ORIGINAL PAPER

Antimicrobial, Cytotoxicity and Photocatalytic Degradation of Norfloxacin Using *Kleinia grandiflora* Mediated Silver Nanoparticles

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Abstract
Synthesis of nanomaterials through green and eco-friendly approaches which are free from toxic chemicals is an emerging interest in the field of nanoscience and nanotechnology. Plant-mediated synthesis of silver nanoparticles (AgNPs) gained importance because of its non-toxic, eco-friendly and potential for biomedical applications. The present study explored the synthesis of AgNPs using *Kleinia grandiflora* leaf extract (KGLE) as a reducing and stabilizing agent. The synthesized AgNPs were characterized via UV–Vis spectroscopy (UV–Vis), Fourier transform-infrared spectroscopy, X-ray diffraction, scanning electron microscopy, transmission electron microscopy and energy dispersive X-ray spectroscopy. The biosynthesized AgNPs were found to be spherical in shape and particle size in the range of 20–50 nm. Besides, the synthesized AgNPs showed significant antimicrobial efficacy against *Pseudomonas aeruginosa* and *Aspergillus niger* as well as considerable cytotoxicity towards Dalton's lymphoma ascites cells with 100% inhibition at the concentration of 200 µg/mL of Ag-NPs. Furthermore, the photocatalytic degradation of norfloxacin under visible light irradiation explored the better reducing ability after 80 min of exposure time It is envisioned that KGLE mediated synthesized AgNPs may have a better antimicrobial, cytotoxic and photocatalytic agent in future.

Keywords Silver nanoparticles · Antimicrobial activity · Cytotoxicity · Photocatalysis

Introduction

Nanoscience and nanotechnology is the fast-emerging discipline covering all areas of physics, chemistry, pharmaceutics, biology, material science and so on [1, 2]. One of the interesting filed of researches in nanoscience, is synthesis of nanoparticles and particularly metal nanoparticles. The wide applicability of the metal-nanoparticles is due to their unique chemical, optical and mechanical properties [3]. Metals like palladium, silver, aluminum, zinc, titanium, copper, gold and iron have been synthesized through chemical [4–6], photochemical [5, 7, 8], electrochemical [4, 9, 10] and biological methods [1, 11–16]. Notably, among these, silver, zinc, copper and gold are frequently used metals for synthesis and application in the biomedical field [17–23]. Metal nanoparticles has been traditionally prepared by physical and chemical procedures. Physical methods of synthesizing nanoparticles require high energy, space and are highly expensive. Chemically synthesized nanoparticles are not appropriate for medical usage due to the binding of hazardous chemicals on their surface. Furthermore, the byproducts obtained in chemical route are toxic to the environment. So there is an increasing need for the green synthetic route of metal nanoparticles synthesis for its targeted usage in biomedical

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