Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 1734 - 1742
Received 16 February 2021; Accepted 08 March 2021.

Green Biosynthesisand Distinguished Pharmaco-Activities of Agnp Utilized From *Abrusprecatorius* Root Extract

Ashaolu Victoria Oladimeji* and M. F. Valan**
* Research Scholar, Department of Chemistry, LIFE, Loyola College, Chennai-600034
** Assistant professor, Department of Chemistry, LIFE, Loyola College, Chennai-600034
E-Mail: vickyoladi@gmail.com.

ABSTRACT
Amid metallic nanostructures, silver nanoparticles (AgNPs) are invariably significant due to their standardized and microbial properties which help in treatments, atomic diagnostics and gadgets utilized for clinical systems. Plant-interceded green combination of nanomaterials has been progressively picking up ubiquity because of its eco-accommodating nature and cost-adequacy. In the current examination, we integrated silver nanoparticles (AgNPs) by utilizing a fluid arrangement of *Abrusprecatorius*Linn. plant extricates. The bio-decreased silver nanoparticles were described by UV-Vis spectrophotometer, checking electron magnifying lens (SEM) and Fourier change infra-red (FTIR) spectroscopy. The UV produced an expansive range at 442 nm frequency. The size of silver nanoparticles extended from1µm-100µm seen by SEM. The FTIR estimation was completed to recognize the conceivable auxiliary metabolites liable for effective adjustment and future organic movement of plant-based silver nanoparticles. AgNP also showed to produce good anticancer, cytotoxicity and wound healing activity.
keywords: Silver nanoparticles, Abrusprecatorius, UV-VIS, SEM, FTIR, Anticancer

INTRODUCTION
Nano studies are one most dynamic examination regions in recent material science. Nanoparticles have one of a kind-properties regarding their size, circulation and morphology. Hence, the utilization of nanoparticles is a significant part of the rapidly creating field of nanotechnology. The importance of Ag has been investigated above 2000 years, to be an alloy that shows great clinical properties that are utilized in various antimicrobial applications. Silver structures are exceptionally harmful to microorganisms and, along these lines, have various jobs in the clinical field [1]. By and large, silver partakes in its nitrate structure, along these lines initiating a solid antimicrobial impact, yet when silver nanoparticles (AgNPs) are utilized, the surface territory gets exposed to various kinds of organisms with significant increments [2]. Silver nanoparticles can be acquired by utilizing regular or whimsical strategies, utilizing two distinct methodologies: "top-down" and "base up". Despite the standard systems of AgNP (e.g.: arrangement, substance/photochemical responses in turn around micelles, warm disintegration of various silver mixes, electrochemical, sonochemical, radiation and microwave-helped courses) they normally include risky synthetic substances, low compound transformations, high vitality prerequisites and inefficient purgings[3,4]. But lately, green science and biosynthetic strategies have become increasingly alluring approaches to acquire AgNPs. These unusual strategies utilize either natural microorganisms (e.g.: microbes, parasites, marine green growth, yeasts) or distinctive alcoholic

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 1734 - 1742
Received 16 February 2021; Accepted 08 March 2021.

or aqueous plant concentrate. Green amalgamation has numerous focal points over old-style courses: it is financially savvy, eco - friendly and doesn't require high weight, vitality, temperature or the utilization of harmful chemical reagents [5].

Silver nanoparticles are a significant piece of nanotechnology predominantly because they don't initiate alteration on living cells and, in this way, can't cause microbial obstruction.

Current examinations uncovered that silver nanoparticles can join to cell dividers and adjust cell breath. AgNPs are generally utilized in science and medicine because of their appealing and special physicochemical properties. In 1970, explores completed utilized silver particles for the treatment of orthopedic maladies brought about by various contaminations with microorganisms and a quicker bone recuperation was taken note.

