Effect of Curcuma longa tuber powder extract on size of silver nanoparticles prepared by green method

Abstract

Biosynthesis of noble metal nanoparticles is a vast developing area of research. In the present study, silver nanoparticles (Ag-NPs) were synthesized from aqueous silver nitrate through a simple and biosynthetic route using water extract of Curcuma longa (C. longa) tuber powder, which acted simultaneousl as a reductant and stabilizery. The as-prepared samples are characterized using UV–Visible, XRD, TEM, SEM, EDXF, and FT-IR techniques. The formation of Ag-NPs is evidenced by the appearance of the signatory brown color of the solution and UV–vis spectra. Formation of Ag/C. longa was determined by UV–Vis spectroscopy where surface plasmon absorption maxima can be observed at 457–415 nm from the UV–Vis spectrum. The XRD analysis shows that the Ag-NPs are of a face-centered cubic structure. Well-dispersed Ag-NPs with anisotropic and isotropic morphology for 5, 10, and 20 mL of C. longa water extract having a size less than 10 nm are seen in TEM images. The optimum volume extraction to synthesize smallest particle size was 20 mL with mean diameter and standard division 4.90 ± 1.42 nm. FT-IR spectrum indicates the presence of different functional groups in capping the nanoparticles with C. longa. The zeta potential analysis results indicated that the charge of C. longa was negative and increased in Ag/C. longa emulsion with increasing of volumes of extract used (10–20 mL). The most needed outcome of this work will be the development of value-added products from C. longa for biomedical and nanotechnology-based industries.

Keyword: Silver nanoparticles; Curcuma longa; Biosynthesis; Green synthesis; Zeta potential analysis