IJPSR (2013), Vol. 4, Issue 8 **(Research Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 11 April, 2013; received in revised form, 14 May, 2013; accepted, 17 July, 2013; published, 01 August, 2013

GREEN SYNTHESIS OF PLANT-MEDIATED SILVER NANOPARTICLES USING *MANGIFERA INDICA* AND *SYZYGIUM CUMINI* LEAF EXTRACT

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Keywords:

Nanotechnology, Silver Nanoparticles, *Mangifera Indica*, *Syzygium cumini*

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ABSTRACT: Nanoparticles of silver (Ag-NPs) have received tremendous research attention for their widespread applications in recent times. The most significant one is their antibacterial properties for which they have been used from food storage to medical supplies. The present study describes a novel green synthesis of silver nanoparticles by using *Mangifera Indica* and *Syzygium cumini* leaf extract. The green synthesized silver nanoparticles had been confirmed by UV-Vis spectrum of the reaction media. The UV-Vis spectrum of green synthesized silver from *Mangifera Indica* and *Syzygium cumini* have maximum absorbance peaks at 370 and 350 respectively. The Based on the findings, it seems very reasonable to believe that this greener way of synthesizing silver nanoparticles is not just an environmentally viable technique but it also opens up scope to improve their antibacterial properties.

INTRODUCTION: Nanotechnology involves the production, manipulation and use of materials ranging in size from less than a micron to that of individual atoms. The synthesis and assembly of nanoparticles would benefit from the development of clean, nontoxic and environmentally acceptable ‘‘green chemistry’’ procedures, probably involving organisms ranging from bacteria to fungi and even plants [1]. The Aloe vera leaf extract as a reducing agent for the synthesis of gold nanotriangles as well as silver nanoparticles was obtained in single crystalline triangular form.

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.4(8).3189-91

Article can be accessed online on: www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.4(8).3189-91

By varying the amount of extract in reaction medium, percentage of gold nanotriangles to that of spherical particles as well as the size of nanotriangles (50–350 nm) have been modulated. The relative amount of triangle and spherical nanoparticles led to the significant control over the optical properties of the nanoparticle solution [2].

The key role in the formation of gold nanotriangles was played by the slow reduction of aqueous gold ions ($HAuCl_4$) along with the shape-directing effects of constituents (carbonyl compounds) of the plant extract.

On the other hand, aqueous silver ions ($AgNO_3$) when incubated with *Aloe vera* extract produce only spherical Ag nanoparticles. The appearance of brownish red color and faint yellow color in the reactions indicate the formation of gold and silver nanoparticles, respectively.

The present study describes the process of synthesis of silver nanoparticles using leaf extract of *Mangifera Indica, Syzygium cumini* plant

MATERIALS AND METHODS:

Plants and Chemicals: Healthy leaves of *Mangifera Indica, Syzygium cumini* were collected from the Kurukshetra University campus as shown in **Fig. 1**. The chemicals, media and reagents used in the present studies were taken from Hi Media Laboratories, CDH and Rankem etc. The chemicals were of AR grade.

FIG. 1: HEALTHY LEAF OF *MANGIFERA INDICA'S* AND *SYZYGIUM CUMINI*

Preparation of plant leaf extract, silver ion complex and green synthesis silver nanoparticles: The plant leaves of *Mangifera Indica* and *Syzygium cumini* were washed thrice with tap water and distilled water and kept in the room temperature for air dry. After drying the known amount of leaf samples were chopped into fine and small pieces. The chopped 25 gram of leaves added with 100 ml of distilled water and boiled up to 100℃ for 30 minutes. After the desired reaction period the desired samples were filtered through Whatman filter paper to get the leaf extract.

Leaf extracts were stored at -20℃ for further study. For the preparation of 1mM silver nitrate, 0.0421gm of $AgNO_3$ was added to 100 ml of double distilled water. The solution was mixed thoroughly and stored in colored bottle in order to prevent auto oxidation of silver. For the synthesis of plant mediated silver nanoparticles, the leaf extract and 1mM silver nitrate solution were taken in 1:4 ratio respectively and kept on a water bath at 60℃ for 30 minutes until the color change was observed. This indicates the preliminary confirmation for the formation of plant mediated silver nanoparticles.

UV visible spectrophotometer is the main technique to examine the silver nanoparticles in the aqueous suspension. Green synthesized silver nanoparticles from *Mangifera Indica* and *Syzygium cumini* were taken for UV spectra Analysis (320-750 nm).

RESULTS AND DISCUSSION: The development of easy, reliable and eco-friendly methods helps to increase interest in the synthesis and application of nanoparticles that are beneficial for mankind [3]. It is well known that silver nanoparticles exhibit yellowish color in aqueous solution due to excitation of surface plasmon vibrations in silver nanoparticles. The appearances of yellowish color in the reaction tubes suggest the formation of silver nanoparticles (SNPs) as shown in **fig. 2**.

Reduction of silver ion into silver nanoparticles during exposure to the plant extracts could be followed by color change. The synthesis of SNPs had been confirmed by measuring the UV-Vis spectrum of the reaction media. The UV-Vis spectrum of colloidal solutions of SNPs synthesized from *Mangifera Indica* and *Syzygium cumini* have absorbance peaks at 370 and 350.

The production of the silver nanoparticles synthesized from the leaf aqueous extract of *E. chapmaniana* was evaluated through spectrophotometry at a wavelength range of 350-700 nm; this revealed a characteristic peak for *E. chapmaniana* AgNPs at 413 nm for the extract and AgNO3 mixture, which confirmed the formation of the silver nanoparticles. This is similar to the surface plasmon vibrations with characteristic peaks of the silver nanoparticles prepared by *E. hybrid* [4].

SNPs from *Mangifera Indica*

SNPs from *Syzygium cumini*

FIG. 2: YELLOW COLOR FORMATION INDICATES THE FORMATION OF SNPs FROM *MANGIFERA INDICA* AND *SYZYGIUM CUMINI*

CONCLUSION: Nano-particle biosynthesis is an emerging technology and has potential applications in biomedical fields. In the present study, we report the use of leaf extract obtained from *Mangifera Indica* and *Syzygium cumini* plant as a reducing agent to synthesize Ag-NPs.

Thus, this novel synthesis strategy highlighted a simple, economically viable, green and more environmentally friendly technique to obtain Ag-NPs, compared to the conventional chemical reduction.

Conflict of Interest - The authors declare that they have no conflict of interest

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How to cite this article:
Kumar S, Saini J, Kashyap D, Batra B, Grewal A, Malik DK and Kumar R: Green synthesis of plant-mediated Silver Nanoparticles using *Mangifera indica* and *Syzygium cumini* leaf extract: . *Int J Pharm Sci Res* 2013: 4(8); 3189-3191. doi: 10.13040/IJPSR. 0975-8232.4(8).3189-91