Abstract

Nanotechnology is a rapidly growing discipline that has a wide range of applications in the fields of biomedicine, food, and engineering. This is due to the exceptional properties of nanoparticles, which include biocompatibility, high productivity, speed of manufacturing, cost effectiveness, and safety. Silver nanoparticles (AgNPs) are believed to be powerful nano-weapons since they have the potential to be utilized as active antibacterial agents in the elimination of a wide variety of bacteria that are widely found in the environment. Using enoki mushrooms, the current research provides a method that is both cost-effective and kind to the environment for the production of AgNPs. UV-visible spectroscopy and fourier transform infrared spectroscopy (FTIR) investigations were utilized in order to characterize and validate the mushroom conjugated silver nanoparticles (M-AgNPs). At a wavelength of 432 nm, the M-AgNPs exhibited a characteristic peak in their UV-vis absorption spectrum. There were peaks in the FTIR spectra of M-AgNPs located in a variety of places. O–H stretching and –NH2 stretching were indicated by the peak at 3206 cm-1. The stretching vibration of the C–H groups was assigned to 2948 cm-1, the stretching vibration of the amide was responsible for 1649 cm-1, and the stretching vibration of the O–H bending vibration and stretching vibration, respectively, were attributed to 1408 cm-1 and 1033 cm-1. It is highly likely that the –NH2 and –OH compound is connected to the mushroom extract. The X-ray diffraction analysis of M-AgNPs showed typical diffraction peaks at the (113), (111), (200), demonstrating the face-centered cubic structure of crystalline metal AgNPs. In addition, scanning electron microscopy (SEM) demonstrated that they were spherical in shape and ranged in size from 10 to 30 nanometers. The Zeta potential of the M-AgNPs solution was found to be -3.61 ± 0.6mV with moderate nanoparticle stability. In order to evaluate the possible effects of M-AgNPs on food safety and control, the antibacterial activity of the synthesized M-AgNPs will be tested against a variety of bacteria that have been isolated from wound samples. There are desirable biological applications where AgNPs of a particular size and surface potential are used in large numbers. Nevertheless, it is required that the particle size must be small to pass across the intracellular and intercellular barriers. That is, the accessibility of the protected cell membranes of the targeted organisms is enhanced, since a smaller particle size enhances the transportation capacity of the particular particle. Consequently, nanoparticles of more than 100 nanometers are used in the drug delivery application, antimicrobial activity, and biosensors. Likewise, the size of the nanoparticles has been established to affect their interactions with biological macromolecules

and the metabolic pathways of living cells, but the charge on the surface of the nanoparticles has a related but distinct impact in these interactions. To assess the antibacterial efficacy of the synthesized M-AgNPs solution, the disc diffusion method was employed with six bacterial pathogens. On W4 it was established that the largest inhibition zone was 1.67 ± 0.35 mm while the smallest was 1.23 ± 0.25 mm. The effectiveness of M-AgNPs was assessed by testing the MIC for biofilm inhibition. The overall MIC of M-AgNPs against all bacterial strains is within $40\mu gmL^{-1}$ to $80\mu gmL^{-1}$. The conclusions of antimicrobial studies are in connection with AgNPs which points out that AgNPs is the metal of choice and research has described that it may be used effectively in combination with antibiotics so as to make the antibiotics more effective against a number of pathogenic microbes. Consequently, the identified findings of the current study will clearly elucidate the possible probability of M-AgNPs to be used in multiple biological applications such as to inhibit the growth of multiple kinds of bacteria isolated from the wound samples.