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Nano-Bioremediation of Contaminated Industrial Wastewater Using Biosynthesized AgNPs and Their Nano-Composite

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Abstract : Nanotechnology as multidisciplinary technology is growing rapidly with important applications in several sectors. Also, nanobiotechnology is known for the use of microorganisms for the synthesis of targeted nanoparticles. The present study deals with the green synthesis of silver nanoparticles using aquatic bacteria and the development of a biogenic nanocomposite for environmental applications. Twenty morphologically different colonies were isolated from the collected water samples from eight different locations at the Rosetta branch of the Nile Delta, Egypt. The obtained results illustrated that the most effective bacterial isolate (produced the higher amount of AgNPs after 24 h of incubation time) is isolate R3. Bacillus tequilensis was the strongest extracellular bio-manufactory of AgNPs. Biosynthesized nanoparticles had a spherical shape with a mean diameter of 2.74 to 28.4 nm. The antimicrobial activity of silver nanoparticles against many pathogenic microbes indicated that the produced AgNPs had high activity against all tested multi-antibiotic resistant pathogens. Also, the stabilized prepared AgNPs-SA nanocomposite has greater catalytic activity for the decolourization of some dyes like Methylene blue (MB) and Crystal violet. Such results represent a promising stage for producing eco-friendly, cost-effective, and easy-to-handle devices for the bioremediation of contaminated industrial wastewater.

Keywords : bioremediation, AgNPs, AgNPs-SA nanocomposite, Bacillus tequilensis, nanobiotechnology
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