Silver nanoparticles are broadly utilized in light of its oneof a kind properties in catalysis, synthetic detecting, biosensing, photonics, gadgets, and pharmaceuticals [6]. They additionally convey the incredible potential for use in antimicrobial exercises [7]. Antimicrobial movement of silver nanoparticles permits them to be helpfully utilized in various family unit items, for example, materials, food stockpiling holders, home machines, and clinical gadgets [8]. Silver is a viable antimicrobial alloy which shows low harmfulness [9]. The most significant use of silver and silver nanoparticles is in the clinical industry, for example, tropical balms to forestall disease against burns and open injuries [10]. Silver products have at times been known for its inhibitory and bactericidal effects, just as antimicrobial activities, which has been utilized for a considerable length of time to forestall and treat human various ailments, most strikingly contaminations [11]. Silver nanoparticles are accounted for to have antifungal, calming, antiviral, against angiogenesis, and antiplatelet movement [12]. Existing writing reports a fruitful blend of silver nanoparticles through a green course where the diminishing and topping operator chose was the latex gotten from Jatrophacurcas[13]. Silver nanoparticles were additionally gotten utilizing Aloe vera[14], *Acalyphaindica*[15], Garciniamangostana[16] leaf extracts. *Crataegusdouglasii* organic product extricates [17] just like different other plant extracts [18] as a reducing agent.

Here we have built up a quick, eco-accommodating and advantageous green technique for the biosynthesis of AgNP from silver nitrate utilizing root concentrates of *Abrusprecatorius*generally known as Indian licorice. In this exploration, the plant intervened integrated silver nanoparticles were synthesized and concentrated in detail with every one of their properties critical to current science and winning advances. Be that as it may, the biosynthesis of AgNP by free cell framework and culture filtrate has not been examined at this point. In this way, these screening procedures will affirm *Abrusprecatorius*as a possible possibility for rapid synthesis of AgNP.

METHODOLOGY

Silver nitrate utilized for the blend of silver nanoparticles was acquired from E. Merck, (India) Limited, Mumbai, India. *Abrusprecatorius*(Indian Liquorice) utilized in this work were gathered from the Kancheepuram locale, Tamil-Nadu.

Preparation of root extract

Indian therapeutic plant *Abrusprecatorius*(Indian Liquorice) was chosen from Tamil nadu, India, because of cost viability, simplicity of accessibility and restorative property. New and sound roots were gathered locally and flushed completely first with faucet water followed by refined water to evacuate all the residue and undesirable obvious particles, cut into little pieces and dried at room temperature and granulated into powder. Around 5g of root powder were weighed independently and moved into 100mL

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 1734 - 1742
Received 16 February 2021; Accepted 08 March 2021.

measuring glasses containing 50mL refined water and bubbled for around 10 min. Concentrate was filtered thrice through Whatman No. 1 channel paper to expel particulate issue and to get clear arrangements which were then refrigerated (4°C) in 100 mL Erlenmeyer cups for additional examinations.

Synthesis of AgNP

0.1M of the fluid arrangement of silver nitrate ($AgNO_3$) was arranged and utilized for the combination of silver nanoparticles. 5mL of root concentrate of *Abrusprecatorius*was added to 45mL of 0.1M $AgNO_3$ answered for the bio-decrease process at room temperature. [19]

Characterization of AgNP

UV-Visible Absorbance Spectroscopy

UV-Visible spectroscopy examination was done on a Systronic UV-Visible ingestion spectrophotometer 117 with a goal of ±1nm somewhere in the range of 200 and 1000nm handling a filtering velocity of 200nm/min. Equivalent measures of the suspension (0.5mL) were taken and examined at room temperature. Reaction progress between the metal ion and the root extract was observed. Nanoparticles in fluid arrangement with various frequencies in nanometers from 340 to 800nm. The decrease of silver particles and the arrangement of silver nanoparticles happened inside an hour of response. Control was kept up by utilizing AgNO3. [20]

FT-IR (Fourier Transforms Infrared Spectroscopy)

For FTIR estimations, the orchestrated silver nanoparticles arrangement was centrifuged at 10000rpm for 30 minutes. The pellet was washed threefold with 5mL of deionized water to dispose of the free proteins or chemicals that are not topping the silver nanoparticles. The pellet was dried by utilizing a vacuum drier. It was analyzed by FTIR.

