



Polyherbal Nano-formulations: A New Frontier in Anticancer, Antibacterial, and Antioxidant Therapies

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Abstract

Cancer is defined as the uncontrolled cell division of cells. Cancer being reported as the 2nd most common cause of deaths worldwide is the major health challenge faced by researchers in current decade. Currently, plants are significantly being used for the treatment of cancer due to their benefits and lower side effects. In this research work, the maceration method was used to form polyherbal extracts using different solvents. These polyherbal extracts were then used to synthesize zinc oxide nanoparticles using ethanol, hydroethanol, and distilled water as solvents by green synthesis method. ZnO nanoparticles synthesized from hydroethanol and ethanol extracts exhibited sharp peaks at 372 and 384 nm, correspondingly, but those of distilled water extract displayed a sharp peak at 327 nm in UV-visible analysis. Scanning electron microscopy (SEM) demonstrated a spherical morphology of synthesized nanoparticles. Zeta potentials for ZnO-NPs from ethanol, hydroethanol, and water extracts were determined to be 19.8 mV, -18.6 mV, and -16.1 mV, respectively. The sizes of the ZnO-NPs were found to be 167.76 nm, 473.9 nm, and 3508.8 nm, respectively. Ethanolic extract nanoparticles have the highest DPPH activity while hydroethanolic extract have the significant TPC and TFC content. Ethanol nanoparticles have shown significant zone of inhibition against *E. coli* and *Staphylococcus aureus*. Lowest MIC values (0.312 mg/ml for *E. coli* and 1.25 mg/ml for *S. aureus*) were recorded in case of ethanolic extract nanoparticles and highest in case of hydroethanol. Results of hemolytic activity and Ames assay indicate that these nanoparticles are non-toxic and non-mutagenic in nature. Results of anticancer activity against 3T3 and Hela cell lines have shown all of these nanoparticles are inactive against these cell lines suggesting their promising anticancer activity. All the experiments were performed in triplicates. All the results of this research work conducted suggest that nanoparticles synthesized from distilled water, ethanol and hydroethanol extracts of polyherbal product have spherical shape with significant antioxidant and antibacterial activities. Cytotoxicity and anticancer studies suggest that these nanoparticles are non-toxic, non-mutagenic and have anticancer potential.

Key Words: Anticancer, antibacterial, cytotoxicity, Zinc oxide nanoparticles, polyherbal product

