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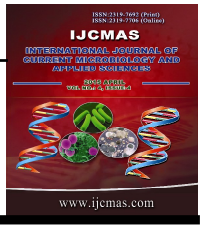

Original Research Article

Extraction and Characterization of Silver Nano Particles Synthesized Using Plant Extract of *Kedrostis foeditissima* (jacq). Lin

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Keywords

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UV,
FTIR,
XRD,
EDAX,
SEM

A B S T R A C T

Nanotechnology is emerging as a rapidly growing field with is application in science and technology for the purpose of manufacturing new materials at the nanoscale level. The recent development and implementation of new technologies have led to new era, the nanoparticle of bio molecules in plants can acts as capping and reducing agents and they have investigated in order to find an eco-friendly techniques for production of well characterized .the present investigation was carried out to green synthesis of $Agno^3$ nano particle s by using the medicinal plant of *Kedrostis feotidissima*. They were synthesized by mixing aqueous extracts and 1mM of $agno^3$, the formation of nanopaticles was monitored by visualizing color changes and it was confirmed by UV-vis spectrophotometer, FTIR, XRD, SEM the result of various techniques confirmed the presence $Agno^3$ nanoparticls.

Introduction

The emergence of nanotechnology has provided an extensive research in recent years by intersecting with various other branches of science and technology impact on all forms of life. Nanotechnology is a field of science and technology which deals with production, manipulation and use of materials carrying in nanometers. In nanoparticles, research is an important aspect due to its innumerable applications. Nanoparticles have expressed significant advances owing to wide range of application in the field of bio-medical, sensors, antimicrobials, catalysts, electronics optical fibers, agricultural, bio-labeling and in other areas.

Synthesis and characterization of nanoparticles is an important area of research as selection of size and shape of nanoparticles provide an effect control over may of the physical and chemical properties. However, these methods cannot avoid the use of toxic chemicals in the synthesis protocol, Gold, Silver and platinum nanoparticles are widely applied to human contact areas such as shampoos, soaps, detergents, shoes, cosmetic products and

tooth pastes as well as medical and pharmaceutical applications. Therefore, there is a growing need to develop Eco-friendly process for nanoparticles synthesis that do not use toxic chemicals.

The biological methods of Silver nanoparticle synthesis using biological entities like bacteria (mandate et al..2006 years (knowshik etal…2003) fungi (Mukherjee, et,al…2001) and plants Siavash Iravani. 2011) were reported to be clean, nontoxic, cost effective and environmentally acceptable when compared to nanopartical synthesis. Kedrostis foedistissima is a present in particular geographical areas in the world, like endemic in south Africa. But not endemic in India, the plant belongings to Cucurbitaceae family.

Materials and Method

Plant material

The leaves of kedrostis freditissima were collected from chittoor district the plant sample was identified and authenticated by nationalized institute and authenticated by nationalized institute of Presidency college, Chennai-5.

Preparation of Leaf extract

The kedrostis foeditissiona Leaf was washed several times with de-ionized water before it is extracted. A 20gm of this plant leaves were finely cut and stirred with 100ml-de-ionized water at 80^{o}C for 3 min, and filtered to get the extract. The filtrate is used as reducing agent and stabilizer.

Synthesis of silver nanoparticles

For the Ag nanoparticles synthesis, 5ml of K. foeditissima leaf extract was added to 45ml of 1mm aqueous $AgNo_3$ solution in a 250ml Erlenmeyer Flask. The flask was then incubated in the dark (to minimize to photo activation of silver nitrate), at room temperature. A control setup was also maintained without leaf extract. The Ag nanoparticle solution thus obtained was purified by repeated centrifugation at 10,000rpm for 15 min followed by re-dispersion of the pellet in-de-ionizer water. Then the Ag nanoparticles were freeze dried using VirTis freeze mobile 6ES freeze drier.

Characterization studies

The biosynthesis of Ag nanoparticles was monitored periodically by scanning at aliquots sample in a wavelength range of 200-1100nm and recording the absorption maxima in Hitachi U-1800 spectrophotometer at a resolution of 1nm. The X-ray diffraction (XRD) measurements were carried out on a Rigakununiflex X-ray diffractometer at a scanning rate of 20 min^{-1} with an operating voltage of 30KV. A Hitachi –S-3400 N SEM equipped with an EDS elemental microanalysis system, were used to study the morphology and size of the nanoparticles.

