

NOVEL ANTIBIOFILM AND ANTILEISHMANIAL ACTIVITY OF AgNPs SYNTHESIZED BY *DIOSCOREA BULBIFERA*

Sougata Ghosh,¹ Soham Jagtap,¹ Piyush More,¹ Rohini Kitture,² Neeraj O. Maheshwari,³ Usha J. Shete,³ Jayesh Bellare,⁴ Shilpa Rao,⁵ Jayanta K Pal,⁵ Shivaprasad Patil,³ Sangeeta Kale,² and Balu. A. Chopade.^{6*}

¹Institute of Bioinformatics and Biotechnology, University of Pune, Pune-411007, India;

²Department of Applied Physics, Defense Institute of Advanced Technology, Girinagar, Pune-411025, India;³ Indian Institute of Science, Education and Research, Pune-411008, India;

⁴Department of Chemical Engineering, Indian Institute of Technology, Bombay, Powai, Mumbai-400076, India;⁵ Department of Biotechnology, University of Pune, Pune-411007, India;

⁶Department of Microbiology, University of Pune, Pune-411007, India.

Dioscorea bulbifera is a potent source of diverse phytochemicals with immense pharmacological significance. Herein we report the synthesis of silver nanoparticles (AgNPs) using the *D. bulbifera* tuber extract (DBTE). Synthesis of AgNPs was confirmed by UV-Visible spectroscopy followed by the development of brown colour with a corresponding sharp peak at 450 nm. Transmission electron microscopy showed that the bioreduced AgNPs were mostly spherical in size. Similarly, energy dispersive spectroscopic data and X-ray diffraction pattern confirmed the presence of pure elemental silver in the nanoparticles. Fourier transform infrared spectroscopy confirmed the involvement of the '-OH' groups of the polyphenols in the bioreduction process. The AgNPs exhibited marked antileishmanial and antibiofilm activity against both Gram negative and gram positive bacteria. It inhibited biofilm formation in *Acinetobacter baumannii*, *Escherichia coli*, *Staphylococcus aureus* upto 29.83, 33.55 and 20.89 % respectively after 24 h while 34.46 % against *Pseudomonas aeruginosa* at 48 h. Scanning electron microscopic analysis showed pore formation on the bacterial cell wall by AgNPs leading to unregulated efflux of the cellular materials and finally leading to death. It is significant to note that the abrupt increase of size of *E. coli* was observed in case of AgNPs treated cells. Broad spectrum cytotoxic activity of bioreduced AgNPs was confirmed by the antiprotozoal effect against *Leishmania donovani* and *Leishmania major* employing MTT based cell cytotoxicity assay. The treated cells showed extreme deformity in the shape and size as compared to the untreated cells. The treated cells were completely spherical. In conclusion it can be summarized that the plant based AgNPs could be utilized for broad spectrum antibiotics activity such as protozoal parasites, namely *Leishmania* spp. This is the first report of antileishmanial activity of AgNPs synthesized by *D. bulbifera*.

Keywords: *Dioscorea bulbifera*, AgNPs, TEM, antibiofilm, antileishmanial.