Filtering Electron Microscopy

The pellet undergoes an SEM investigation. Thin films of the pellet were set up on a carbon covered copper network by simply dropping an exceptionally limited quantity of the sample on the matrix; the additional solution was evacuated utilizing a smudging paper and afterward, the film on the SEM framework could dry for investigation. [21]

Cytotoxicity/Anticancer Activity

The evaluation of the cytotoxic activity and cancer activity on MCF7 was performed using the bromide colorimetric method (3-[4.5-dimethylthiazol-2-il]-2.5-tetrazolium diphenyl) (MTT). The methodology used to conduct this test followed the rules of the International Standard Organization.[22]

Cells (1×10^5/well) were plated in 0.2 ml of medium/well in 96-well plates. Incubate at 5 % CO_2 incubator for 72 hours. Then, added various concentrations of the samples in 0.1% DMSO for 24 hrs at 5 % CO_2 incubator. View the images under Inverted microscope 40X and take the photos. After removal of the sample solution and 20µl/well MTT reagent was added. Viable cells were determined by the absorbance at 540nm. 50% inhibition of cell viability (IC50) value was determined graphically. The effect of the samples on the proliferation of & VERO cells was expressed as the % cell viability, using the following formula:

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 1734 - 1742
Received 16 February 2021; Accepted 08 March 2021.

Calculation

% cell viability = A540 of treated cells / A540 of control cells × 100%

Wound-Healing Activity

VERO cells were seeded into 96 well plates and After 72 hours, the cell monolayer was scraped with a sterile 200 µL micropipette tip to create a wound, examined under inverted microscope. Thereafter, the cells were treated with sample 240 and 120µg. After 12- and 24-hours treatment period, the plates were view under microscope and the images were captured at 10× magnification.[23]

Calculation

% cell migration = A540 of treated cells / A540 of control cells × 100%

RESULTS AND DISCUSSION

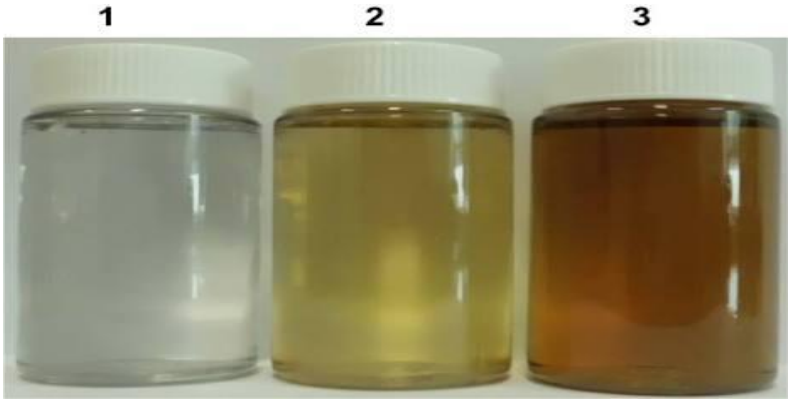


Figure 1: Formation of Silver Nanoparticle

The photograph shows compartments with tests of silver nitrate. After a decrease for 48 hours, culture filtrate shading changed from yellow to brown. The earthy colored development is because of the surface plasmon reverberation property of silver nanoparticles. Watery silver nitrate particles were decreased during the introduction to the liquorice root extricate. The shade of the response blend changed from yellow to brown demonstrating the arrangement of silver nanoparticles (Figure 1). As a result of excitation of surface Plasmon vibration in metal NP, AgNP shows earthy shading in water. The UV range is demonstrated explicit top in the 442 nm area that affirmed the nearness of silver nanoparticles in a colloidal arrangement. This solid strip compares to the Surface Plasmon reverberation of silver nanoparticles (Figure 2). The high OD of the arrangement proposes a high change of Ag^{+} to Ag^{0} as a nanoparticle.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 1734 - 1742
Received 16 February 2021; Accepted 08 March 2021.

