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Original Research Paper

Green Synthesis of Silver Nanoparticles Using Cinnamomum Verum Leaves and its Antimicrobial Activity

Biological Science

KEYWORDS : Cinnamomum verum, Silver nanoparticles, Silver nitrate, Plant extract, UV spectrophotometer.

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ABSTRACT

The evolution of nanotechnology and the production of nanomedicine from various sources had proven to be of intense value in the field of biomedicine. The smaller size of nanoparticles is gaining importance in research for the treatment of various diseases. Moreover the production of nanoparticles is eco-friendly and cost effective In the present study, amalgamation of silver nanoparticles (AgNPs) or (Green-Silver) has been exhibited utilizing concentrates of Cinnamomum verum diminishing fluid silver nitrate. The AgNPs were characterized by Ultraviolet-Visible (UV-vis) Spectrometer. The reaction process was simple for formation of silver nanoparticles. This work proved the capability of using biomaterial towards the synthesis of silver nanoparticle and effectiveness of animicrobial properties

INTRODUCTION

As of now, manageability activities that utilization green science to enhance and/or ensure our worldwide surroundings are central issues in numerous fields of examination. The improvement of expense productive and naturally considerate techniques for union of nanomaterials still remains an experimental test as metal nanoparticles are useful in different reactant applications, via gadgets, science and biomedical applications, material science, material science, natural remediation fields. It is no doubt understood that the lethality of nanomaterials basically relies on upon the auxiliary highlights, for example, size, shape, piece and the surface science. To draw out the life compass of metal nanoparticles it is fundamental to choose balancing out specialists and pathways that are earth amicable, non lethal and simple to implement. Novel techniques for in a perfect world integrating NPs are therefore being thought which are shaped at encompassing temperatures, unbiased pH, low expenses and naturally cordial design. Keeping these objectives in perspective nanomaterials have been combined utilizing different courses. Among the natural choices, plants and plant concentrates appear to be the best choice. Plants are nature's "substance factories". They are expense proficient and oblige practically zero upkeep. An unfathomable collection of optional metabolites is found in all plants which have redox limit and can be misused for biosynthesis of nanoparticles. As an extensive variety of metabolites are displayed in the plant items/removes, nanoparticles delivered by plants are steadier and the rate of combination is quicker in comparison to microorganisms. Hence, the benefits of utilizing plant and plant-determined materials for biosynthesis of metal nanoparticles have induced scientists to investigate instruments of metal particles uptake and bioreduction by plants, and to comprehend the conceivable component of metal nanoparticles arrangement in and by the plants. Cinnamomum verum is an unarmed, reasonably measured to expansive deciduous tree with a straight trunk. It is wide spreading with various branches shaping a vast shady crown, accomplishes a stature of 30 m or more and a measurement of up to 4.5 m. Bark smooth, pale ashy-dark or dim to yellow with dark patches and prominent corky round lenticels. Inside surface of bark quickly transforms chestnut on introduction and sheds into thick woody plates or scurfy chips. Blast light orange and mottled with darker orange shading. Leaves inverse decussate, for the most part rather delicate and limp; petioles tube shaped, 5-15 cm long, puberulent or glabrous; leaf cutting edges extensively praise, 10-25 cm x 7-20 cm wide, apically long sharpen or caudate, whole on experienced plants however emphatically toothed or lobed on youthful plants, generally cordate or truncate basally, with a short cuneate lessening into the petiole, thickly tomentose above when youthful, getting to be glabrous above when experienced, forever thickly fulvulous-tomentellous with stellate hairs underneath, glanduliferous simply over the petiole on the basal constriction. It can be inferred that the concentrates Cinnamomum verum of have antibacterial, cancer prevention agent and antidiabetic exercises. In this correspondence we report a green system for the blend of silver nanopar- tickles at room temperature by utilizing plant concentrates of Cinnamomum verum as lessening/ balancing out operators and the likely component for the arrangement of NPs.

CHEMICALS/MATERIALS REQUIRED

Silver nitrate(AgNO3)
Deionized water
Brain heart infusion agar
Cinnamomum verum leaves
Filter paper
Glassware: Petriplates, Conical flasks, thermometer etc.
Micropipette along with tips.

METHODS

Preparation of leaf extract:

Cinnamomum verum leaves were collected from Belagavi, Karnataka, India. The leaves were washed several times with distilled water to remove dust particles. The extract was prepared by placing 20g of washed dried fine cut leaves in 250ml glass beaker along with 100ml of sterile distilled water. The mixture was then boiled for 20min until the colour of the aqueous solution changes from watery to light yellow. The extract was cooled at room temperature and filtered by whattman filter paper, then the extract

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was stored in a room temperature in order to use for further characterizations.

Preparation of $AgNO_3$
Preparation of silver nitrate nanoparticles:
For the synthesis of nanoparticles 100mL Cinnamomum verum extract was taken and boiled at 60 to 80°C by using hot water bath. Then 20gm of Silver nitrate is added to solution as the temperature reached at 60° C this mixture was then boiled until solution became turbid with brown precipitation of particles. This solution collected and centrifuged at 17000rpm for 20min at 4°C using ultracentrifugation.

