ECO-SUSTAINABLE ZNO AND RGO/ZNO NANOMATERIALS SYNTHESIZED USING MISTLETOE EXTRACTS: ASSESSMENT OF THEIR ANTIMICROBIAL POTENTIAL AND CLINICAL RELEVANCE

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Eco-sustainable synthesis of nanocomposites has gained considerable attention in the biomedical field due to its low cost, efficiency, and reduced environmental impact. In recent decades, antimicrobial resistance has emerged as one of the major threats to global health, driving the search for more effective therapeutic alternatives. In this study, green sustainable nanoparticles (GSNs) of zinc oxide (ZnO) [1] and reduced graphene oxide-supported zinc oxide (ZnO/rGO) [2] were synthesized using aqueous extracts obtained from leaves and flowers of *Psittacanthus calyculatus* (P. calyculatus), a plant traditionally used in Mexican herbal medicine. These extracts acted as reducing and stabilizing agents during the synthesis process. The aim was to evaluate the antimicrobial potential of these nanomaterials against clinically relevant pathogens: *Escherichia coli* (E. coli) and *Trichophyton rubrum* (T. rubrum).

The results indicated that ZnO and ZnO/rGO nanocomposites, at an optimal concentration of 0.75 mg/mL, exhibited antimicrobial activity against the Gram-negative bacterium *Escherichia coli*, as evidenced by inhibition halos in the agar diffusion assay, suggesting a bacteriostatic effect. In contrast, against the dermatophytic fungus *Trichophyton rubrum*, inhibition was observed exclusively with the ZnO nanocomposite synthesized using aqueous leaf extract at a concentration of 10 mg/mL, indicating a possible fungistatic activity dependent on both concentration and synthesis method.

In conclusion, the green synthesis of ZnO and ZnO/rGO nanoparticles, mediated by aqueous extracts from leaves and flowers of *P. calyculatus*, exhibited antimicrobial activity against *E. coli* and *T. rubrum*, showing a response dependent on both concentration and the type of plant extract. These preliminary findings suggest that the green-synthesized nanoparticles hold clinical potential as alternative antimicrobial agents against resistant strains.

Referencias

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