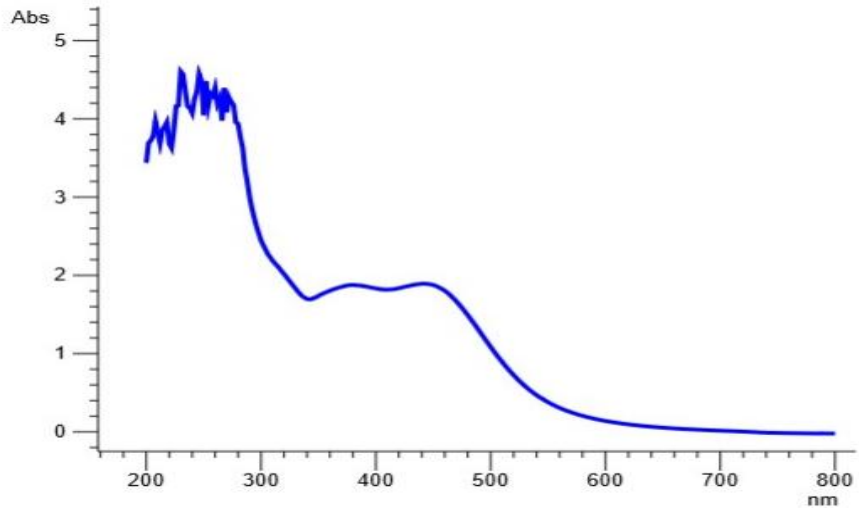


Figure 2: UV-Visible Spectrum

FT-IR (Fourier Transforms Infrared Spectroscopy)

The NP suspension is centrifuged at 10,000 rpm for 20 min and the dried concentrate was assessed utilizing FT-IR spectroscopy. This procedure was utilized for the characterization of the *Abrusprecatorius*root extricate and arranged silver nanoparticles. FTIR procedure was utilized to watch the chemical structure of silver nanoparticles combined with an absorbance band of 3516, 3457,3267,3178,2955,2352,1644,1592,1534,1385,1233,1064,1039,671,539, and 447 cm-1which uncovered the nearness of alkaloids because of N-H extending, polyphenols and flavonoids because of O-H extending, terpenes because of C-H group.[24] The practical gatherings present in test nanoparticle extracts are aldehydes, alkenes, amines, amides, alcohols, phenols, aromatics, carboxylic acids and anhydride, esters and lactones, ethers, quinines and natural halogen composition. These compounds have a place with auxiliary plant metabolites according to analyst clarifications [25,26]. These were affirmed by the FT-IR spectrophotometer study that anticipated the nearness of the gatherings: O-H, N-H, C-H, CCl, C=C, and nitrates extending.

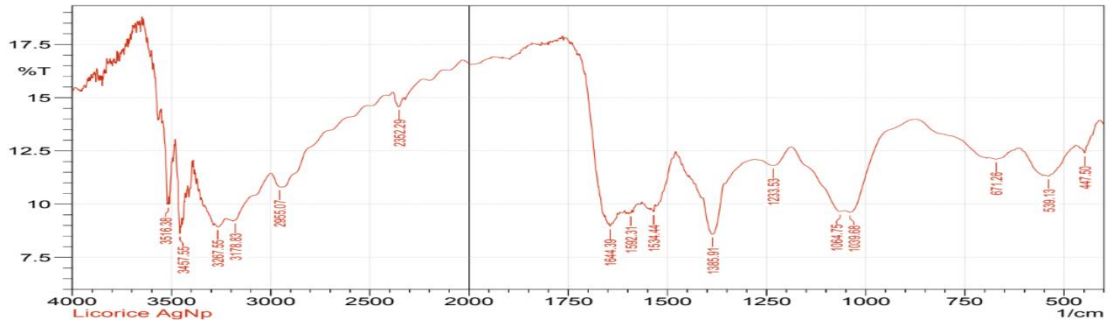


Figure 3: FT-IR Spectrum

These outcomes recommend that the natural atoms perform double elements of arrangement and adjustment of silver nanoparticles in the fluid medium.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 1734 - 1742
Received 16 February 2021; Accepted 08 March 2021.

