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# Anticariogenic Activity Of Silver Nanoparticles Synthesized Using Fresh Leaves Extract Of Kalanchoe Pinnata

Research Article

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## Abstract

The silver nanoparticles synthesized using herbal plants are widely used much biomedical research area. The plant Kalanchoe pinnata is herbal plant with very good nephroprotective activity and called as miracle plant. In this present investigation we have synthesized silver nanoparticles using fresh plant extract of *Kalanchoe pinnat*a leaves. The synthesized particles were characterized using atomic force microscopy for morphological characters and UV-vis spectroscopy for surface plasmon resonance. The Anticariogenic activity of *Kalanchoe pinnata* mediated silver nanoparticles were tested against *Streptococcus mutans, Staphylococcus aureus, Enterococcus faecalis and Candida albicans*. The peak at 420 nm confirms the silver nanoparticles and zone of inhibition in the microbial plates demonstrate the Anticariogenic activity.

**Keywords:** Silver Nanoparticles; Kalanchoe Pinnata; Green Synthesis; Anticariogenic Activity.

## Introduction

The nanotechnology is the advanced field with applications in various biomedical applications. The nanoparticles are the major element in the nanotechnology and its various research developments [1-4].

Chemical and physical synthesis techniques lead to the presence of some dangerous synthetic species adsorbed on the surface that may have troublesome impacts in clinical applications [5, 6]. In chemical intervened synthesis of nanoparticles, some poisonous substances could be utilized as reducing and stabilizing agent to end the agglomeration. Therefore, researchers in the field of the nanoparticle synthesis have gone to green synthesis method [7, 8].

Metallic nanoparticles have been broadly misused for biomedical application and among them, silver nanoparticles (AgNPs) are profoundly striking. Their natural highlights, for example, optical, electronic, physicochemical and, surface plasmon resonance (SPR); which can be modified by changing the characteristic features of particles, for example, shape, size, aspect ratio, or condition; easy synthesis and functionalization properties have come about to different applications in various fields of biomedicine, for example, detecting, drug delivery, imaging, photothermal and photodynamic theraphy [9-12].

In the present investigation, we have synthesizedsilver nanoparticles using Kalanchoe pinnata plant extract.

## Materials And Methods

The chemicals used in this study such as Silver nitrate, Mueller Hinton agar were purchased from Hi-media laboratories Pvt. Ltd, India.

### Biosynthesis of silver nanoparticles using Kalanchoe pinnata Plant extract

Fresh leaves of Kalanchoe pinnatawere collected from garden in Chennai. The Kalanchoe pinnataleaves were washed thoroughly and removed all the contaminants present on the leaves' skin with soap water followed by deionised water. The washed leaves were crushed finely and mixed in 100mL of distilled water and heated at 80ºC for about 10 minutes using a heating mantle. The extract

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were filtered using No 1 Whattman filter paper and used to synthesize silver nanoparticles, 10mL of Kalanchoe pinnata extract was added into 90mL of 1mM aqueous silver nitrate solution. The reaction mixture was kept in magnetic stirrer for 72 hours. The synthesized nanoparticles were characterized using UV-vis spectrophotometer and atomic force microscope [13].

### Anticariogenic activity

The Anticariogenic activity of silver nanoparticle was determined against oral pathogens like *Streptococcus mutans, staphylococcus aureus, Enterococcus faecalis and candida albicans*.

The agar well diffusion method was used to check the Anticariogenic activity of silver nanoparticlesandamoxiriteas standard, In the100 mL of Muller Hinton agar and 20 mL of rose Bengal agar was prepared and sterilized. Sterilized medium was then poured into 4 petri plates of 180 mm diameter and it was allowed to solidify. Using sterile swab, the prepared bacterial suspension was streaked onto the surface of medium. Four 6 mm diameter wells were then punched using sterile cork borer. The three different concentration of nanoparticles were loaded in the wells. The plates were then incubated at 37°C for 24 hours. After incubation, the plates were observed for zone of inhibition and the diameter of zone of inhibition was measured in mm [14].

## Results and Discussion

### Visual observation

The colour change during nanoparticle synthesis confirms the reducing and stabilizing ability of plant extract [15]. The figure 1 shows the, formation of light yellow to dark brown colour in the reaction mixture could confirm the presence of formation of silver nanoparticles which also denotes the ability of the Kalanchoe pinnata plant extract to reduce silver nitrate into silver nanoparticles.

