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GREEN SYNTHESIS OF SILVER NANO PARTICLES

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ABSTRACT

The research was carried out to investigate the synthesis of silver nano particles. The silver nano particles have wide tremendous application in the therapeutics, antimicrobials, diagnostics, catalysis, micro-electronics and high sensitivity biomolecular detection. Silver nano particles grow in a single-step method, at room temperature, and with no addition of external energy. The silver nanoparticles were synthesized from silver nitrate aqueous solution through a simple, eco-friendly and cost effective course using the leaf broth of the Oscimum sanctum, Azadirachta indica and Lawsonia Inermis (kadvi mehndi), therefore calling it green synthesis.
The Synthesized AgNP was confirmed by sampling the aqueous component at different time intervals and the absorption maxima was scanned by UV-Vis spectrometry and Particle Size Distribution (PSD). Based on PSD, the particles were further characterized by Scanning Electron Microscope. Synthesized AgNP was confirmed at 531,540and 543 nm. Among the total percentage of size distribution, D-50 value, which is 50% size distribution, was taken into consideration, where the size of the nanoparticle was established to 0.135µm. Further research is going on with reference to the synthesized nanoparticles.

Keywords:
Nanoparticles, Therapeutics, Micro- electronics, Green synthesis, UV-Vis spectrometry, Particle Size Distribution.

INTRODUCTION

Nanotechnology includes developing and changing organic and inorganic matter at the nanoscale. It provides us with designing nanomaterials; materials with physical, chemical and biological properties controlled by defined molecular structures and dynamics. Nanobiotechnology and their derived products are unique not only in their treatment methodology but also due to their uniqueness in particle size, physical, chemical, biochemical properties and broad range of application as well. [3]
Nano particles are the very small structures of the element which vary in their size with their transformed properties. the synthesis of metal nano particles is an important topic of research in material science due to their potential applications in the field of electronic, magnetic, optoelectronic, information storage and drug delivery.

In **environmental provisions**, there is a necessity to build up the environmental friendly measures to avoid the toxic chemicals in the synthesis procedures to avoid adverse effect in medical applications. The chemically synthesized nanoparticles may also penetrate inside the cell causing

damage by interacting with phosphorus- and sulfur containing compounds such as DNA and protein.[5]. So, the silver nanoparticles obtained by the green synthesis method are candidates to be used in biological systems. [2]

Ocimum sanctum (local name *Tulasi*) is a traditional medicinal plant of India has source of bio-reductant and stabilizers. It has been reported to contain alkaloids, glycosides, tannins, saponins and aromatic compounds [7]. Keeping this in mind, we had taken the leaf extracts of kadvi mehndi, tulsi and neem.

MATERIALS AND METHODOLOGY

PREPERATION OF 1MM $AGNO_3$

1 mM AgNO3 was prepared from analytical grade provided by Merck, Germany. [7]

PREPERATION OF LEAF EXTRACT BROTH

Fresh Tulsi *Ocimum, Neem and Kadavi mehndi (Lawsomia) leaves* were collected from garden located in Rajkot. They were weighed 20g and washed with glass distilled water, finely cut leaves in 500 ml Erlenmeyer flask along with 100 ml of distilled water, boiled for 5minutes and filtered with Whatman No. 1 filter paper and stored at 4°C and used for further experiments.

SYNTHESIS OF SILVER NANO PARTICLES

In the experiment, the leaf extract (1ml) was added to 9 ml of 1 mM AgNO3 aqueous solution. And then the absorption maxima was recorded using UV-Visual spectrophotometer at intervals of 0min, 15 min, 30 min, 45 min, 60 min and 24 h.

UV Vis SPECTROPHOMETRY

Synthesize AgNP was confirmed by sampling the aqueous component of different time intervals and the absorption maxima was scanned by UV-Vis spectrophotometer at the wavelength of 250 – 600 nm on CHEMILINE CL -1320 spectrophotometer.

PARTICLE SIZE DISTRIBUTION

Colloidal Silver Nano particles synthesized with green leaf extract were further characterized for Particle Size Distribution using Particle Size Analyzer of Microtrac-Model S3500, Junagadh Agriculture Uni, Junagadh. The size distribution is determined based on the dynamic scattering of red laser having wavelength 750 nm. The light is scattered due to Brownian motion of the colloidal Silver Nanoparticles. Among the total percentage of size distribution, D-50 value, which is 50% size distribution, was taken into consideration.