Filtration Electron Microscope (SEM)

Scanning electron magnifying instrument examination was utilized to quantify the size of silver nanoparticles. In this investigation size of silver nanoparticles was between 1µm-100µm with various amplifications (Figure 4)

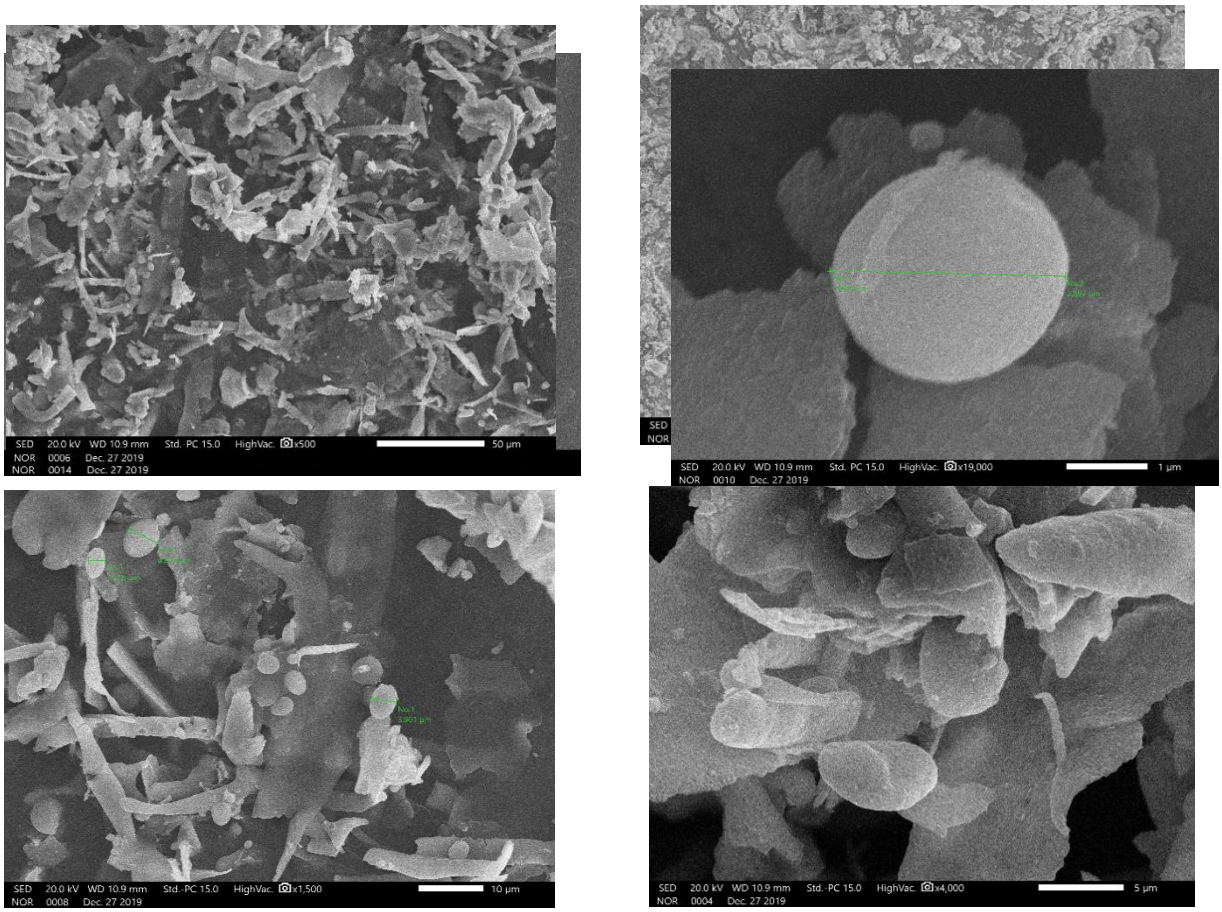


Figure 4: SEM Diagram

SEM pictures indicated that the greater part of the AgNP are predominately round fit as a fiddle having a smooth surface and very much scattered with the close reduced course of action. The silver nanoparticles are framed as white shady masses between hued dim masses of the concentrate.

