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Research Article

GREEN SYNTHESIS AND CHARATERISATION OF SILVER NANOPARTICLE FROM AQUEOUS SOLUTION OF HYGROPHILA AURICULATA SEEDS

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ABSTRACT

Hygrophila auriculata, a perennial *angiosperm* of Acanthaceae, broadly distributed semi-aquatic herb in India, is creature used as vegetable in several states like Odisha, Chhattisgarh & West Bengal. The pre-flowering or flowering succulent aerial parts are boiled and consumed by the rural people of these states to increase the haemoglobin level. This herbal therapy does not have any side effects with confirmed effectiveness. Silver was of a particular concern for this progression due to its evocative chemical and physical properties. Silver nanoparticles have attained special place in the area of nano technology because of their antimicrobial and biomedical applications, and they are rich sources of various medicinally important substances. The aqueous silver ions are reduced to silver nanoparticles when exposed to seeds extract. We discussed on the Synthesis and characterization of silver Nanoparticles by green synthesis method. It attempt was made to silver Nanoparticles is prepared by using a medicinal seed of *Hygrophila auriculata,* silver nitrate as used to synthesis the silver Nanoparticles by using aqoeous extract of *Hygrophila auriculata.* The synthesized silver nanoparticles from *Hygrophila auriculata seeds and* were characterized by various other techniques viz. Fourier-transform infrared spectroscopy (FTIR), UV, X-ray Powder Diffraction (XRD) and SEM.

INTRODUCTION

Hygrophila auriculata, plant contains various groups of phyto-constituents viz. phytosterols, fatty acids, minerals, polyphenols, proanthocyanins, mucilage, alkaloids, enzymes, amino acids, carbohydrates, hydrocarbons, flavonoids, terpenoids, vitamins, glycosides, etc. It is useful in the treatment of anasaraca, dropsy of chronic, Bright's disease, hyperdipsia, diseases of urinogenital tract, vesicle calculi, flatulence. Dry seed powder assorted with milk & sugar is in use to heal spermatorrhoea. It also used for removal of gall stones as aphrodisiac. Nanotechnology is an important field of modern research dealing with design, synthesis, and manipulation of particle structures [1-6]. It have large range of applications in areas such as cosmetics, health care, environmental health, optics, mechanics, biomedical sciences, chemical industries, space industries, electronics, drug-gene delivery, optoelectronics, energy science, catalysis, single electron transistors, nonlinear optical devices, light emitters,& photo-electrochemical applications. It are used, or being estimated for use, in several fields. The surface coating of nanoparticles decides many of their chemical and physical properties. The important physical and chemical properties of nanomaterials are Size, shape, specific surface area, aspect ratio. Silver NPs are of concern because of the exclusive properties which can be included into antimicrobial applications, composite fibers, biosensor materials, cosmetic products, cryogenic super-conducting materials, & electronic components. The various important applications of silver NPs are pharmaceutics, dentistry and medicine. An gradually more common application is the use of Ag nanoparticles for antimicrobial coatings, and so many textiles, wound dressings, keyboards, and biomedical devices now include silver nanoparticles that constantly release a low level of silver ions to offer protection beside bacteria [7-16]. Green synthesis methods make use of to some extent pollutant-free chemicals for prepare of nanostructures. It embraces the use of ecofriendly & secure solvents such as water, natural extracts. So biological approaches applying microorganisms & plants or plant extracts for prepare of metal nanoparticles have been

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recommended as safe options to chemical methods. Green chemistry decreases pollution risk at source level & it is improved to prevent waste rather than pleasure or clean up waste behind it is formed. The 'green' environment friendly processes in chemistry and chemical technologies are becoming increasingly popular and are much needed as a result of worldwide problems associated with environmental concerns [17-20]. Silver is the one of the most commercialized nano-material with five hundred tons of silver nanoparticles production per year and is estimated to increase in next few years. In the present work, we have synthesized silver nano particles from green method and the resulting sample were characterized by FTIR, UV, XRD and SEM.

MATERIALS AND METHODS

$AgNO_3$ (Merck), $NaBH_4$ (Merck.), distilled water were applying in the nanoparticle preparation with the extracts. ***Hygrophila auriculata*** leaves were collected from the Botanical garden.

Preparations of Aqueous Extract from Hygrophila auriculata

Green leaves of ***Hygrophila auriculata*** seeds are composed & washed with distilled water several times for the replacement of dust particles. The leaves were then mashed using mortar and pestle until the leaves are grinded finely. Whatman Filter paper was used to filter the grinded leaves to collect the leaf extract. The extract were collected and kept at the room temperature.

Synthesis of silver nanoparticles

1g of ***Hygrophila auriculata*** with 4 mL water was taken in a round bottom flask with constant stirring. 2mL solution of 0.1g of $AgNO_3$ in water was added drop wise with vigorous stirring at room temperature. After completion of the addition, the reaction mixture was stirred for another 20 minutes. Then 0.1 g of aqueous solution of $NaBH_4$ was added drop wise in to mixture. The color of resultant solution of the seeds solution turned to deep brown.

