Green biosynthesis, antioxidant, antibacterial, and anticancer activities of silver nanoparticles of Luffa acutangula leaf extract

ABSTRACT

Studies on green biosynthesis of newly engineered nanoparticles for their prominent medicinal applications are being the torch-bearing concerns of the state-of-the-art research strategies. In this concern, we have engineered the biosynthesized Luffa acutangula silver nanoparticles of flavonoid O-glycosides in the anisotropic form isolated from aqueous leave extracts of Luffa acutangula, a popular traditional and ayurvedic plant in south-east Asian countries. These were structurally confirmed by Ultraviolet-visible (UV-Vis), Fourier transform infrared spectroscopy accessed with attenuated total reflection (FTIR-ATR) spectral analyses followed by the scanning electron microscopic (SEM) and the X-ray diffraction (XRD) crystallographic studies and found them with the face-centered cubic (fcc) structure. Medicinally, we have explored their significant antioxidant (DPPH and ABTS assays), antibacterial (disc diffusion assay on E. coli, S. aureus, B. subtilis, S. fecilis, and S. boydii), and anticancer (MTT assay on MCF-7, MDA-MB-231, U87, and DBTRG cell lines) potentialities which augmented the present investigation. The molecular docking analysis of title compounds against 3NM8 (DPPH) and 1DNU (ABTS) proteins for antioxidant activity; 5FGK (Gram-Positive Bacteria) and 1AB4 (GramNegative Bacteria) proteins for antibacterial activity; and 4GBD (MCF-7), 5FI2 (MDA-MB-231), 1D5R (U87), and 5TIJ (DBTRG) proteins for anticancer activity has affirmed the promising ligand-protein binding interactions among the hydroxy groups of the title compounds and aspartic acid of the concerned enzymatic proteins. The binding energy varying from -9.1645 to -7.7955 for Cosmosioside (1, Apigenin-7-glucoside) and from -9.2690 to -7.8306 for Cynaroside (2, Luteolin-7-glucoside) implies the isolated compounds as potential bioactive compounds. In addition, the performed studies like QSAR, ADMET, bioactivity properties, drug scores, and toxicity risks confirmed them as potential drug candidates and aspartic acid receptor antagonists. This research auxiliary augmented the existing array of phytological nanomedicines with new drug candidates that are credible with multiple bioactivities.