

Characterization of Silver Nano Particles Synthesized by Leaves Green Tea Extract

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Abstract

Background and Objective: Plant extract contain biomolecules which can be reduce metal, ions to nanoparticles in one step synthesis process.. Materials and Methods: green synthesis of silver nanoparticles using aqueous leaves extract of green tea and study the characters of this particles using UV -VIS spectrophotometer and SEM .Also, Investigation the antifungal activity of it. Results : silver nanoparticles were synthesized using leaf extract of green tea in present of silver nitrate and the color change to brown .UV-Vis spectrophotometer appear peak in wavelength at 420nm which is prescribed for silver nanoparticles . the microscope images by SEM, showing the size of Ag nanoparticles in range 3.6-5.3nm.Antifungal activity explain the ability of biosynthesis silver nanoparticles to inhibition the growth of yeast, *C. neoformans* with zone of inhibition 2.7mm compare with leaves extract in diameter 7mm.Conclusion: An extract of leaves green tea at room temperature act as reducing agent and can be used in synthesis of silver nanoparticles which have antifungal activity.

Keywords: *Green synthesis, Nanoparticles, Silver nanoparticles, C. neoformans.*

Introduction

A Nano particle is one of the modern material science, have been developed, making an impact in all fields of human life ⁽¹⁾. Nanoparticles have specific properties such as size, shape, distribution and surface morphology.

These are a noble metals such as gold , silver , iron , zinc , platinum and titanium ,have widely uses in besides medical and pharmaceutical applications ⁽²⁾.Silver nanoparticles have an important roles in many fields .It's been reported that silver nanoparticles are non-toxic and have antimicrobial activity at low concentrations with no side effects ⁽³⁾.

There are many types of methods for synthesis of nanoparticles using chemical and physical agents .These methods involves the usage hazardous solvent and toxic compounds⁽⁴⁾.Several ways have been developed for biological synthesis of nanoparticles from salts of corresponding metals ^(5,6). Thus this study used a simple, effective, and low cost and co-friendly way for

silver nanoparticles synthesis, using leaves extract of green tea.

Materials and Methods

Fungal Strain: *Cryptococcus neoformans* which obtain from laboratory of AL-Diwaniyah hospital that isolated from patient with meningitis and diagnostic by specialist.

Synthesis of Silver Nanoparticles

About 2 g. of leaves tea put in beaker containing 20ml of DW .the mixture was thoroughly agitated overnight using a magnetic stirrer .then the mixture was filtered to obtain brown liquor .The liquor was centrifuged and again filtered to remove the impurities.

1M of AgNO₃ solution was prepared in DW. Silver nanoparticles was prepared by mixed 0.2 ml of AgNO₃ solution ,0.1 ml of tea extract and 3.7 ml DW .Then it was kept overnight in dark to stabilize .Change in color was observed on the next day⁽⁷⁾

Optical Analysis

Optical characters of the synthesized silver nanoparticles and AgNO_3 were studied by analyzing the UV-Vis specter using spectrophotometer at room temperature^(8, 9)

Scanning Electron Microscopy (SEM)

Scanning Electron Microscopy (SEM) technique was used for measuring nanoparticle size of silver.

Antifungal Activity

The Antifungal activity of the extracts was carried out by disc diffusion method⁽⁷⁾ Circular discs of 5 mm diameter were made from the What man No.1 filter paper and sterilized by autoclaving at 15lb/inch² for 15 minutes. The sterile discs were impregnated with equal volume (100µg/ml) of tea leaf extracts and silver nanoparticles The discs containing each of 25µl samples were

aseptically placed on plates containing SDA medium after being spreaded with each of the test pathogens, . The plates were incubated at 37 °C for 24 hours and the zone of inhibition was measured (in mm diameter).

Results and Discussion

Synthesis of Silver Nanoparticles

Results showed that the silver nanoparticles were synthesized by using leaf extract of green tea from silver nitrate. The change in color from yellow to brown in mixture of reaction after 24h indicated the reduction in Ag^+ to Ag^0 fig(1). These color changes arise because of the excitation of surface Plasmon vibrations with the silver nanoparticles⁽¹⁰⁾. .Li⁽¹¹⁾ reported that producing of nanoparticles by plant extracts with solution of the metal salt at room temperature complete in few minutes.

