

## ABSTRACT

The research work emphasized on the microbicidal potential of zinc oxide nanoparticles (ZnO NPs) synthesized via green approach. ZnO NPs were synthesized by hydrogel and zinc acetate dihydrate. The hydrogel was extracted from psyllium husk and used as stabilizing, reducing, and capping agent. The NPs were characterized by UV-Visible spectrophotometry, Fourier transform infrared spectroscopy (FT-IR), and scanning electron microscopy (SEM) with energy-dispersive X-ray spectroscopy (EDX) while hydrogel was characterized only by Fourier Transform infrared spectroscopy (FT-IR). The antibacterial activity of NPs was also observed. UV-Vis analysis reported maximum absorption at 364 nm. FT-IR analysis of hydrogel confirmed the presence of O-H stretching, ether linkage, C-H stretching, and bending functional group. The peak of NPs was observed at  $619.88\text{ cm}^{-1}$  and other values from  $3379.39$  to  $1034.85\text{ cm}^{-1}$  indicated capping of NPs with hydrogel. SEM images reported wurtzite type hexagonal structure and size of 33.3 nm while EDX confirmed the existence of zinc and oxygen elements in NPs. The antibacterial assay of ZnO NPs was performed against two types of cells i.e., gram-positive (*B. licheniformis*, *B. subtilis*) and gram-negative (*S. shigella*, *E. coli*). Results indicated bacterial growth inhibition by ZnO NPs is comparable with an antibiotic i.e., Rifampicin. The minimum concentration used to inhibit and kill bacteria i.e., MIC and MBC were 0.83 and 1.83 mg, 0.5 and 1.167 mg, 1.167 and 1.67 mg, 1.67 and 2.67 mg against *B. subtilis*, *B. licheniformis*, *E. coli*, and *S. shigella*, respectively.

**Keywords:** Psyllium husk, Psyllium husk hydrogel, Psyllium mucilage, Nanoparticles (NP), Zinc oxide nanoparticles (ZnO NPs), UV-Vis, SEM, FT-IR, Antibacterial activity.