### UV- Visible Spectroscopy

The UV-Visible spectroscopy was used to characterize the Kalanchoe pinnata mediated silver nanoparticles to find structural properties of silver nanoparticles. The absorbance spectra range from 345 to 445 nm and the reaction time (12h and 24h) of silver nanoparticles as shown in fig 2. The absorption peak of Kalanchoe pinnata intervened silver nanoparticles was obtained at 425 nm which denotes the intense absorption in visible light region. It was states the reduction and stabilization capability of Kalanchoe pinnata extract. The UV results of previous studies such as seems to be concurrent with this study [16-18].

**Figure 1. Visual observation for silver nanopartilces synthesis.**

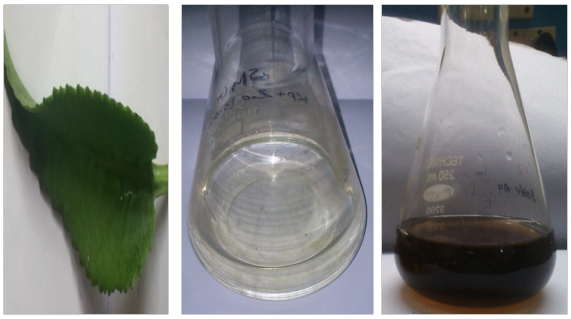


**Figure 2. UV-Visible spectra image of Kalanchoe pinnata mediated silver nanoparticles.**

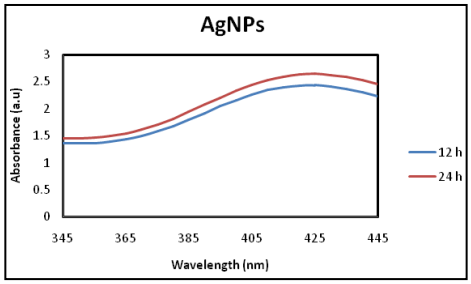



**Figure 3. AFM image of Kalanchoe pinnata mediated silver nanoparticles.**

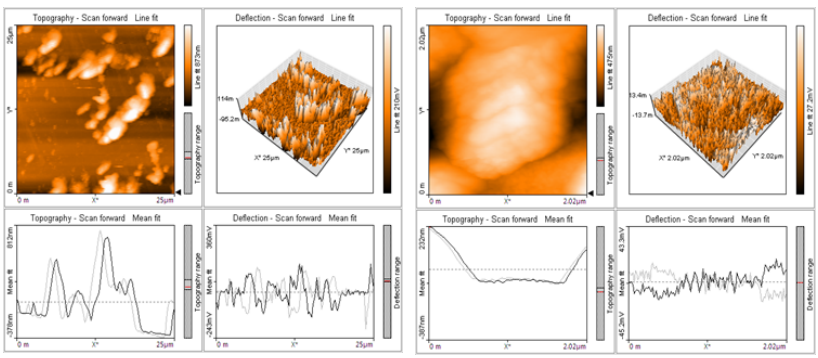
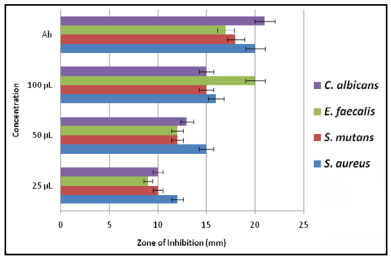


**Figure 4. Anticariogenicactivity of silver nanoparticles.**




### Atomic Force Microscopy

Atomic force microscopy was used to characterize the Kalanchoe pinnatamediated silver nanoparticles in three dimensional form with sub-nanometer resolution. And the corresponding AFM image was shown in Fig 3. The AFM imaging was conducted in 2.02µm and 475nm. The size of the silver nanoparticles as predicted by AFM analysis seems to be in agreement with the SEM results. The obtained AFM results found to be concurrent with the existing works [19].

### Anticariogenic Activity

The figure 4 clearly shows the Anticariogenic activity of silver nanoparticles against Streptococcus mutans, staphylococcus aureus, Enterococcus faecalis and candida albicans. In that, the fungus Candida albicans shows maximum zone of inhibition. The Satphylococcusaureusshows the very god zone of inhibition in bacterial strain. The remaining bacterias like Streptococcus mutans and Enterococcus faecalis shows the moderate zone of inhibition by the plant mediated silver nanoparticles. The silver nanoparticles synthesized using different plant extracts are having killing property against different oral pathogens [20-23].

## Conclusion

In dentistry, oral pathogens are major reason for many oral health complications. The development of advanced medicine to control oral pathogens is very important now a day. In this study we synthesized the silver nanoparticles using herbal plant Kalanchoe pinnata fresh plant extract. It shows very good Anticariogenic activity against three bacterial strains and one fungal strain. Based on this positive result we will use the nanoparticles for the preparation of tooth paste and mouthwash in future.

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