

Biogenic Synthesis of Fe₃O₄-Conjugates using medicinal plant extracts of *Simarouba Glauca* and functionalized with Essential Oils for applications in Nanomedicine.

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Abstract:

Biogenic synthesis of superparamagnetic Fe₃O₄ nanoparticles with specific sizes and shapes have been a challenge in biomaterial science. Synthesis using plant compounds has remarkable advantages in pharmacology to cure various diseases due to higher efficacy and less toxicity of the plant phytochemicals that attach to the NPs. The well developed surface chemistry of Fe₃O₄ makes it easy to load them with biopharmaceutics, promoting them as nanoplateforms for building up nanoparticle-based theranostics. These phytochemical-loaded magnetic nanosystems permit a slow, sustained & controlled release of the encapsulated plant compounds at the target site. This paper describes the fabrication of monodispersed superparamagnetic Fe₃O₄ conjugates by using phytochemical extracts of the medicinal plant *Simarouba Glauca* (*Laxmi Taru*) having anticancer properties. These Fe₃O₄-Lax nanocomposites are then functionalised with essential oils Eugenol & Ylang Ylang by surface coating methods. These essential oils are known to be powerful anticancer, anti-inflammatory, antioxidant agents. The nanoencapsulation of Eugenol & Ylang Ylang on polymeric Fe₃O₄ improves their solubility and bioavailability, prevents photo-oxidation, decreases volatility and enhances their antimicrobial and therapeutic efficiency. Various techniques used for confirming the formation of the Fe₃O₄ conjugates were XRD, FTIR, VSM, SEM, TEM and DLS methods. The amount of Essential Oils loaded on Fe₃O₄ nanoparticles was measured as Entrapment Efficiency values using UV-Vis spectroscopy. The antibacterial activity was tested on the bacteriums *S. Aureus* & *E. Coli*. The compounds showed synergistic antioxidant activity which was measured using DPPH assay. The study showed that Fe₃O₄-Lax- Eugenol/Ylang phytohybrids are efficient for stabilising and controlling the release of these essential oils thereby maximising their biological activity. All compounds used for synthesis are of natural plant origin with no side effects and thus these phytohybrid nanosystems can be used as a strategy for therapeutic approach in Nanomedicine such as cancer therapy, magnetoaerosols, anti-biofilm and anti-Infection therapy.

Keywords: Fe₃O₄ NPs, *Simarouba Glauca* (Lax), Eugenol, Ylang-Ylang, Antioxidant Activity.

Biography:

Ms. Janesline P. D. Fernandes has an excellent academic record with O+ Grade in M.Sc (Inorganic Chemistry) and a M. Phil. Degree to her credits. She is currently an Associate Professor in Chemsitry, St. Xavier's College, Goa, India. Her research interests are in synthetic strategies and functionalization of nanomaterials for drug delivery and biomedicine. She has guided several projects in the field of Nanochemistry and has presented her research papers at conferences / seminars and earned appreciations in the State of Goa and Outside. She has won several awards in the first place category for her oral and poster paper presentations at various events. In December 2016, she has received the International Best Oral Paper Presentation Award at the International Science Congress 2016, Pune-India. She has also earned great reviews for her teachings and student motivation and was honored with Best Educationist Award in June 2017. She is a friendly person, loves travelling and has a happy and a positive approach towards life.

