Moringa Oliefera-mediated Iron Oxide Nanoparticles, Characterization and their Anti-Proliferative Potential on Highly and Weakly Metastatic Human Breast Cancer Cells

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Abstract

Iron oxide nanoparticles (Fe_2O_3 NPs) stabilized with *Moringa Oliefera* were synthesized. The study aimed to investigate the cytotoxic, anti-proliferative potential of Fe_2O_3 NPs through various assays such as trypan blue and MTT assay. The *Moringa Oliefera*-mediated Fe_2O_3 NPs (MO Fe_2O_3 NPs) were analyzed using a range of techniques, including Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), UV-vis spectroscopy (UV-vis), scanning electron microscopy (SEM), and energy-dispersive X-ray spectroscopy (EDX). FTIR, XRD, and SEM-EDX results confirmed the successful synthesis of Fe_2O_3 NPs. Gas chromatography-mass spectrometry (GC-MS) analysis of *Moringa Oliefera* revealed various compounds that have medicinal potential. The analysis of UV-Vis spectra indicates an absorption peak at 314 nm, thereby ensuring both the successful synthesis and remarkable stability of the nanoparticles. The nanoparticles exhibited uniform spherical morphology and contained Fe, O, and some minor elements, confirming the formation of Fe_2O_3 NPs. The cytotoxic and anti-proliferative potential on MCF-7 and MDA-MB 231 human breast cancer cells was observed with various concentrations of *Moringa Oliefera*-mediated Fe_2O_3 NPs, and the cytotoxicity result revealed an IC_{50} of 69.7 μg/mL. Stable Fe2O3 nanoparticles were synthesized using a methanolic extract of *Moringa Oliefera*. The nanoparticles exhibited cytotoxicity and anti-proliferative activity on highly and weakly metastatic human breast cancer cell lines.

Keywords: Scanning electron microscopy; UV-vis spectroscopy; Trypan blue; Spherical Morphology; Fourier-transform infrared spectroscopy.