Result and Discussion

A study on photosynthesis of Ag nanoparticles by the aqueous leaf extract of K. foeditissima was carried out in this work. During the visual observation, Silver nitrate incubated with the extract showed a color

change from yellow to brown within 4h whereas no color change could be observed in silver nitrate without leaf extract (Fig--1) the appearance of yellowish brown color in leaf extract treated flask is clear indication for the formation of Ag nanoparticles. This color arises due to excitation of surface Plasmon vibrations in Ag nanoparticles.

UV-Visible absorption studies

The nanoparticles were primarily characterized by UV-visible spectroscopy, which proved to be a very use full technique for the analysis of nanoparticles fig 2, a,b,c,d shows the UV-Vis spectra of reaction medium recorded as a function of reaction time using silver nitrate and K. Foeditissima Leaf broth. It is observed that the maximum absorbance of Ag nanoparticles occurs at 421 nm. Appearance of this peak, assigned to a surface Plasmon is well. Documented for various metal nanoparticles with size ranging from 2nm to 100nm.

XRD: AND-EDS analysis

Analysis of An nanoparticles using X-ray diffraction confirmed the crystalline nature of particles. ((Fig 5) A number of Bragg reflextion with 20 values of 39.01^{o}, 46.14^{o}, 61.41 and 77.18 Corresponded to the (III), (220) and (311) set a latticle planes are observed which may be indexed as the bond for face centered cubic structure (Fcc) of silver. Further analysis of particles by EDS confirmed the presence of the signal characteristic of elemental silver (Fig – 3&4) silver nanocrystallite 3Kev. Which is typical of the absorption of metallic silver nanocrystals due to surface Plasmon resonance.

