Banana Peel Waste Assisted Green Synthesis of Silver Nanoparticles for Their Antimicrobial Applications

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ABSTRACT

INTRODUCTION: A sustainable and economical technique for producing silver nanoparticles is by using green synthesis method by making banana peel extract. Banana peels are rich in phytochemicals like polyphenols, serve as natural reducing agents in the formation of silver nanoparticles. This eco-friendly approach avoids the use of harmful chemicals, aligning with green principles. As an environmentally conscious alternative, the green synthesis using banana peel extract represents a significant stride in the intersection of nanotechnology and sustainable practices.

OBJECTIVES:

- To provide an eco-friendly alternative to conventional methods by utilizing natural resources
- Minimize the environmental impact associated with chemical synthesis.
- Ensuring that the resulting silver nanoparticles are biocompatible, making them suitable for applications in medicine and other fields.

Methodology: Only defect-free banana fruits were chosen. After removing the peel and cleaning it, the peels were dried to eliminate excess moisture. The dried peels were then turned into powder and mixed with water. The resulting mixture was heated and filtered to obtain a solution used for synthesizing silver nanoparticles. The synthesis involved adding banana peel extract to a silver nitrate solution, leading to observable color changes indicating the formation of AgNps. The process relies on the reduction of silver ions, with surface plasmon resonance causing distinctive color changes in the solution. Centrifuge At 3000 rpm was applied. It is then further dried in an oven. Characterization is performed on FTIR and SEM. Antimicrobial activity is also checked.

Results/Conclusion: The optimum conditions were found to be 1mM solutions of AgNO3 solution with 15% of banana peel extract, pH 9.5 at 35 °C. UV-vis spectrophotometer confirmed the formation of AgNPs which can be seen on absorption peak between 400-420nm. Further characterization of AgNPs was done by using Fourier-transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). Antimicrobial activity against gram positive and gram negative bacteria was also shown. This approach is environmentally friendly and cost-effective. The synthesized nanoparticles exhibit potential applications in various fields.

Keywords: Antimicrobial Agent, Banana Peel Extract, Green Synthesis, Nano Particles, Silver Nano Particles

ACKNOWLEDGMENT

The authors would like to express appreciation for the support of Dcob, Dow University of Health Sciences.

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