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Green synthesis: *In-vitro* anticancer activity of Iron oxide nanoparticles against human colorectal cancer cell lines

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Introduction: Nowadays cancer remains as a serious health problem among human beings characterized by uncontrolled cell growth. Biosynthesis of nanoparticles (NPs) using plant extracts has gained more attention due to its nontoxicity and environment friendly nature. Among various metal oxide NPs, iron oxide NPs have attracted wide interest due to their super paramagnetic properties and nontoxicity. Iron oxide NPs are used in cancer magnetic nano therapy because of their ability to produce oxygen radicals. In the present study, we report an extracellular rapid biosynthesis of iron oxide nanoparticles using aqueous leaf extract of *Pimenta dioica* and their anticancer activity against human colorectal cancer cell lines.

Methods: The iron oxide nanoparticles were synthesized via green method using *Pimenta dioica* leaf extract as reducing agent. The synthesized NPs were characterized by techniques such as UV-Visible spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM-EDS), Transmission Electron Microscopy (TEM) and Thermo Gravimetric Analysis-Differential Thermal Analysis (TGA-DTA). *In-vitro* anticancer and cytotoxic effects were determined by MTT assay.

Results & Discussions: The synthesized NPs of iron oxide have spherical shape and size ranges from 5-15 nm. XRD spectrum confirms the presence of rhombohedral hematite phase of magnetite nanoparticles (α -Fe₂O₃). *In-vitro* cytotoxicity was determined on L929 (fibroblast) cells and *in-vitro* anticancer studies were done on DLD1 (colorectal cancer cell line) cells. The present study confirms that iron oxide NPs kill human colorectal cancer cells and are less toxic to normal L929 (fibroblast) cells.

Conclusions: The study reveals that iron oxide NPs can be effectively synthesized using *Pimenta dioica* leaf extract and thus synthesized NPs can be used as a potential agent in cancer cell treatment.

Key words: Green synthesis, Iron oxide nanoparticles, Cytotoxicity, Anticancer activity.

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