Fig.1 Preparation of Leaf extract

Fig – 2 a

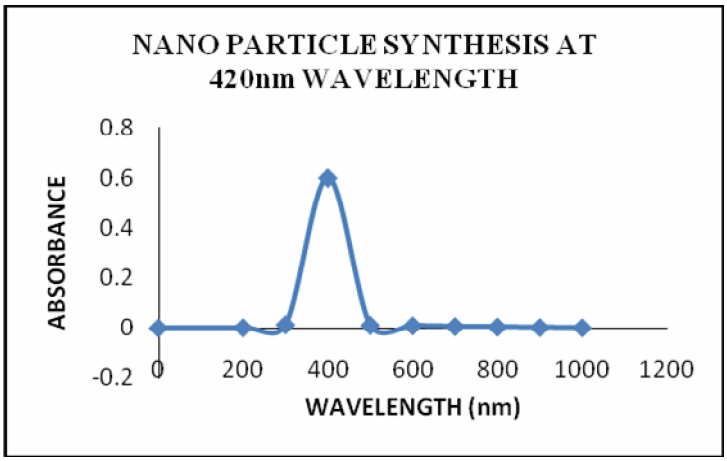


Fig – 2 b

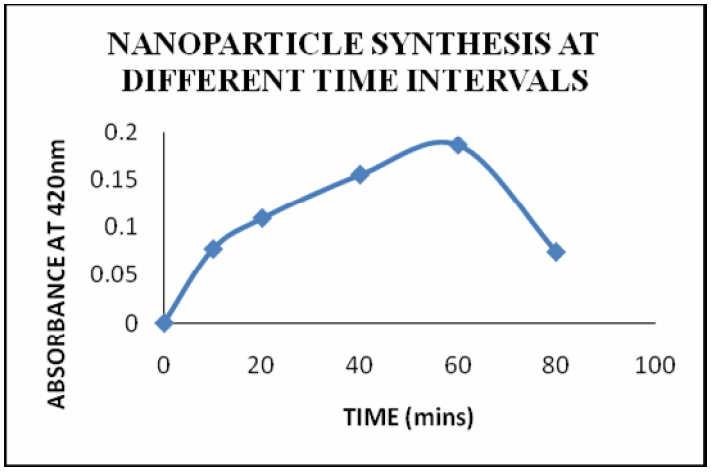


Fig – 2 c

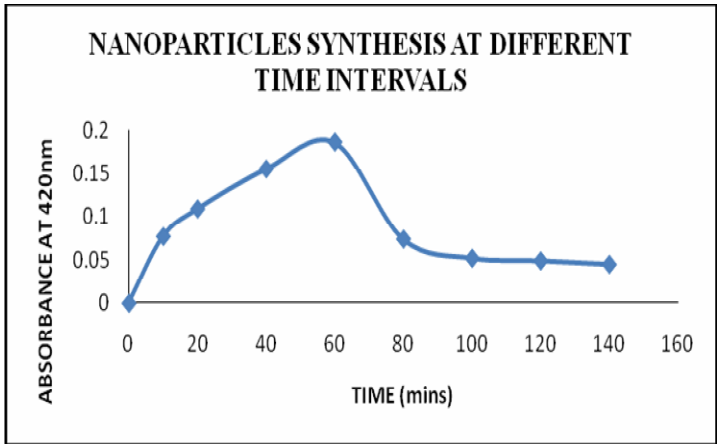


Fig – 2 d

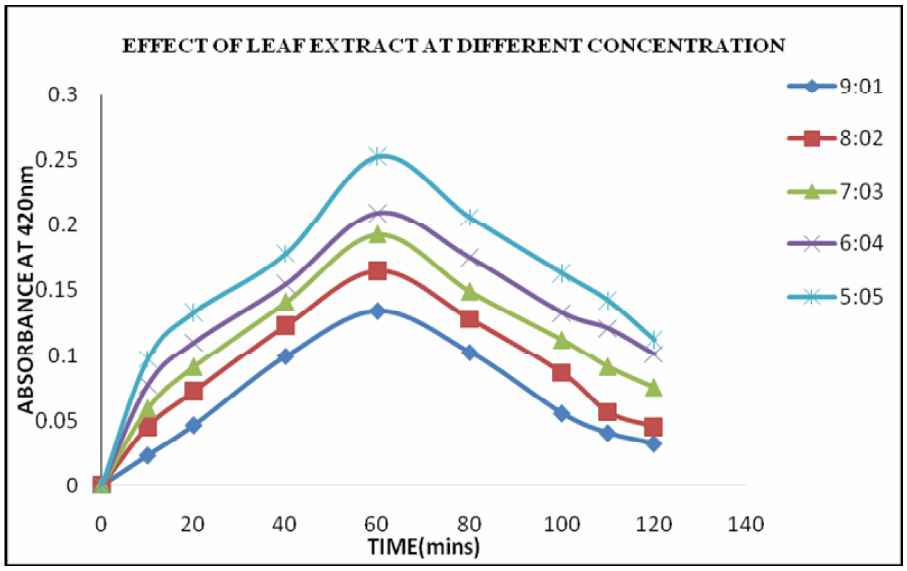


Fig - 3

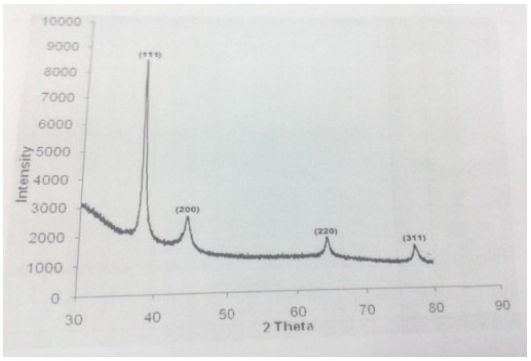


Fig – 4

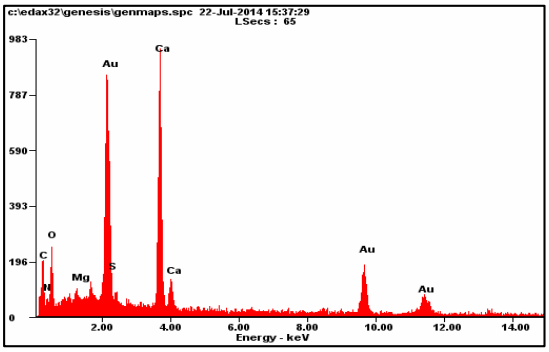


Fig – 5

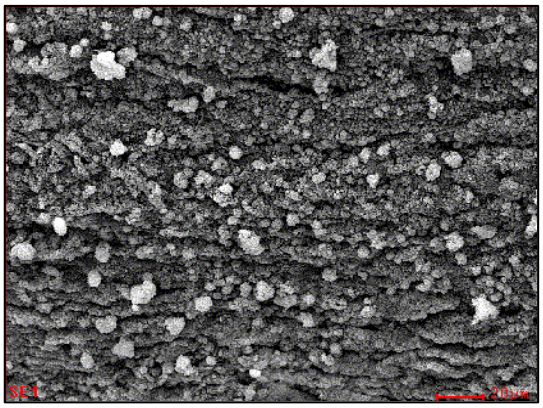
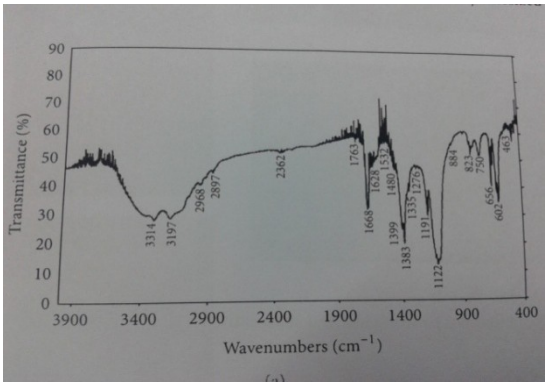


