ABSTRACT

This thesis presents a study on the extraction of *Bacillus licheniformis* from tap water, followed by the optimization of nutritional parameters for the production of alginate lyase. Initially, *Bacillus licheniformis* was successfully isolated and identified from local tap water sample, demonstrating its potential as a source for biotechnological applications. Optimization of nutritional parameters was performed to enhance the enzyme activity, leading to a significant increase in its yield and efficacy. Subsequently, silver-coated nanoparticles were synthesized using the alginate lyase extracted from *Bacillus licheniformis*. The characterization of these nanoparticles revealed promising properties for various applications. The efficacy of both partially purified alginate lyase and silver-coated nanoparticles was evaluated through their application on seedlings of *Ocimum sanctum*. The results demonstrated a notable improvement in seedling growth and health, indicating the potential of these biotechnological products in agricultural enhancement. The alginate lyase coated nanoparticles enhances the enzyme's antibacterial effects. The alginate lyase-coated nanoparticles exhibited significant antibacterial activity against *Bacillus fortis*, with notable reductions in bacterial viability compared to controls. This research work highlights the innovative use of *Bacillus licheniformis*-derived enzymes and nanoparticles, contributing to advancements in both enzymology and agricultural technology.