

INFLUENCE OF COPPER(II) ION CONCENTRATION ON STRUCTURE AND MORPHOLOGY OF GREEN SYNTHESISED COPPER NANOPARTICLES USING *Coccinia grandis* LEAF EXTRACT

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Nanomaterials are emerging and have gained significant attention in areas such as medicine, energy, materials and environmental industries. Among them, copper nanoparticles stand out, due to their biocompatibility, easy synthesis and low-cost of production. Various secondary metabolites in plant extracts can be used to reduce metal ions into nanoparticles in a single step known as green synthesis. This study investigated a simple, eco-friendly and cost-effective method to synthesise copper nanoparticles using copper sulfate pentahydrate, as the precursor salt, and an aqueous leaf extract of *Coccinia grandis* that is rich in phytochemicals as a reducing, capping and stabilising agent. The synthesis of four different nanoparticle formulations was carried out by varying the concentration of the precursor solutions at 20 mM, 30 mM, 60 mM and 100 mM. The synthesised products were characterised using powder X-ray diffraction (PXRD), scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR) and particle size analyzer (PSA). PXRD data confirmed a highly pure crystalline, face centered cubic structure of Cu nanoparticles with mean crystallite sizes of 10.59, 11.43, 13.72 and 17.43 nm for the four types synthesised (CuNP-1, CuNP-2, CuNP-3, CuNP-4) in four different concentrations, respectively. The FTIR spectra of the products confirmed the presence of functional groups of various biomolecules involved in capping and stabilising the CuNPs. Spherical nanoparticles of average sizes for CuNP-2 and CuNP-4 were found to be 16 nm and 72 nm, respectively, as identified from SEM imaging and by ImageJ analysis. The results of dynamic light scattering analysis by PSA showed that the average hydrodynamic diameters were 19, 71, 201 and 95 nm, respectively for the four synthesised products. This study demonstrates that precursor concentration is a crucial factor for controlling nanoparticle properties. A detailed study to reveal their antimicrobial activity is currently underway.

Keywords: Characterisation, *Coccinia grandis*, Green synthesis, Nanotechnology, Phytochemicals