Cytotoxicity/Anticancer Activity

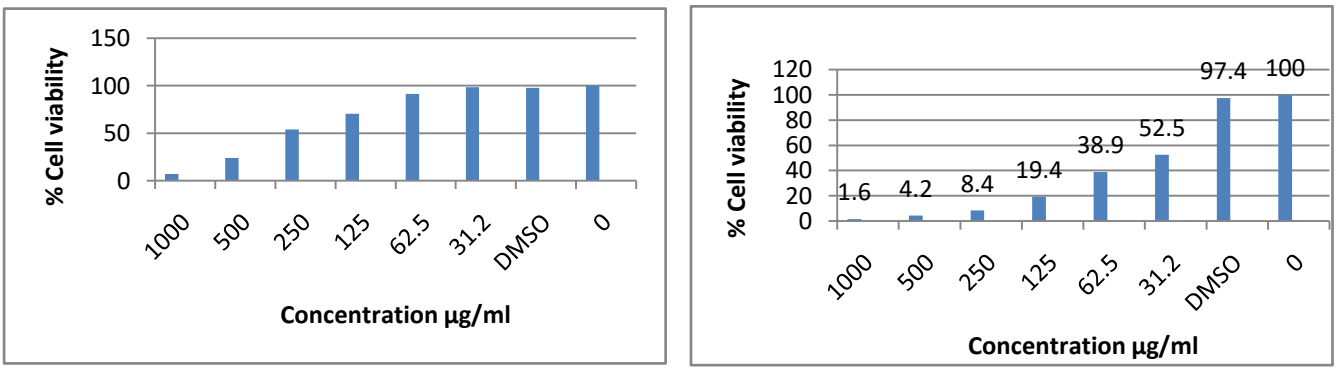


Figure 5 Cytotoxicity/Anticancer Activity

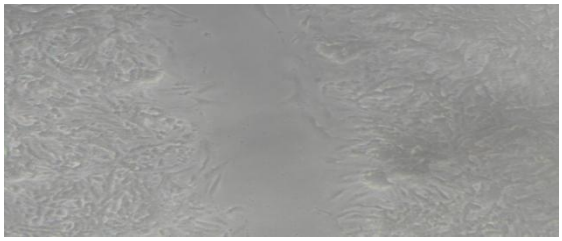
Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 1734 - 1742
Received 16 February 2021; Accepted 08 March 2021.

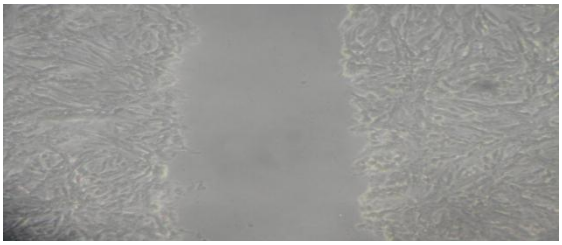
AgNP proves to have cytotoxic effect and also good anticancer activity, thus it may be a suitable alternative apitherapy extract for cancer research. the *in vitro* cytotoxicity test is one of the tests that serves to evaluate the biocompatibility of a particular material or extract, showing an important step for animal testing and clinical trials. Graphical data are shown in Figure 5.

Wound-Healing Activity

Silver nano-particle of Abrusprecatorius root extract exhibit good wound healing activity. Wound healing is a dynamic and interactive process initiated in response to an injury and restore the anatomical and functional continuity of the tissue. The process is essential for maintaining the body integrity. A large number of investigations and clinical trials have been conducted with the aim of improving the healing process of wounds and consequently quality of life.

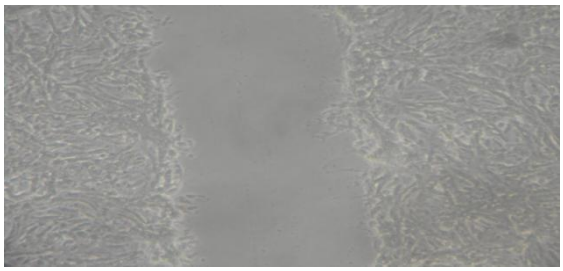
VERO control (Wound

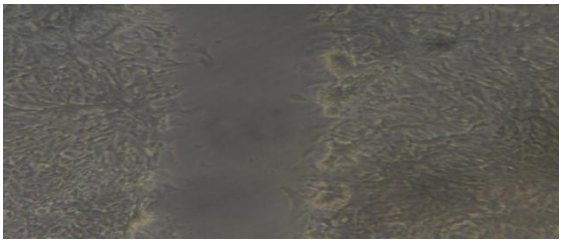




Silver nanoparticles 40 µg (Wound created)

