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(57) Abstract :
The present invention relates to a bacteria-mediated method for synthesizing silver oxide nanoparticles (Ag2O NPs) using Bacillus cereus PGPR. The invention provides an eco-friendly, cost-effective, and scalable approach to enhancing plant growth, improving soil fertility, and controlling fungal pathogens in agriculture. The biosynthesized nanoparticles demonstrate superior nutrient uptake, pathogen resistance, and prolonged stability compared to PGPR alone. The nanoparticles exhibit potent antifungal activity against Rosellinia necatrix, a pathogenic fungus responsible for white root rot in various crops. Seed germination trials on tomato plants showed faster germination within 42–43 hours with no free radical accumulation, confirming the effectiveness of the invention. The method eliminates the need for chemical synthesis, reducing environmental impact and ensuring sustainability for large-scale agricultural applications. Keywords: Bacteria-derived silver oxide nanoparticles (Ag2O NPs), PGPR, Bacillus cereus, Sustainable agriculture, green nanotechnology, Pathogen control in crops, Tomato seed germination enhancement

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