ESTIMATION OF ANTIBACTERIAL ACTIVITY (Ref Shameli, 2012)

The antibacterial activities of the Ag NPs synthesized was assessed against Gram negative *E. coli*, Enterobacter, Proteus and Salmonella Spps. as test microorganisms by standard Agar Ditch and Agar Cup Method. In each N-agar plate the ditch was filled with respective leaf extract Ag NP and pathogens were single line streaked against ditch. In agar cup plates, N-agar, (molten agar) was inoculated with pathogen and then cups were filled with 0.1ml of leaf extract AgNP. The plates were incubated at 37°C for 24 to 48 h. Next day the zone of inhibition were observed, measured and recorded.

RESULTS AND DISCUSSION

The silver nanoparticles were confirmed primarily by the change in colour after mixing leaf extract and $AgNO_3$ together for different time intervals. [2] The colour changes from dark green to shades of pink to purplish pink. It was further confirmed by UV Vis spectrophotometer, at absorption peak at 293, 296 and 299 nm as shown in Fig.1 [2], [7], [4].

Particle size distribution was carried out and PSD 50% shown 0.1350 um as per Table.1.

Anti-bacterial activity by synthesized AgNPs with pathogenic E.coli, Enterobacter, Salmonella and Proteus was done by agar cup and agar ditch method exhibited considerable size of inhibition zone.

Table 1: Particle Size Distribution

Summary	Percentiles

Data	Value	%Tile	Size(um)
MV(um):	27.26	10.00	0.1110
MN(um):	0.1230	20.00	0.1180
MA(um):	0.1800	30.00	0.1240
CS:	33.24	40.00	0.1300
SD:	60.48	50.00	0.1350
		60.00	0.1430
Mz:	40.44	70.00	0.358
□□□	51.63	80.00	36.17
Ski:	1.000	90.00	132.8
Kg:	32.69	95.00	141.3

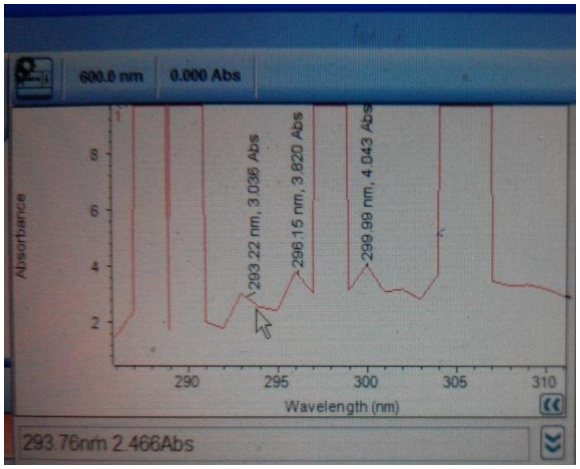

Figure1: UV-Vis spectrophotometry Graph.

CONCLUSION

The green synthesis of AgNP with the extracts of three plants was carried out from which only Neem extract showed satisfactory result and it could synthesis AgNP. Colour change was the preliminary criteria for further investigation for the properties of Ag NP. Particle size distribution showed 135 **nm** size. UV Vis spectrophotometry showed peak in the range of 293 -299 nm for AgNP. Ag NP exhibited inhibitory effect on *Ecoli, E.aerogens,Salmonella paratyphi* B and Proteus spps.

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REFERENCES

*1. Asmita J. Gavhane1, P. Padmanabhan2, Suresh P. Kamble*1 And Suresh N. Jangle, Synthesis Of Silver Nanoparticles Using Extract Of Neem Leaf And Triphala And Evaluation Of Their Antimicrobial Activities, Int J Pharm Bio Sci 2012 July; 3(3): P 88 – 100*

*2. Ericka Rodriguez-Leon et al ,2013 Nanoscle Research Letters 2013 "Synthesis of silver nanoparticles using reducing agents obtained from natural sources (Rumex hymenosepalus extract)",**8** :318*

3. Priya Banerjee et al 2014 Bioresources and Bioprocessing 2014, "Leaf extract mediated green synthesis of silver nanoparticles from widely available Indian plants:
*synthesis, characterization, antimicrobial property and toxicity analysis" **1**:3*

*4. Kamyar Shameli et al , 2012 Cheistry Central Journal 2012, "Investigation of antibacterial properties silver nanoparticles prepared via green method". **6**:73*

5. Yogeswahri Rout et al, 2012 Jour of Microbiology and Antimicrobials Vol.4(6),pp.103-109

6. Abishek Mathur et alpelagiaResearch Library, Der Pharmacia Sinica,2014, "Green synthesis of silver nanoparticles using medicinal plant and its Characterization", ,2014 5(5): 118-122

7. K. Mallikarjuna et al, 2011 Digest Jour of Nanomaterils and Biostructures Vol.6,No 1, "Green Synthesis Of Silver Nanoparticles Using Ocimum Leaf Extract And Their Characterization" p.181-186