Fig - 6



Scanning Electron Microscopy of Ag Nanoparticles

SEM analysis was carried out to understand the topology of Ag nanoparticfles, which showed the synthesis of monodisperse spherical Ag nanoparticles. (Fig.5) with the size ranging from 20 to 25 nm.

FTIR analysis :

FTIR spectrum (Fig - 6) was examined to identify the possible biomolecules responsible for capping and efficient stabilization of Ag Nanoparticles synthesized by plant leaf extract. The peaks observed for Ag nanoparticles formed through reduction by K. foetidissima at ranges suggest the pressure of alkaloids and terperiods adsorbed on the surface of Ag nanoparticles.

In the present study, a bio reductive synthesis of silver nanoparticles using the leaf extract of K. foeditissima has been successfully presented. This work also demonstrates the use of a natural, renewable and low cast biological reducing agent to produce metal nanostructure in aqueous solution at room temperature, avoid the input o hazardous and toxic solvents. From the present study we found that the leaves of K. foetidissima can a good source synthesis of silver nanopartices.

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References

A.henglein , j. phys. Chem. B97 (1993) 5457

B.Nair, T.Pradeep , Cryst , growth Des2(2002) 293

N. Vijaykumar, SVN Pammi, Pratap Kollu, et.al 2013, Green synthesis and characterization of silver nanoparticle using Boerhearia diffusa plant extract and their antibacterial activity 562-566.

Jasmina Kurapa, Ryo Nakabayash. Etal – 2013 Direct isolation of falavonoids from palnts using ultra small anatase T_1o_2 Nanoporticies. 443-453

K.Jeeva M.Thiyayarajan, Vstangovan.etal. 2013 biosyntheses of metallic sliver nanoparticles and their anti bacterial activity against – clinically isolated pathogens. 714-720.

K.K Reddy K.lee, A.L gopalan, mater. Lett 62(2008) 1815

Kanniah paulkumar, Ganadhas Gnanajobita, chelludurai malarkodi, Gurusamy Annadurai. 2013 piper nigrum leaf and stem Assited Green synthesis of silver nanoparticles and Evaluation of its Antibacterial activity.1-8.

Kavitha.K.S. Syed Baker, Rakthith. D. Kaviath H.U at al. 2013. Plants as Green source towards synthesis of nanoparticles 66-76.

Naheed Ahmad, Seema Sharma to 2012 Green Synthesis of silver nanoparticles using Extracts of Ananas Comosvs,

P.Ramesh, A. Rajendran, M. Meenakshisundaram. 2014, Green synthesis of Zinc oxide nanoparticle using Flower extract cassia auriculate. P.V .Kamat, chem. Rev. 93(1993) 267

Prashant Mohanpuria, Nisha.K. Rana Sudesh Kumar Yedav. Biosynthesis of nanoparticles, technologyical concepts and future applications. 507-517.

PROGIN Phanjan, Azmin Sultana. Et.al. 212. Plant mediated synthesis of silver nanoparticles uing Elaenus Latifolia leaf extract 1117-1123.

Sagaya John Paul J, Rajkumar A, Nivedha Rajan N, Photosynthesized silver nanoparticles from medicinal plant and their larvicidal activity against A edes aldopictus 2014, 174.176.

Sharma V.K yngard R.A, Lin. Y. 2009. Silver Nanoparticles Green synthesis and their Antimicrobial Activities adv. Colloid interfece. Sci,145,83-96

Siavash Iravani and Behzad Zolfaghari 2013 Green synthesis of silver naroparticles using pinus eldaria Bark Extract (1-5)

Siavashlravani, 2011 Green Synthesis of Metal nano particles using plant- Green chem.,13, 2638-2650, Kanniah

T.Pradeep, anushup, thin – solid films 517 (2009) 6441

Williams, van den wildenverg, road map report on nanoparticles, W &W espanasl, spain - 2005