



Abstract

Diabetes is a metabolic disorder which is characterized by high blood glucose level (hyperglycemia). Chronic form of diabetes causes the impairment and damage of various organs with delayed wound healing which leads to amputation of organs. Almost 20% people are affected by diabetic wounds in which foot ulcer is most common form of diabetic wounds. One of the recent technologies that is paving the way for the most effective approaches to treat diabetic wounds is nanotechnology which is utilized in the form of nanoparticles for treatment of wound. Zinc oxide nanoparticles (ZnO NPs) were synthesized using zinc acetate, sodium hydroxide and leaves extract of *Hibiscus rosa sinensis* (*H. r. sinensis*). Different techniques such as ultraviolet-visible spectrophotometry (UV-Vis), Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), Photoluminescence Spectroscopy (PL) and scanning electron microscope (SEM), energy dispersive X-ray (EDX), were performed to characterize the green synthesized nanoparticles. UV-Vis spectroscopy showed the optical properties of ZnO NPs, FTIR analysis showed the presence of functional groups which are involved in green synthesis of nanoparticles. XRD analysis is utilized to determine particle size, crystallinity, and qualitative identification of nanoparticles, PL showed the electronic structure, SEM revealed the spherical and granular structure of nanoparticles and EDX showed the presence of impurities. Antibacterial activity of nanoparticles was employed using agar well diffusion assay against gram positive bacteria *Staphylococcus aureus*. The inhibitory effect was measured as a zone of inhibition in which 75% concentration of ZnO NPs showed the inhibitory effect of 4.75 ± 1.29 mm. Because of the presence of phenolic compounds in the extract, we decided to test the antioxidant activity of the produced ZnO NPs. ZnO NPs showed antioxidant activity of 99.54 ± 0.02 at 100% concentration. *H. r. sinensis* showed antioxidant activity of 99.702 ± 0.002 at 100% concentration. These results were compared with standard antioxidant, ascorbic acid which showed the antioxidant activity of 99.77 ± 0.02 . Albino mice were used to evaluate the healing properties of ZnO NPs, in which diabetes was introduced using alloxan monohydrate and wound was formed on skin of diabetic mice using biopsy punch. Ointment was made using ZnO NPs and Vaseline petroleum jelly as a base to treat diabetic wounded mice. All mice were healed in duration of 15 days and histological analysis was done by collecting the skin sample at day 5 and day 15 which showed the dead tissue and complete healing of wound respectively.

Key words: Diabetes, Wound healing, Nanotechnology, Zinc oxide nanoparticles, *Hibiscus rosa sinensis*, Diabetic wound.