Hygrophila auriculata

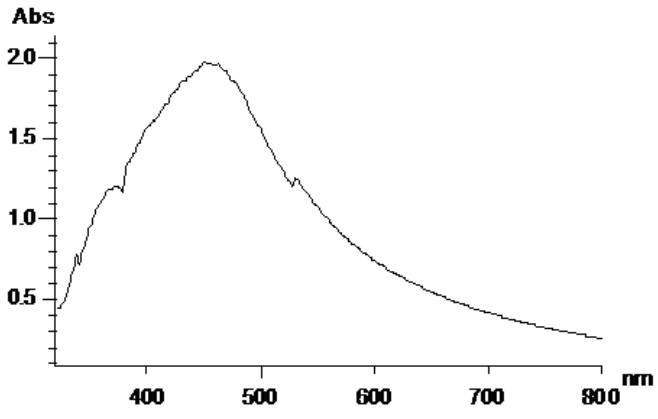

Figure 1 UV Spectrum of silver nanoparticle

Hygrophila auriculata

RESULT AND DISCUSSION

The formation of silver nanoparticles from *Hygrophila auriculata* was observed using UV visible absorption spectrum studies (Figure 1). After reduction of Ag^+ ions to Ag^0, a strong absorption at about 424 nm was observed.

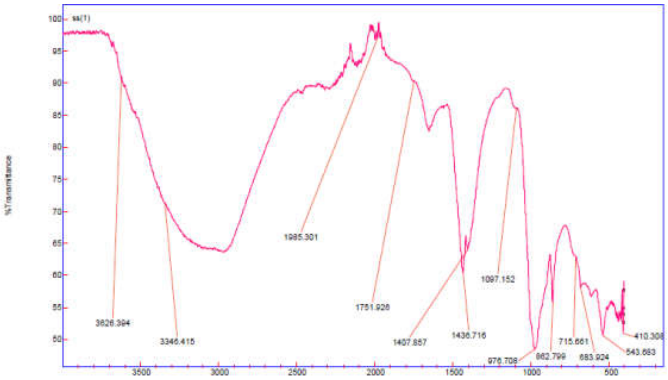

Figure 2 FTIR spectrum of silver nanoparticle

The peaks around 1751 cm^{-1} corresponding to the carbonyl group (Fig;2). The peak at 3826 cm^{-1} corresponding to carboxylic acid groups and the peaks at 33846m^{-1} could be attributed to the absorptions from hydroxy groups. The stretching of CH_2 is seen at 1436 cm^{-1} due to the presence of the aromatic group. These data indicate that the polymers contain hydroxy groups, ester bonds and carboxylic OH groups, which were in agreement with objective Samples. The physicochemical properties of *Hygrophila auriculata* extract act as capping agent and prevents the nanoparticles formed from aggregation.

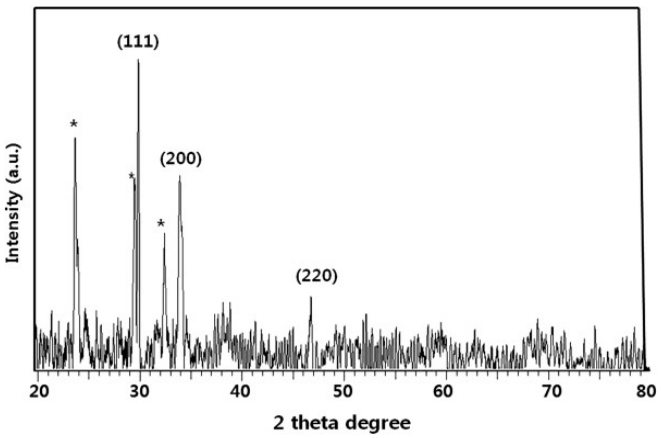

Figure 3 XRD Spectrum of silver nanoparticle

The silver nanoparticles were further characterized by XRD technique. Figure.3. illustrates a typical X-ray pattern of nanosilver / *Hygrophila auriculata*. The *Hygrophila auriculata/* silver nanoparticles shows five prominent peaks at 2θ values of about 32°,38°, and 44° which correspond to (111), (200), and (220), planes representing Bragg´s reflections for the face symmetry of nanosilver. All diffraction peaks are in good concord with the standard value (JCPDS card No. 04-0783).

The characterization of silver nanoparticles was done by using Scanning Electron Microscope (SEM). (SEM) image of the silver nanoparticle synthesized is shown in the Figure.4 which indicates well dispersed particles that are more or less spherical

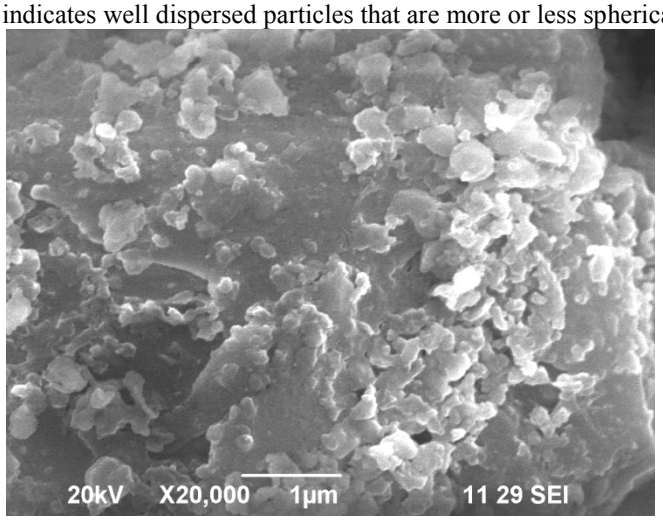

Figure 4 SEM image of Silvernanoparticle

CONCULSION

A green synthesis of stable silver nanoparticles using ***Hygrophila auriculata*** Seed extract was reported in this study. Synthesis was found to be resourceful in terms of reaction time as well as stability of the prepared nanoparticles which prohibit external stabilizers. It confirms to be an eco-friendly, rapid green method for the synthesis providing a cost efficient and an proficient way for the synthesis of silver nanoparticles.

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