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ORIGINAL ARTICLE

Yellow colored blooms of *Argemone mexicana* and *Turnera ulmifolia* mediated synthesis of silver nanoparticles and study of their antibacterial and antioxidant activity

N. Chandrasekhar[1] · S. P. Vinay[1]

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Abstract In the present work, AgNPs were prepared using a simple bio-reduction method. This is ecologically welcoming and cost-effective method. Yellow colored blooms concentrate of *Argemone mexicana* and *Turnera ulmifolia* are used as bio reducing agents in the study. The formation of silver nanoparticles was confirmed by UV–Vis spectrophotometer and characterization of the nanoparticles was done by FTIR, SEM, XRD and EDX. The Antibacterial action of silver nanoparticles was tested against *Staphylococus aureus, Pseudomonas aeruginosa, Escherichia coli* and *Klebsiella aerogenes.* The phytochemical analysis of the blooms concentrate has shown the existence of saponins, alkaloids, amino acids, phenols, tannins, terpenoids, flavonoids and cardiac glycosides. In vitro anti-oxidant action of both *A. mexicana* and *T. ulmifolia* AgNPs were studied by DPPH assay and reducing power assay.

Keywords Phytochemical assay · *Argemone mexicana* · *Turnera ulmifolia* · Blooms concentrate · DPPH assay · Reducing power assay

Introduction

Nanoparticles are generally considered as the particles of 1–100 nm in at least one dimension (Chen et al. 2013; Mohamed and Xing 2012; Tian et al. 2013; Xing et al. 2010). As the size of the particles decreases, the surface area to volume ratio of nanoparticles increases considerably, this leads to trivial changes in their physicochemical and biological properties. AgNPs have been among the fewest commonly used in our health care system for hundreds of years. In recent times, the nanoparticles have become a passionate awareness in biomedical applications as they possess antifungal, anti-inflammatory, antiviral, and antibacterial actions (El-Badawy et al. 2010; Zhong et al. 2010). AgNPs have been extensively used for diagnosis treatment (Uchihara 2007; Sibbald et al. 2007), coating on medical devices (Galiano et al. 2008), drug delivery (Skirtach et al. 2006), in wound dressing of (Moore 2006), contraceptive devices (Chen and Schluesener 2008) and medical textiles (Vigneshwaran et al. 2007). Nanoparticles can be easily produced by various approaches which include chemical (Sun et al. 2002), electrochemical (Yin et al. 2003), radiation (Dimitrijevic et al. 2001), photochemical and biological techniques (Naik et al. 2002). The majority of chemical reduction procedures applied for the production of NPs involve the use of lethal, dangerous chemicals that causes biological risks and these methods are not ecologically friendly. This leads to emergent requirement for developing eco-friendly methods by bio-reduction approaches using plants and microorganisms. The production of nanoparticles using plants materials and their concentrate are more advantageous than the microorganisms as they involve complex procedures of maintaining microbial cultures (Sastry et al. 2003a; 2003b).

Among the different biological methods of silver nanoparticles production, the production of nanoparticles using microorganisms is not much appropriate for industrial practicability because of high sterile conditions & their care. Hence utilization of plants concentrate is advantageous over microbes (Kalishwaralal et al. 2010). Plant-mediated synthesis of nanoparticles provides bio available

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Production, Characterization and Evaluation of thrombolytic activity of Staphylokinase of *Staphylococcus hominis*

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Abstract

Staphylokinase isolated from *Staphylococcus hominis* has therapeutic function to dissolve the blood clots. *Staphylococcus hominis* was isolated from curd. *Staphylococcus* spp was confirmed by morphological, biochemical and molecular techniques such as 16s rDNA sequencing. Satoh's medium was used for the production Staphylokinase. Cells were separated from culture broth by centrifugation and the supernatant fluid was added to 3 volume of acetone. After centrifugation of the mixture, the resultant precipitate was purified by ion exchange column chromatography (DEAE Cellulose). Sodium Dodecyl Sulfate Polyacrylamide gel electrophoresis (SDS-PAGE) was done by using 10 to 20% gradient polyacrylamide gel and a 4% stacking gel at 4°C. The purity of the Staphylokinase was determined by SDS-PAGE and HPLC. Finally the thrombolytic activity of Staphylokinase was evaluated by Radial Caseinolytic assay and Heated Plasma agar assay. It was suggested that 0.18 of enzyme is sufficient to dissolve the blood clot.

Key words: Staphylokinase, *Staphylococcus hominis*, SDS-PAGE, Caseinolytic, blood clot.