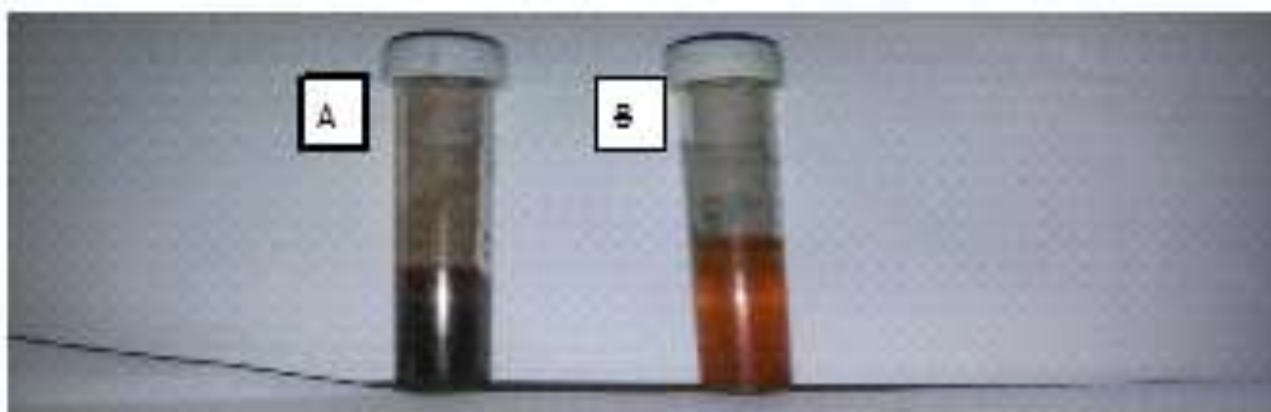


Fig.1: (A) aqueous of leaf tea extract, (B) synthesized Ag Nps

U-V-Vis Spectroscopy

The results of UV spectroscopy were obtained from this test shown in Fig (2, 3),its represented the UV-vis spectrum of the silver nanoparticles sample, and AgNO_3 Respectively .The absorption peak obtained for these samples are in rang of 400- 420 nm for silver nanoparticles .This results

emphasizes the existence of silver nanoparticles in the solution .This results coordinated with Birla⁽¹⁰⁾ that found the wavelength of silver nanoparticles in rang 400-430 nm. Also, the absorbance in the range of 420-450 nm has been used as an indicator to the reduction of Ag^+ to metallic Ag ⁽¹²⁾.

