Exploring the antimicrobial potential of biogenically synthesized graphene oxide nanoparticles against targeted bacterial and fungal pathogens

ABSTRACT

Graphene oxide (GO) and reduced graphene oxide (rGO) nanoparticles were synthesized using 40 mL of lemon juice extract as a reducing agent. The synthesized nanoparticles were characterized using various analytical techniques, including UV–visible spectroscopy, scanning electron microscopy, energy-dispersive X-ray spectroscopy, Fourier transform infrared spectroscopy, and X-ray diffraction. The results confirmed the successful synthesis of GO and rGO nanoparticles with varied sizes and shapes. The synthesized nanoparticles were tested for their antimicrobial activity against a range of bacterial and fungal strains, including Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae, Candida albicans, Fusarium oxysporum, and Aspergillus flavus. Multiple concentrations of GO and rGO nanoparticles were tested, and it was observed that 100 µg·mL−1 of both GO and rGO showed the highest inhibitory effect against bacterial and produced zones of inhibition of 17.66 mm, 18.67 mm, and 17.88 for E. coli, S. aureus, K. pneumoniae and 20.33, 22.45, and 21.34 mm for C. albicans, F. oxysporum, and A. flavus. Comparatively, GO performed well as compared to rGO regarding antimicrobial activity. The synthesized nanoparticles exhibited significant antimicrobial activity against various bacterial and fungal strains and have the potential to be developed as novel antimicrobial agents.