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Green synthesis of ZnO/CuO nanocomposite using juice extracts of *Citrus limon* and the evaluation of its antibacterial activity.

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The green synthesis of nanoparticles and nanocomposites has received a great deal of interest due to the fact that it is a low-cost, easily scalable, non-toxic, and environmentally friendly method of synthesis. Green synthesis of nanoparticles and nanocomposites, as opposed to chemical synthesis, requires the use of fungus, yeast, actinomycetes, bacteria, and plants. This research focuses on the green synthesis of a 10% ZnO/CuO nanocomposite (ZnO:CuO ratio; 90:10) utilizing *Citrus limon*, a plant that contains citric acid, which functions as a good capping and stabilizing agent. This study compares the antibacterial activity of the synthesized nanocomposite to that of ZnO and CuO nanoparticles. The produced nanocomposite was characterized using a variety of methods. UV-Visible spectroscopy to confirm the formation of the ZnO/CuO nanocomposite, FTIR (Fourier Transform Infrared) spectroscopy for the identification of functional groups present, and SEM (Scanning Electron Microscope) analysis for the investigation of the surface morphology of the nanocomposite were used as the characterization techniques. Antibacterial activity for the synthesized nanocomposite was done using *E. coli* and *S. aureus* bacteria as test organisms, which are gram-negative and gram-positive bacteria, respectively. The ZnO/CuO nanocomposite showed promising antibacterial activity against the tested bacterial strains. The nanocomposite showed inhibitory action against *E. coli* at a concentration of 10 mg/mL, while for *S. aureus*, the nanocomposite showed inhibitory action at concentrations of 5 mg/mL and 10 mg/mL. In comparison, the nanocomposite showed a better inhibitory action against *S. aureus* than against *E. coli*. The comparison done between the nanoparticles and the nanocomposite confirmed that the nanocomposite showed similar or even higher antibacterial activity towards the tested bacteria. As a result, for the first time, this work reveals the green synthesis of ZnO/CuO nanocomposite using *Citrus limon* and its role as an antibacterial agent.

Keywords: Antibacterial activity, Green synthesis, Nanocomposite