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Characterization of Silver nanoparticles synthesized from Curculigo orchioides extract using UV vis spectroscopy

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ABSTRACT

Background: Silver nanoparticles (AgNPs) are the most broadly used nanomaterials[1,2]. Up to this point silver in the form of metal, metal–protein complexes, and salts has been utilised in medicine mostly as a component of antibacterial drugs.One of the fields in which nanotechnology finds broad applications for nanomedicine, a rising new field which is an outcome of a combination of nanotechnology and medicine. Nanotechnology can improve our understanding of the living cells and molecular level interactions

Aim: To observe the characterisation of silver nanoparticles using Curculigo orchioides using UV visual spectroscopy

Materials and methods: The material of study is Curculigo orchioides extract which is prepared in the laboratory. Then the silver nanoparticles are synthesized and subjected to characterisation assay.

Results and discussion: The results are obtained from the laboratory and the reports are analysed.The images of the extract before and after UV exposure are obtained and the required data are recorded.It was observed that solution of silver nitrate turned brown in addition to seed extract.This shows the formation of Ag NPs.

Conclusion: Scanning electron microscope image of Silver synthesised by Curculigo orchioides extract. The image clearly indicates the particle size range of our nanoparticles to be within 84.5 nm

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INTRODUCTION

Silver nanoparticles (AgNPs) are the most broadly used nanomaterials[1,2]. Up to this point silver in the form of metal, metal–protein complexes, and salts has been utilised in medicine mostly as a component of antibacterial drugs (for example, collargol, protargol, silver nitrate, silver sulfadiazine) with a wide range of antimicrobial activity[3,4]. Nanotechnology is one of the fastest developing areas of manufacturing nanoparticles in current days. Numerous analysts have seen biosynthesis of nanoparticles and their applications in catalysis, chemical sensing, bio-sensing, photonic, electronics, area of medicine and drug delivery[5-10]. One of the fields in which nanotechnology finds broad applications for nanomedicine, a rising new field which is an outcome of a combination of nanotechnology and medicine. Nanotechnology can improve our understanding of the living cells and molecular level interactions[11]. Nanoparticles can be synthesized by using different strategies including physical, chemical, and biological methods. Although chemical method of synthesis take short period of time for synthesis of nanoparticles in larger quantity, ecological nontoxic synthetic for nanoparticles synthesis leads to developing enthusiasm in biological approaches, which are free from the utilisation of toxic chemicals as a by-product[12]. Many biological approaches for intracellular and extracellular nanoparticle synthesis have been accounted till date using microorganisms including plants, fungi and bacteria. Plants have been giving a superior stage to blend nanoparticles, they are free from toxic chemicals and providing a natural capping agents[13].Various plant extract mediated synthesis of AgNPs have been reported in the literature[14].

MATERIALS AND METHODS

Collection and Preparation of Curculigo orchioides extract:

Curculigo orchioides were collected from Chennai. The collected seeds were
washed 3-4 times using distilled water. Then dried it in shade for 7-14 days. The well dried seeds were made into a powder by using mortar and pestle. The collected powder was stored in an airtight container. One gram of Curculigo orchioides powder was dissolved in distilled water and boiled for 5-10 minutes at 60-70 degrees. The solution was filtered by using Whattman no.1 filter paper. The filtered extract was collected and stored in 4 degrees for further use.

Synthesis of Ag Nanoparticles:

1 milli molar of Silver nitrate dissolved in 90 ml of double distilled water . The seed extracts of avocado were added with the metal solution and was made into a 100 ml solution. The colour change was observed visually and photographed. The solution is kept in a magnetic stirrer for nanoparticles synthesis.

Characterization Of Silver Nanoparticles:

The synthesised nanoparticles solution is preliminarily characterised by using UV-vis-spectroscopy spectroscopy 3 ml of the solution is taken in the cuvette and scanned in double beam UV vis spectrophotometer from 300 nm to 700 nm wavelength. The results were recorded for the graphical analysis.

Preparation of Nanoparticles powder:

The nanoparticles solution is centrifuged using lark refrigerated centrifuge. The silver nanoparticles solution is centrifuged at 8000 rpm for 10 minutes and the pellet is collected and washed with distilled water twice. The final purified pellet is collected and dried at 100-150 degrees for 2/24 hours and finally the nanoparticles powder is collected and stored in airtight eppendorf tube.

Inhibition of albumin denaturation assay:

BSA(Bovine Serum Albumin) was used as a reagent for the assay. Bovine serum albumin (BSA) makes up approximately 60% of all proteins in animal serum. Its commonly used in culture, particularly when protein supplementation is necessary and the other components of serum are unwanted. BSA undergoes denaturation upon heating and starts expressing antigens associated with Type III hypersensitivity reaction which are related to disease such as rheumatoid arthritis, glomerulonephritis, serum sickness and systemic lupus erythematosus.

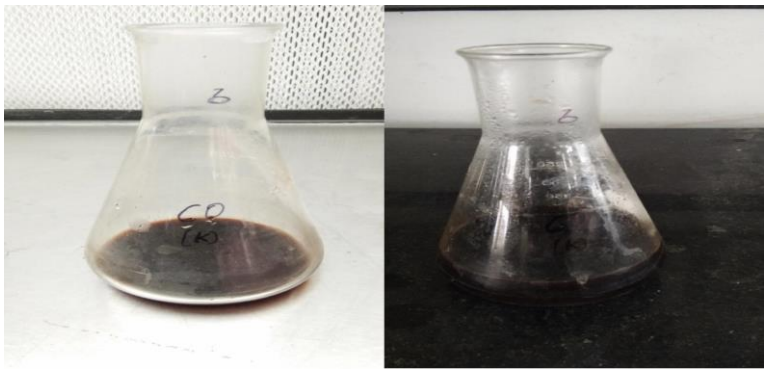
a 2ml of 1% Bovine albumin fraction was mixed with 400 microliter of plant crude extract in different concentrations (500-100 micro g/mL) and the pH of the reaction mixture was adjusted to 6.8 using 1N HCl. The reaction mixture was incubated at room temperature for 20 minutes and then heated at 55oC for 20 min in a water bath. The mixture was cooled to room temperature and the absorbance value was recorded at 660 nm. An equal amount of plant extract was replaced with DMSO for control. Diclofenac sodium in different concentrations was used as standards. The experiment was performed in triplicate.