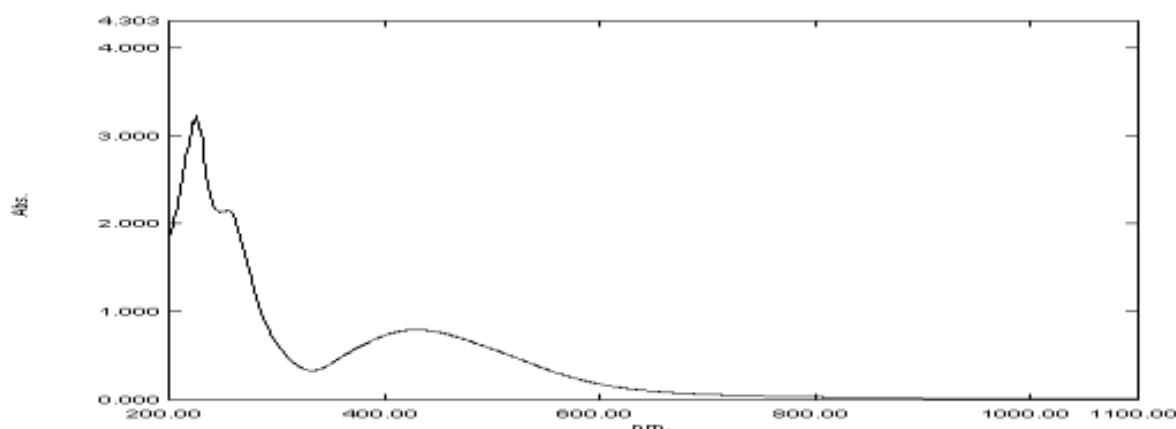


Fig.2: VIS absorption spectra of Ag nanoparticles

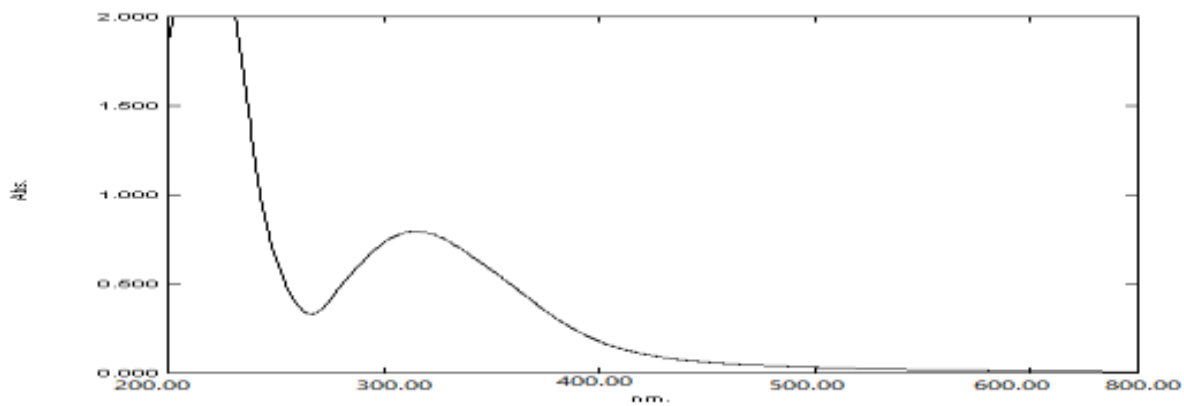


Fig.3: VIS absorption spectra of AgNO₃

SEM Images

The results by SEM show in Fig.(4,5,6) ,and this results indicated the present of silver nanoparticles with varies size ranging 3.6-

5.3 nm. The images show that most of the particles are spherical in shape with a smooth surface

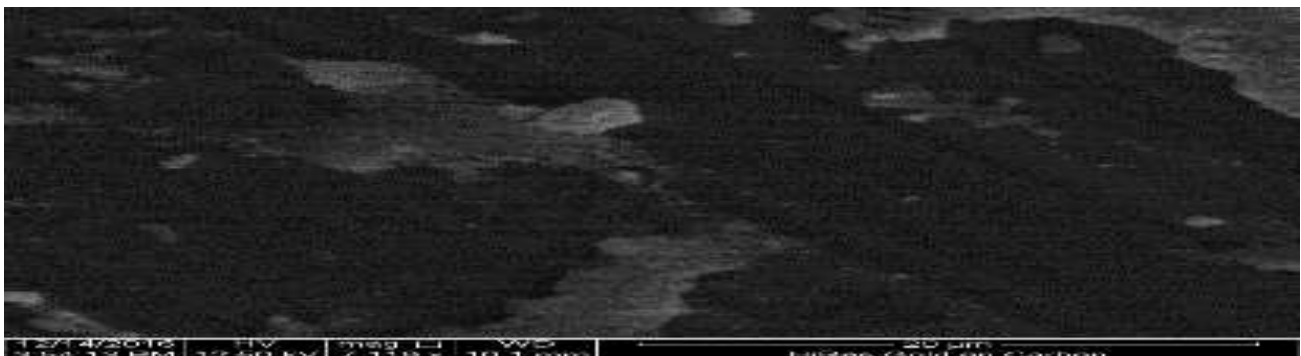


Fig.4: SEM sections of the biosynthesis of AgNps with average size (3.6nm)

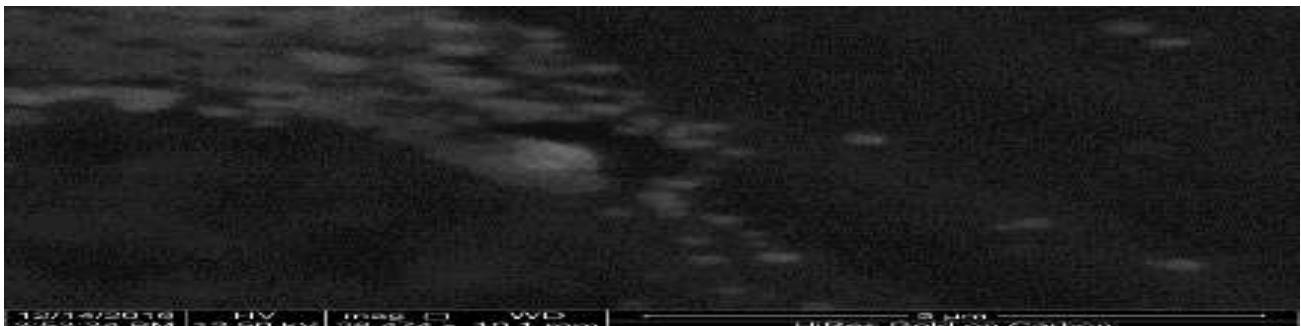


Fig.5: ESM sections of the biosynthesis of AgNps with average size (2.7nm)

