Biosynthesis of gold nanoparticles and study of its In-Vitro cytotoxic activity on HCT15 human colon cancer cell line

Arpita Dey, Mohd Yousuf Rather[1], A Yogamoorthy[1], SM Sundarapandian[1,#,]

[1]Department of Ecology and Environmental Sciences, School of Life Sciences, Pondicherry University, R V Nagar, Kalapet, Puducherry-605014, India. #Email: smspandian65@gmail.com

Abstract: Biosynthesis of metal nanoparticles has gained much momentum in recent decades for it is eco-friendly, cost-effective, and is in compliance with the green chemistry principles. The present study reported a facile and rapid synthesis of gold nanoparticles (AuNPs) from aqueous extract of *Wedelia trilobata* leaves and their in-vitro cytotoxicity against HCT15 human colon cancer cell line. Gold (Au) is a block –d transition metal and has a higher atomic number. Its biocompatibility makes it a suitable candidate for biomedical applications. The phytochemical constituents of the aqueous dried-leaf extract was used as a precursor of biotic reducing and capping agents for AuNPs formation, nucleation, growth, and stabilization.

Formation of AuNPs was initially confirmed by change in colour in the solution from light yellow to deep purple and appearance of Surface Plasmon Resonance (SPR) peak at 533 nm in UV-Visible Spectroscopy after 35 minutes of incubation. It was later confirmed by X-ray Diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), Scanning electron microscopy (SEM), Energy dispersive X-ray analysis (EDX) and Transmission electron microscopy (TEM) analysis. The influence of reactants ratio, incubation time and reaction temperature was evaluated to optimize reaction parameters. The reactants ratio of 1:9 of plant extract to metal salt, 50º C temperature and 6 hours of reaction time were found to be optimum for the synthesis. The particles were spherical, crystalline with face-centred cubic (fcc) structure with a preferential orientation of (111) plane, and size varied within the diameter 10-50 nm. The particles showed a band gap value of 3.41 eV. Further, MTT (3-(4,5-dimethylthiazol -2-yl)-2,5-diphenyltetrazolium bromide) tetrazolium reduction assay was carried out with different concentrations of AuNPs (25-500 µg/ml) which showed dose-dependent toxicity of AuNPs with 30 percent cell death at the highest concentration.

The present study is one more step towards exploring the biosynthetic route of nanoparticle synthesis, which greatly reduces the use of toxic solvents and harmful by-products as well as it tries to understand the cytotoxic activity of AuNPs. Future studies in this direction could be taken up to better understand the mechanism of action and enhancing the cytotoxic efficiency of the AuNPs with suitable adjuvants.

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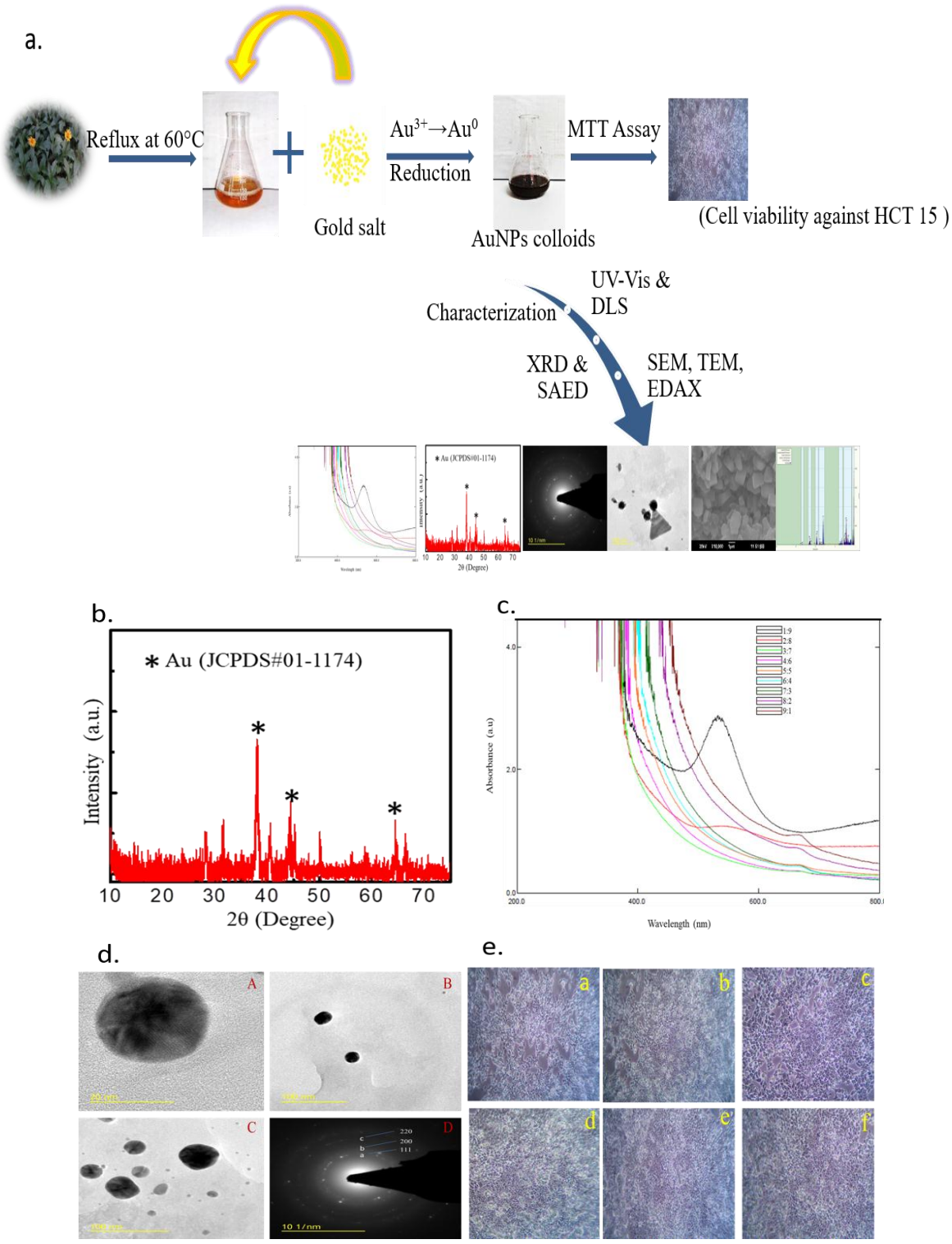

Figure 1.a. Schematic representation of the synthesis and characterization of gold nanoparticles, b. XRD pattern of the synthesized gold nanoparticles confirms its crystalline nature, c. SPR peak for the 9 different ratio d. TEM image showing spherical particles with an average size of 34.02 nm, SAED pattern confirming the lattice planes, e. cytotoxic activity of the gold nanoparticles on HCT 15 cell line.

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