After 24hrs





After 24hrs

In addition, application of AgNP, to the area of the wound may stimulates re-epithelialization and increases the number of fibroblasts, exhibiting a healing activity on skin injuries. Therefore, new researches on this plant incorporated with silver nanoparticle could contribute to a topical treatment in tissue repair process with benefits to the population.

CONCLUSION

Nanotechnology is growing quickly and more techniques to acquire nanoscale particles are rising persistently. The green amalgamation of Silver nanoparticles utilizing *Abrusprecatorius*root extricate was demonstrated to be quick, eco-accommodating and delivered nanoparticles are genuinely uniform fit as a fiddle. In outline, visual perceptions, UV-Vis and SEM spectroscopic strategies affirmed the development of silver nanoparticles by liquorice root extract. The FT-IR range attributed the natural particles which perform double elements of development and adjustment of silver nanoparticles in the fluid medium. Plant based nano- complex also determined its comprehensive detail for pharmacological

activities as it exhibited good cytotoxicity, anticancer activity and wound healing activity. Notwithstanding, progressively definite examination by means of animal studies and clinical trials are required to comprehend the organic action of plant-based silver nanotechnology for the cure and treatment of ailments.

Acknowledgment
The authors want to say thanks to the National Institute of Ocean innovation, Pallikkaranai Chennai TamilNadu, for their specialized help with a large portion of the characterization examination during this research

REFERENCES

[1] S.Galdiero, A.Falanga, M.Vitiello, V.Marra, M.Galdiero, "Silver nanoparticles as potential antiviral agents", Molecules, vol.16, pp.88948918, 2011.
[2] B.Tang, J.Wang, S.Xu, T.Afrin, W.Xu, X.Wang, "Application of anisotropic silver nanopaticles: multifunctionalization of wool fabric", J.Colloid Interface Sci, vol.356, pp.513-518, 2011.
[3] A.Mourato, M.Gadanho, A.R.Lino, R.Tenreiro, "Biosynthesis of crystalline silver and gold nanoparticles by extremophilic yeasts", Bioinorganic Chemistry and Applications, vol.2011, article ID 546074,, pp.2010-2018, 2011.
[4] H.Haiza, A.Azizan, A.H.Mohidin, D.S.C.Halin, "Green synthesis of silver nanoparticles using local honey", Nano Hybrids, vol.4, pp.87-98, 2013.
[5] O.V.Kharissova, H.V.R.Dias, B.I.Kharisov, B.O.Perez, V.M.J.Perez, "The greener synthesis of nanoparticles", Trends in Biotechnology, vol.31, no.4, pp.240-248, 2013.
[6] R. Sarkar, P. Kumbhakar, and A. K. Mitra, "Green synthesis of silvernanoparticles and its optical properties," Digest Journal of Nanomaterials and Biostructures, vol.5, no.2, pp.491–496,2010.
[7] N. Sap-Lam, C. Homklinchan, R. Larpudomlert, W. Warisnoicharoen, A. Sereemaspun, and S.T. Dubas, "UVirradiation induced silvernanoparticles as mosquito larvicides," Journal of Applied Sciences, vol.10, no.23, pp.3132–3136,2010.
[8] C. Marambio-Jones and E.M.V. Hoek, "A review of the antibacterial effects of silvernanomaterials and potential implications for human health and the environment," Journal of Nanoparticle Research, vol.12, no.5, pp.1531–1551,2010.
[9] M. D. A. Farooqui, P. S. Chauhan, P. Krishnamoorthy, and J. Shaik, "Extraction of silvernanoparticles from the left extracts of clerodendrumincerme," Digest Journal of Nanomaterials and Biostructures, vol.5, no.1, pp.43–49,2010.
[10] M. Ip, S.L. Lui, V.K.M. Poon, I. Lung, and A. Burd, "Antimicrobial activities of silver dressings: an in vitro comparison," Journal of Medical Microbiology, vol.55, no.1, pp.59–63,2006.
[11] S. S. Shankar, A. Rai, A. Ahmad, and M. Sastry, "Controlling the optical properties of lemongrass extract synthesized gold nanotriangles and potential application in infrared-absorbing optical coatings, "Chemistry of Materials, vol.17, no.3, pp.566– 572,2005.
[12] B. J. Wiley, S. H. Im, Z.-Y. Li, J. McLellan, A. Siekkinen, and Y. Xia, "Maneuvering the surface plasmon resonance of silver nanostructures through shape-controlled synthesis," Journal of Physical Chemistry B, vol.110, no.32, pp.15666–15675,2006.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 1734 - 1742
Received 16 February 2021; Accepted 08 March 2021.