Characterization of silver nanoparticles
The UV spectrophotometer was carried out in the wavelength range of 200-800nm in reflectance mode.

Antimicrobial Assay
The antimicrobial activity of the prepared silver nanoparticles was tested against human pathogenic bacteria. The test was performed by well diffusion method against Staphylococcus aureus and Candida albican. The 5.2gm agar was weighed and dissolved in 100ml of Distilled water and then autoclaved t 15psi for 30mins. The media on slight cooling was poured into sterile petriplate and allowed to solidify. The synthesized NPs were tested against two bacterial strains.

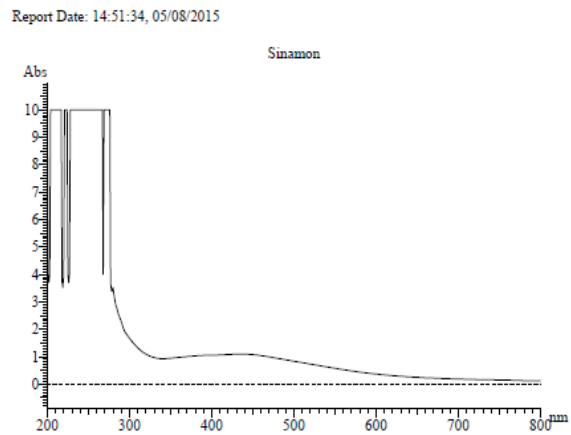
Inoculum preparation
Colony from stock culture was cultured into normal saline and adjusted to 0.5Mc Farmlands standard. 25µl of the culture was added to the culture plate and spread over the plate using sterile cotton swab. Well was prepared in the center of the plate using borer. 100µl of synthesized Silver Nps solution was added to the well and kept for incubation t 37°C in bacteriological incubation for 24hrs. After the incubation the one of incubation were measured in mm and the inhibitory activity of the test compound was determined.

RESULTS
Preparation of silver nitrate nanoparticles

(b)

Figure 1: Cinnamomum verum extract after addition of Silver nitrate (a) before incubation (b) After incubation solution became turbid with brown precipitation of nanoparticles

UV spectrophotometer analysis
Reduction of silver ions into silver nanoparticles during exposure to plant extract was observed as result of the colour change. The colour change is due to the surface Plasmon Resonance phenomenon. The metal nanoparticles have free electrons, which give the SPR absorption band, due to the combined vibration of electrons of metal nanoparticles in resonance with light wave. The sharp band of silver nanoparticles was observed round 437nm in case of Cinnamomum verum (Fig 2).



Sample: Sinamon
File name: DEMO1842.UDS
Run Date: 14:49:23, 05/08/2015
Operator: Acer
Comment:

Instrument
Model: U-2800 Spectrophotometer
Serial Number: 00000-00000
ROM Version: 2512 01
Option: Silver nanoparticles

Instrument Parameters

Measurement Type:	Wavelength Scan
Data Mode:	Abs
Starting Wavelength:	800.0 nm
Ending Wavelength:	200.0 nm
Scan Speed:	400 nm/min
Sampling Interval:	1.0 nm
Slit Width:	1.00 nm
Lamp change mode:	Auto
Auto change wavelength:	340.0 nm
Baseline Correction:	User 1
Response:	Medium
Path Length:	10.0 mm

(Abs values are corrected to 10 mm path length)

Peak Integration

Method:	Rectangular
Sensitivity:	1
Threshold:	0.0100

Peaks

Peak #	Start (nm)	Apex (nm)	End (nm)	Height (Abs)	Area (Abs*nm)
1	800.0	437.0	343.0	1.093	258.515
2	343.0	274.0	219.0	10.000	652.071

Figure 2: UV-DRS spectrum nanoparticles synthesized using Cinnamomum verum leaf extract.

Antimicrobial Assay
The antimicrobial activity of Silver nanoparticles was investigated on both gram positive and gram negative bacteria by one inhibition method. The results of one inhibition method re depicted in figure 3& 4. The diameter of inhibition zone (mm) around each well with silver nanoparticles solution is as follow in the table. The positive control showed activity against Staphylococcus aureus and Candida albican microbial strains tested. The antibacterial activity of silver nanoparticles depends on size; the smaller the size, the better is the antibacterial activity. We suppose that the silver nanoparticles formed in this experiment have good antibacterial activity.

Sno.	Name of organism	Zone of inhibition (mm)
1.	Staphylococcus aureus	12,13
2.	Candida albican	26,27

Figure 3: antibacterial activity of silver nanoparticles against Staphylococcus aureus and Candida albican

CONCLUSION

The rapid biologic synthesis of silver nanoparticles using Cinnamomum verum leaves extract provided environmental friendly, simple and efficient route for synthesis of nanoparticles. We used the extract of leaves of Cinnamomum verum as reducing and capping gent. By this method of preparation, the problem of environmental pollution was avoided. The optical absorption spectrum of silver nanoparticles was synthesized by using Cinnamomum verum extract. The sample has clear and strongly observed absorption peak below 473nm.These nanoparticles showed antibacterial activity against Staphylococcus aureus and Candida albican. A long term research is required to overcome these limitations and implement this procedure for large scale production.

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