

Biosynthesis of ZnO nanoparticles by a new yeast strain *Pichia kudriavzevii* and evaluation of their antimicrobial and antioxidant activities

ABSTRACT

The potential ability of a new yeast strain, *Pichia kudriavzevii*, in the synthesis of zinc oxide nanoparticles (ZnO-NPs) through a green method was explored in this study. The effect of reaction time (12, 24 and 36 h) on the structure of the resulting ZnO nanoparticles was investigated. From the XRD and TEM results, the ZnO-NPs with a hexagonal wurtzite structure and a particle crystal size of ~10-61 nm was formed at different reaction times. Combining XRD, TEM, and PL results, it was revealed that the sample prepared at intermediate duration (24 h) has the most favorable nanosized structure with the lowest defect concentration. The biomedical properties of ZnO-NPs as free radical scavenging activity, cytotoxicity and antibacterial agents were characterized. Biosynthesized ZnO-NPs showed strong DPPH free radical scavenging and a dose dependent toxicity with non-toxic effects on Vero cells for concentrations below 190 µg/mL. Desirable bactericidal activity was shown by the ZnO-NPs on Gram-positive bacteria (*Bacillus subtilis*, *Staphylococcus epidermidis* and *Staphylococcus aureus*) and Gram-negative bacteria (*Escherichia coli* and *Serratia marcescens*). A maximum inhibition zone of ~19 mm was observed for *Staphylococcus epidermidis* at a concentration of 100 µg/mL for sample prepared at 24 h. The results from this study reveal that ZnO-NPs possesses potential for many medical and industrial applications.

Keyword: *Pichia kudriavzevii*; Antibacterial activity; Antioxidant; Green synthesis; Zinc oxide nanoparticles