ABSTRACT

ZnO nanoparticle induced exopolysaccharide (EPS) production from Bacillus subtilis strain JCT1 (NCBI GenBank Accession No. JN194187) is a novel approach for arid soil applications. In the series of investigations, environmentally benign protocol was followed for the synthesis of ZnO nanoparticles using extracellular enzymes obtained from Aspergillus fumigatus TFR8. Putative characterization techniques were employed for confirmation of size, shape, surface structure, crystalline nature and elemental proportion of ZnO nanoparticles. Results established an average size of ZnO nanoparticles to be 2.9nm at least at one dimension and oblate spherical in structure. The qualitative composition of the nanoparticles exhibited 97.5% Zn element atom percentage. Biosynthesized ZnO nanoparticles enhanced exopolysaccharide production by 596.1% as compared to control and further EPS amelioration led to enhanced soil aggregation (up to 82%), moisture retention (10.7-14.2%) and soil organic carbon. Soil aggregation stability was further confirmed by Fourier Transform Infra-Red spectroscopy. A possible ZnO nanoparticle mediated biological mechanism for enhancing exopolysaccharide production has been discussed.