**Abstract**

The synthesis and characterization of nanomaterials by using *S. platensis* is an emerging field of nanotechnology with an extensive applications in the fields of Medicine, Physics, Chemistry, and Biology. With the development of several chemical synthesis protocol, the concern for environmental contamination is also high as the chemical synthesis protocols need some toxic chemicals for synthesis. Integrative conventional biotechnology and hybrid nanotechnology lead to nano-biotechnology which utilizes original concepts and natural materials for manufacturing nanoscale devices under the control of Biological Chemistry principles. In general, living organisms traditionally represent a good model for engineers to learn from biological constituents with the optimal functionality of our interests having been used in the creation of nano-biotechnology products. Synthesis of metallic nanoparticles by using biological approach is an attractive one particularly at medicinal applications because of advantage of certain properties such as biodegradability, environmental friendly, high biocompatibility with low toxicity when compared with conventional synthesis methods.

The present study is one such attempt with a novel biological synthesis of silver nanoparticles (AgNPs) and copper oxide nanoparticles (CuO NPs) using the cell free extract of *Spirulina platensis*. Biosynthesized nanoparticles were characterized by UV-Vis Spectroscopy, SEM, TEM, and FTIR analysis and finally evaluated for antibacterial activity. Extracellular synthesis using aqueous extract of *S. platensis* showed the formation of well scattered, Monodispersed, highly stable, spherical AgNPs with an average size of 30-50 nm and 30–40 nm respectively. The size and morphology of the nanoparticles were confirmed by SEM and TEM analysis. FTIR and UV-Vis spectra showed that biomolecules, proteins and peptides, are mainly responsible for the formation and stabilization of nanoparticles. Furthermore, the synthesized nanoparticles exhibited high antibacterial activity against pathogenic gram-negative i.e. *Escherichia coli* - MTCC-9721, *Proteus vulgaris* - MTCC-7299, *Klebsiella pneumonia* - MTCC-9751 and gram-positive i.e. *Staphylococcus aureus* - MTCC-9542, *S. epidermidis*-MTCC- 2639, *Bacillus cereus* - MTCC-9017 bacteria. The AgNPs had shown maximum zone of inhibition (ZOI) i.e. 31.3±1.11 in *P.*
vulgaris. Whereas The CuO NPs had shown maximum zone of inhibition (ZOI) i.e. 28.0±0.41 mm in P. vulgaris.

Further more explores biological synthesis of ZnO nanoparticles (ZnO NPs) and magnesium oxide nanoparticles (MgO NPs) using the cell free aqueous extract of Spirulina platensis has been carried out. Biosynthesized ZnO NPs and were characterized by UV-Vis Spectroscopy, SEM, and TEM analysis and finally tested for antibacterial activity. Bio-synthesis using extract of S. platensis showed the formation of well scattered, highly stable, spherical nanoparticles with an average size of 30-50 nm and 30-40 nm respectively. The size and morphology of the nanoparticles were confirmed by SEM and TEM analysis. FTIR and UV-Vis spectra showed that proteins and peptides are mainly responsible for the formation and stabilization of ZnO NPs. Furthermore, the synthesized nanoparticles exhibited good antibacterial activity against pathogenic gram-negative i.e. Escherichia Coli- MTCC-9721, Proteus vulgaris- MTCC-7299, Klebsiella pneumonia- MTCC-9751 and gram-positive i.e. Staphylococcus aureus- MTCC-9542, S. epidermidis- MTCC- 2639, Bacillus cereus- MTCC-9017 bacteria. The ZnO NPs had shown maximum zone of inhibition (ZOI) i.e. 34.8±1.65 in P. vulgaris and The MgO NPs had shown maximum zone of inhibition (ZOI) i.e. 25.3±0.48 in S. aureus- MTCC-9542. Use of such a biological method provides a simple, cost-effective alternative template for the synthesis of nanomaterials in a large scale that could be great use in biomedical applications.