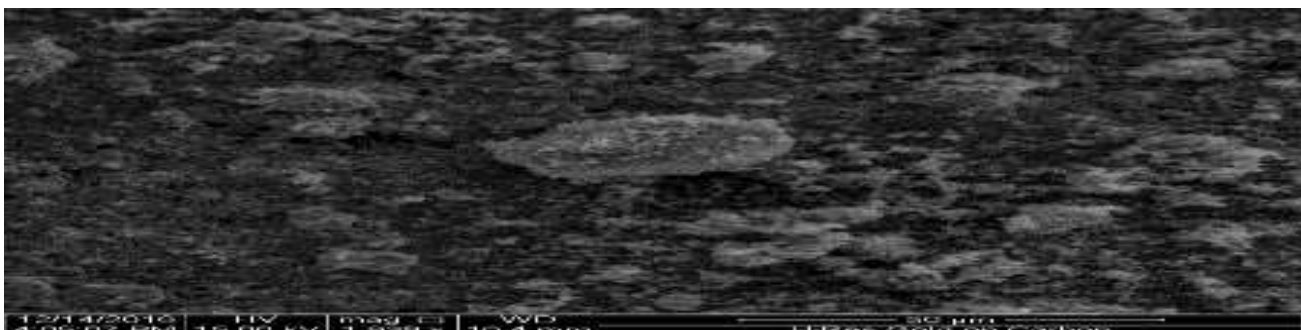


Fig.6: ESM sections of the biosynthesis of AgNps with average size (5.3nm)

The present study has shown that the leaf extract of green tea has the capability of reducing Ag from respective ion sources. This agreement with many study that green synthesis of Ag Nps from leaf extract of plant, Babu ⁽¹³⁾ synthesized 35 nm silver

nanoparticles using a flower extract of *Calotropisprocera*. Kouvaris ⁽¹⁴⁾ used a leaf extract of *Arbutus uredo* to produce nanoparticles with a narrow size distribution. Baskaralingam ⁽¹⁵⁾ used a leaf

extract of *Calotropis gigantea* to produce silver nanoparticles.

Antifungal Activity

The antifungal effect of biologically silver nanoparticles was investigated against *Cryptococcus neoformans*, that causing many types of infections, by disc diffusion method. Growth inhibition of the yeast by silver nanoparticles was compared with An aqueous extract of leaf green tea.

Results showed that the green synthetic Ag nanoparticles had effect on *C. neoformans* with rate of inhibition zone 7mm. Fig.(7,8).and Size and shape of nanoparticles are more effect on the antifungal activity.^(17,18) While the results of this study agreement with⁽¹⁹⁾ that reported the Ag Nps inhibition of the forming of conidia in *italic pleise*.

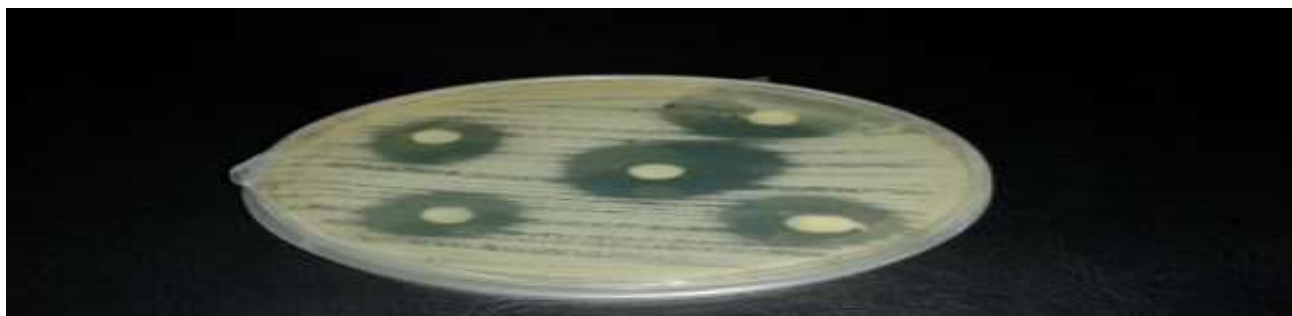


Fig.7: Effect of biosynthesis of Ag Nps on *C.neoformans*



Fig.8: Effect of biosynthesis of Ag Nps on *C.neoformans*1: An aqueous extract of leaf green tea 2: biosynthesis AgNPs

The reason in the inhibitory affects of silver nanoparticles its wide surface area for size and this lead to reaction of this particle with cell wall of microbe to make an imbalance in the cellular permeability ⁽²⁰⁾.

Conclusions

-Silver nanoparticles are produced by reduction of silver ions, in this study leaf extract of green tea was used as reduced agent. The biosynthesis method considers an easily, eco-friendly and Cost effective for prepare nanoparticles. Also, UV-

spectrophotometer and SEM technique are usefully for identification of biosynthesis Ag nanoparticles. Ag nanoparticles which were synthesized by aqueous leaves extract in present silver nitrate have effective for reducing the growth of yeast, *italic pleise*.

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