Bactericidal activity of biogenic AgNPs using plant pathogenic fungus and their structural characterisation

M. Amin Bhat*1,2, B. K. Nayak 3 and Anima Nanda 2

1 Department of Biotechnology, Government College for Women, Nawakadal Srinagar Kashmir, India. 
2 Department of Biomedical Engineering, Faculty of Bio. & Chemical Engineering, Sathyabama Institute of Science and Technology (Deemed to be University), Chennai, TN, India.
3 Department of Botany, K. M. Centre for P.G. Studies (Autonomous), (Govt. of Puducherry), Laws pet, Pondicherry-605008, India. Email: aminbio3@gmail.com

Abstract: In recent years, Nanotechnology has emerged as an interdisciplinary research area in biochemical applications mainly focus on synthesis of nanoparticles for improved antimicrobial activities against MDR pathogens1. Silver (Ag) is known for its antimicrobial properties from centuries against diverse group of bacteria in medical field. Alexander the Great used silver vessels to store drinking water during his life time2. However, the silver formulations has changed during antiquity, from bulk silver to ionic silver or adsorbed on carrier materials (Zeolite)3 and now to silver nanoparticles. Nanoparticles exhibit size and shape dependent unique properties, which are of great interest for applications ranging from biosensing and catalysts to optics, antimicrobial activity, computer transistors, electrometers, chemical sensors, and wireless electronic logic and memory schemes4. Nanoparticles have best applications as nanomedicine for the treatment, diagnosis, monitoring and control of biological systems5. Silver is safe and effective bactericidal metal as compared to others because it is non-toxic to animal cells and highly toxic to single cellular bodies like bacteria6,7.

The aim of the present work was to synthesize the extracellular silver nanoparticles from Cladosporium cladosporioides. The possible biological entities responsible for the reduction of silver ions into the silver nanoparticles have been investigated through different techniques like AFM, HRTEM, FTIR and XRD. In addition to these, the AgNPs were evaluated for their antibacterial properties by well diffusion method against clinical bacterial samples.

The plant pathogenic fungus, Cladosporium cladosporioides was used for the preparation of metallic silver nanoparticles. The atomic florescence microscopy and high resolution transmission electron microscopic studies confirmed the formation of silver nanoparticles (AgNPs) which have the average size of 23±5nm. FTIR spectroscopic analysis was carried out to identify the functional groups involved in the reducing/capping of silver ions into silver nanoparticles. The surface plasmon band was confirmed at 416nm. The AFM characterizations confirmed through different analysis that the AgNPs were uniform in size and have average roughness of 17.7638 nm. The synthesized metallic nanoparticles were investigated for their antibiotic efficacy through well diffusion method against clinical pathogens and found remarkable positive results. The minimum inhibitory concentration was found to be 20 μM to 25 μM/ml for AgNPs. The present study concluded that the silver nanoparticles, synthesized biologically, would be used as better drugs and may potentially eliminate the higher doses of antibiotics due to their vital role inhibiting bacterial growth as compared to the common antibiotics.
The biosynthesis process was found to be fast growing, cost effective and eco-friendly in our present study.

**Key words:** *Cladosporium cladosporioides*, UV-Vis Spectrophotometer, FTIR, AFM, HR-TEM, MIC, Antibacterial activity.

**References:**