Introduction

Thrombolytic disorders have emerged to be one of the main causes of human mortality worldwide (1). A blood clot (thrombus) developed in the circulatory system can cause vascular blockage leading to life threatening consequences. A healthy homeostatic system suppresses the development of such blood clots in normal circulation. However, reacts extensively during vascular injury to prevent blood loss (2). The failure of the system to produce the bodily clot lysine such as tissue plasminogen activator (t-PA) and Urokinase, leads to stroke, pulmonary embolism, deep vein thrombosis and acute myocardial pathologies. The clinical intervention to cure these disorders is carried out by the external administration of thrombolytic agents (3).

Staphylokinase is a bacterially derived protein that has been used effectively as a plasminogen activator (4). Staphylokinase could be relatively inexpensive when compared to that of other thrombolytic agents and scaled up into large amounts for industrial production (5). Apparently, the only limitation with this thrombolysis is its bacterial origin that could raise undesired immune responses. Considering a thrombolytic agent for industrial scale development, the present work is undertaken to isolate the mature Staphylokinase from a new source.

Staphylococcus hominis is a coagulate-negative member of the bacterial genus of

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BIOLOGICAL SYNTHESIS OF SILVER NANOPARTICLES USING *CALLISTEMON VIMINALIS* (BOTTLE BRUSH) BLOOMS CONCENTRATE AND STUDY OF THEIR ANTIBACTERIAL ACTIVITY

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Abstract

In the present study, the silver nanoparticles (AgNPs) were synthesized through green synthesis using blooms concentrate of Callistemon viminalis. The aqueous Ag^{+} ions were reduced into AgNPs when the $AgNo_3$ solution was mixed with the Callistemon viminalis blooms concentrate. The biologically synthesized AgNPs were characterized by UV–vis, FT-IR, XRD and SEM analysis. The phytochemical analysis of the plant Callistemon viminalis blooms concentrate reveals the presence of flavonoids, alkaloids, cardiac glycosides and saponins. The synthesized AgNPs have shown good antibacterial activity against Klebsiella aerogenes, Staphylococus aureus, E-coli and Pseudomonas aerogenes.

Keywords: Callistemon viminalis, biological synthesis, AgNPs, antibacterial activity, XRD.

I. Introduction

Nanotechnology is the science and engineering involved in the synthesis, design, characterization and application of materials of nanometric scale. Nanoparticles can be produced using various approaches such as physical, chemical, and biological approaches. The synthesis of nanoparticles by chemical method is quick and more quantity of nanoparticles can be produced. These methods also require capping agents for size stabilization of the nanoparticles, which are toxic and end up with toxic byproducts. Therefore there is a need for ecofriendly and nontoxic methods for the synthesis of nanoparticles. This lead to the development of biological methods of synthesis of nanoparticles. Many biological methods for nanoparticles synthesis have been reported till date using bacteria [1], fungi [2]-[3], and plants concentrate [4-6].

Plants mediated nanoparticles synthesis is of more advantageous as they are free from toxic chemicals and provide natural capping agents. Plant concentrate can also reduce the isolation and culture of microorganism [7].

Silver nanoparticles are widely used because of their unique properties in chemical sensing, bio-sensing, catalytic, photonics, electronics, and pharmaceuticals [8]. These have a good potential as antibacterial activity [9]. Because of the antimicrobial properties the AgNPs find many applications in household products like food storage containers, textiles, home appliances, and medical devices [10]. Silver is an effective antimicrobial agent and exhibits low toxicity [11]. These are used in tropical ointments to prevent infection against open wounds and burn [12]. Silver nanoparticles are reported to possess anti-inflammatory, anti-platelet, anti-angiogenesis, antiviral, and antifungal activity [13].

For the present study the blooms of *Callistemon viminalis* were selected for biological production of AgNPs. *Callistemon* is a genus of shrubs belongs to the family *Myrtaceae*. *Callistemon* species have commonly referred as bottle brushes because of their cylindrical, brush like flowers resembling a traditional bottle brush. This popular evergreen tree has a dense, low-branching, multi trunked, pendulous growth habit and a moderate growth rate (Fig. 1). These blooms appear in great abundance during March to July. The flowers are followed by persistent woody capsules which are not noticed unless closely observed [14].