% Inhibition was calculated using the formulae:

% Inhibition = Control O.D – sample O.D/Control O.D

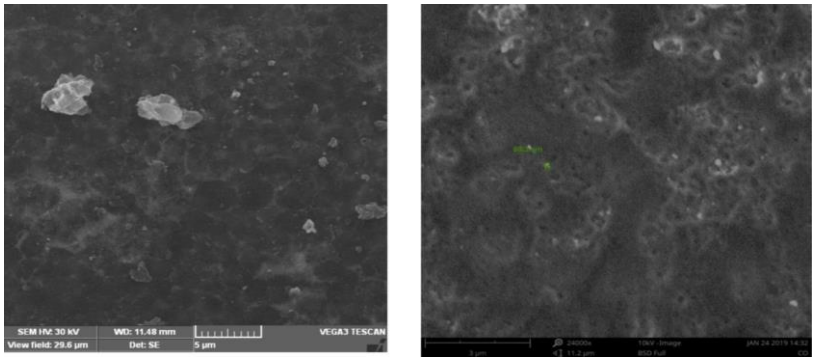
RESULTS AND DISCUSSION

Visual observation



Before UV exposure. **After UV exposure**

Characterization

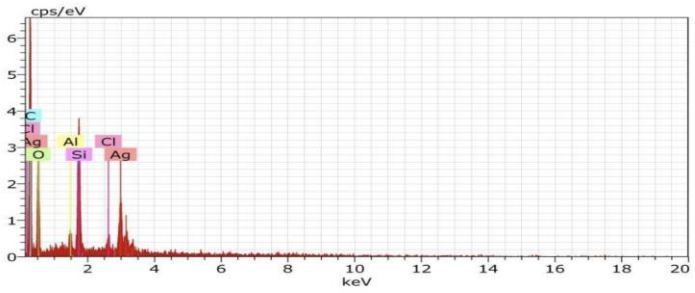


Scanning electron microscope image of Silver synthesised by Curculigo orchioides extract. The image clearly indicates the particle size range of our nanoparticles to be within 84.5 nm.

DISCUSSION

The formation of silver nanoparticles using seed extract of Avocado was viewed by the colour change from yellow to dark brown. UV-Visible spectrum the maximum absorbance peak for avocado was observed at 440 nm. [18]. FT-IR analysis confirmed that the bioreduction of Ag+ ions to silver nanoparticles is due to the reduction by seed extract[19]. The average size of silver nanoparticles synthesized by Avocado was found to be about 35.6 nm[20].Further studies can be carried out on the effect of synthesized nanoparticles in wound healing and also in the field of medicine.

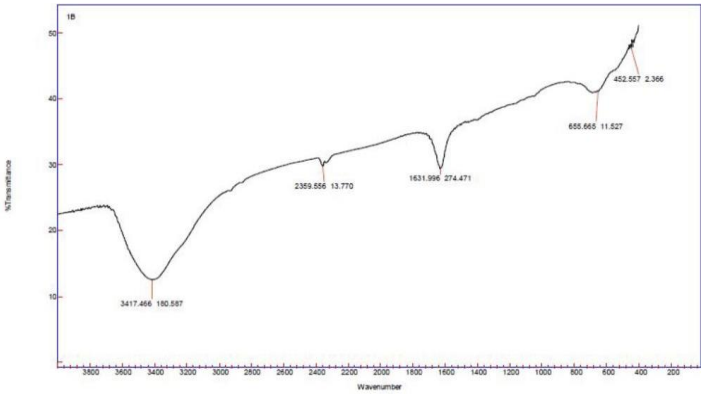
EDX



Spectrum: training

El	AN	Series	unn. C [wt.%]	norm. C [wt.%]	Atom. C [at.%]	Error (1 Sigma) [wt.%]
C	6	K-series	37.39	47.93	61.50	8.61
O	8	K-series	26.44	33.90	32.65	6.14
Ag	47	L-series	7.76	9.95	1.42	0.48
Si	14	K-series	5.00	6.41	3.52	0.30
Al	13	K-series	0.74	0.95	0.54	0.10
Cl	17	K-series	0.67	0.86	0.37	0.28
		Total:	78.00	100.00	100.00	

FTIR



RESULT

The extracellular silver nanoparticle synthesis occurred during the exposure of seed extract of to 5mM aqueous silver nitrate solution. The complete reduction of silver ions was noticed immediately. The change in dark brownish color of the reaction mixture was noticed during the incubation period because of the development of silver nanoparticles. The impression of this dark brownish colour definitely affirms the formation of silver nanoparticles succeeding addition of the seed extract.The synthesised silver nanoparticles was noticed by recording the absorption spectra at a wavelength ranges of 350 to 550nm.It was observed that solution of silver nitrate turned brown on addition of seed extract.This shows the formation of Ag NPs.

CONCLUSION

Scanning electron microscope image of Silver synthesised by Curculigo orchioides extract. The image clearly indicates the particle size range of our nanoparticles to be within 84.5 nm

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