

## Photocatalytic Activity of Biosynthesized of Silver Nanoparticles Using Leaf Extract of *Annona glabra*

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Recently metallic nanoparticles were found to possess photocatalytic activity on organic molecules under visible radiation a phenomenon which will be useful in degrading and removing hazardous organic dyes. During this study the photocatalytic activity of *Annona glabra* - AgNPs (bare NPs) and Tween 80-stabilized *Annona glabra* – AgNPs (stabilized NPs) was studied by monitoring the degradation of methylene blue as a model dye. AgNPs were synthesized by incubating the leaf extract of *A. glabra* (2 mL) with silver nitrate (1 mM, 20.00 mL) for 3 hours. The solution was kept under dark conditions with continuous slow agitation. The solution was centrifuged at 6000 rpm for 20 minutes to separate the AgNPs and NPs were washed with water. The synthesized AgNPs were characterized using UV – Visible spectrometer, particle size analyzer, scanning electron microscope. In order to synthesize stabilized AgNPs, biofabricated AgNPs as above were ultrasonicated for 15 mins and added to a solution of Tween 80 (1% w/v, 20.0 mL) and kept stirring for 3 hours. To determine the photocatalytic activity, above prepared AgNPs (25mg/mL, 2.0 mL) were added to a Methylene blue solution ( $1 \times 10^{-5}$  M, 50.0 mL). The suspension was stirred under dark conditions for 30 mins. It was exposed to sunlight under slow agitation. Photodegradation was monitored at 30-minute intervals by withdrawing 5 mL aliquots of AgNP added methylene blue solution. The aliquots were centrifuged, and the absorbance was measured using the UV-Visible spectrophotometer at 665nm for a period of 3 hours.

The AgNPs are spherical in shape and show a characteristic absorbance peak at 417 nm. This peak is due to the surface plasmon resonance of the AgNPs. The average size range of the nanoparticles is 10 – 190 nm. Methylene blue solution with added AgNPs became opaque overtime. Initially, the methylene blue solution with bare AgNPs showed subtle reduction of absorbance of the solution. Then the reduction of absorbance was leveled off near the end of the experiment. The absorbance decreased from 0.985 to 0.796 within a period of 3 hours which is a 19.19% reduction of the initial absorbance of the solution. The opacity of the methylene blue solution with stabilized AgNPs increased only by the end of the experiment. Stabilized AgNPs showed methylene blue degradation with higher efficiency than bare AgNPs. The absorbance of the solution reduced from 1.361 to 0.145 within a period of 3 hours which is an 89.34% reduction of the initial absorbance of the solution.

Both bare and Tween 80-stabilised AgNPs showed photocatalytic activity on the degradation of methylene blue. The Photocatalytic activity was enhanced by the stabilization of biogenic *A. glabra* AgNPs with Tween 80.

Keywords: Photocatalytic activity; silver nanoparticles; Secondary stabilization; *Annona glabra*; Biosynthesis

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