose was extracted from cow dung, offering a cheap and sustainable source of cellulose nanofibers. A sol-gel method was used to create silver nanoparticles and nickel oxide nanoparticles, while an in-situ chemical reduction technique produced the corresponding nanocellulose-metal composites. Fourier transform infrared spectroscopy (FTIR), which demonstrated the distinctive hydroxyl and glycosidic bonds of cellulose as well as metal-oxygen or metal-ligand vibrations suggestive of nanoparticle integration, validated the structural and chemical characteristics of all materials. Agar diffusion experiments were used to assess antimicrobial efficacy against representative bacteria. There were no inhibitory zones in both pure and nanocellulose. In contrast, NiO NPs and AgNPs had definite dose-dependent action. When these nanoparticles were incorporated into the nanocellulose matrix, composites with sustained or synergistic antibacterial properties were created, indicating the approach's promise for environmental friendly and cost effective antimicrobial materials.