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GREEN SYNTHESIS OF SILVER NANOPARTICLES USING FERMENTED YERBA MATE EXTRACTS AND THEIR BIOLOGICAL ACTIVITY

Green synthesis of metallic nanoparticles has emerged as an environmentally friendly alternative to conventional chemical synthesis methods. Plant-derived reducing agents and fermented biological products offer a sustainable approach to producing nanoparticles with desirable physicochemical and biological properties. The study presents the biological characterization of silver nanoparticles synthesized using kombucha-fermented Yerba mate (*Ilex paraguariensis*) extracts as reducing agents.

The synthesized nanoparticles were subjected to physicochemical analysis, including zeta potential and size distribution measurements, as well as biological evaluation of antibacterial activity, reactive oxygen species generation, antioxidant potential, cytotoxicity, and cell migration. The obtained silver nanoparticles demonstrated effective antibacterial properties against *Salmonella enterica* and *Enterobacter cloacae*, with concentration-dependent biological effects. Additionally, the nanoparticles influenced oxidative stress responses and cellular migration processes while maintaining relatively low cytotoxicity toward fibroblast cell lines.

The presented work aligns with current trends in applied materials science and nanobiotechnology, emphasizing sustainable synthesis strategies and the biomedical potential of green-engineered nanomaterials. The results indicate that kombucha-fermented plant extracts may serve as promising reducing agents for the production of biologically active silver nanoparticles suitable for future antimicrobial and biomedical applications.

Keywords: green synthesis, silver nanoparticles, Yerba mate, nanobiotechnology, antibacterial activity