[13] H. Bar, D.K. Bhui, G.P. Sahoo, Colloids Surf APhysicochemEng Asp, 2009, 339, 134–139
[14] S.P. Chandran, A. Ahmad, M. Sastry, BiotechnolProg., 2006, 22, 577–583
[15] C. Krishnaraj, E.G. Jagan, S. Rajasekar, P.T. Kalaichelvan, N. Mohan, Colloids Surf B: Biointerfaces, 2010, 76, 50–56
[16] R. Veerasamy, T.Z. Xin, S. Gunasagaran, E.F.C. Yang, J Saudi Chem Soc., 2010, 15:113–120
[17] M. Ghaffari-Moghaddam, R. Hadi-Dabanlou, J Indus Eng Chem., 2014, 20, 739–744
[18] M. Ghaffari-Moghaddam, R. Hadi-Dabanlou, M.M. Khajeh, K. Shameli, Korean J Chem Eng., 2014, 31, 548– 557
[19] S. Garima, B. Riju, K. Kunal, R. S. Ashish, and P. S. Rajendra, "Biosynthesis of silver nanoparticles using Ocimum sanctum (Tulsi) leaf extract and screening its antimicrobial activity," Journal of Nanoparticle Research, vol. 13, no. 7, pp. 2981–2988, 2011.
[20] S. S. Shankar, A. Rai, A. Ahmad, and M.Sastry, "Controlling the optical properties of lemongrass extract synthesized gold nanotriangles and potential application in infrared-absorbing opticalcoatings," Chemistry of Materials, vol.17, no.3, pp.566– 572,2005.
[21] N. Savithramma, M. LingaRao, and P. Suvarnalatha Devi, "Evaluation of antibacterial efficacy of biologically synthesized silver Nanoparticles using stem barks of Boswelliaovalifoliolata Bal. and Henry and ShoreatumbuggaiaRoxb," Journal of Biological Sciences, vol.11, no.1, pp.39–45,2011.
[22] Mosmann T. 1983. Rapid colorimetric assay for cellular growth and survival: application to proliferation and cytotoxicity assays. J Immunol Methods 65: 55-63.
[23] Wang B, Xing Z, Wang F, Yuan X, Zhang Y. Fangchinoline inhibits migration and causes apoptosis of human breast cancer MDA-MB-231 cells. OncolLett 2017; 14: 5307–5312.
[24] Maobe MAG, Nyarango RM. Fourier Transformer InfraRed Spectrophotometer Analysis of Warburgiaugandensis Medicinal herb used for the Treatment of Diabetes, Malaria and Pneumonia in Kisii Region, Southwest Kenya. Global J Pharmacology. 2013; 7(1):61-68.
[25] Skoog A, Holler EJ, Crouch SR. Principles of instrumental analysis. 6 Edition, 2007, 1039.
[26] Paulraj K, Irudayaraj V, Johnson M, Patric D. Phytochemical and anti-bacterial activity of epidermal glands extract of Christellaparasitica (L.) H. Lev. Asian Pac. J. Trop Biomed.2011; 1:8-11.