Fig.1 Callistemon viminalis

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Synthesis of Silver Nanoparticles by Bioreduction Method using Leaves Extracts of *Tecoma capensis* and Study of their Antibacterial Properties

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ABSTRACT: In this study the silver nanoparticles were synthesized from leaves extract of *Tecoma capensis* plant by bioreduction method. Silver has long been known to have effective bactericidal properties. The synthesized AgNPs was elucidated using various instrumentation techniques including UV-Vis, FTIR, XRD & SEM. The synthesized AgNPs have shown an effective antibacterial activity when compared against standard antibiotic (Taxim) by *E-coli, Staphylococus aureus, Klebsiella aerogenes* and *Pseudomonas aeruginosa* bacterial strains.

KEYWORDS: *Tecoma-capensis,* AgNPs, bioreduction, SEM, FT-IR, XRD.

I. INTRODUCTION

Nanotechnology is the most active area of research in modern material science. Nanoparticles exhibit completely new or improved properties based on their specific characteristics such as size, morphology and distribution [1]. Nanotechnology means scaling down to nano level starting from the bottom [2]. Numerous methods of physical, chemical and biological methods have been established and reported for the synthesis of silver nanoparticles which play a major role in the control of their size and shape [3-5]. Among these methods, the biological methods utilize bacteria, fungus, bio-derived chemicals, and plant extracts for the synthesis of nanoparticles [6]-[8]. Bioreduction methods of synthesizing silver nanoparticles has increasingly become a topic of interests as conventional chemical reduction methods are expensive and requires the use of chemical compounds and organic solvents as reducing agents which causes environmental issues. Many researchers have reported the bio-synthesis of silver nanoparticles using plant extracts such as pine, persimmon, ginkgo, magnolia, and platanus leaves [9], *Acalypha indica* [10], *Chenopodium album* leaf [11] and *Murraya koenigii* [12].

Silver products have long been known to have strong inhibitory and bactericidal effects, as well as a broad spectrum of antimicrobial activities, which has been used for centuries to prevent and treat various diseases, most notably infections [13]. Antibacterial activity of the silver containing materials is used in medicine to reduce infections in burn treatment [14], arthroplasty [15], preventing bacterial colonization on prosthesis [16], catheters [17], dental materials [18], stainless steel materials [19], and human skin [20].

Plant description: *Tecoma capensis* common called as Cape honeysuckle (Fig.1) is a species of flowering plant in the family *Bignoniaceae*, and native to southern Africa. Despite its common name, it is not closely related to the true honeysuckle. The classification of *Tecoma capensis* is given below.

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Screening and Characterization of Micro Organisms for the bio-production of Electricity from Rice Straw using Microbial FUEL CELL

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ABSTRACT: The demand for the fossil fuels such as petrol, diesel, kerosene and other petroleum derivatives is increasing day to day due to the enormous increase in the vehicles and population. These are nonrenewable energy sources which will be depleting soon due to their continuous usage. Therefore the presently available renewable energy sources must be properly utilized. There is an immediate need for the search of alternate energy sources. The rice straw which is abundantly available all over the can be used as an alternate energy source. Electricity can be produced from rice straw by using Microbial fuel cell (MFC) technology, which uses microorganisms to transform chemical energy of organic compounds of the rice straw into electricity. In this article, electricity generation from rice straw in two-chambered microbial fuel cells (MFC) using rice straw and microorganisms is described. The MFC produced the maximum Voltage of 3.1 and corresponding to the maximum current of 3.9 amperes which results in power output of 12.09 W. The results of this study can contribute for the improvement, understanding and optimizing electricity generation from rice straw in microbial fuel cells.

KEYWORDS: Rice straw, Microbial fuel cell, Electricity, microorganisms, Alternate energy source.

I. INTRODUCTION

In recent years the demand for the energy supply has become one of the major issues worldwide. Every day the energy requirement is an ever increasing entity throughout the world due to the enormous increase in the vehicles and population. Continuous use of fossil fuels, especially petroleum oil and natural gas, has led to the environmental pollution. In this regard, renewable energy source have been viewed as a possible alternative to fossil fuels, which have potential to generate energy and also environmental friendly energy sources. Use of lignocellulosic biomass offers the enormous potential for bioenergy production of the second generation of biofuels. Depending upon the end use applications, a variety of biofuels, such as bioethanol, methane, hydrogen and bio oils, can be extracted from lignocellulosic biomass. Rice straw is considered to be one of the waste materials suitable for renewable energy resource for electricity production using microbial fuel cell. Rice straw contains bio-masses such as cellulose, hemicellulose, and some lignin [1]. The hemicellulose undergoes degradation to its constituent sugars by acidic and/or enzymatic hydrolysis. The sugars produced from hydrolysis can be further used as substrates to for the production of ethanol or organic acids [2]-[3]. Microbial fuel cell is a system in which the micro organisms converts the chemical energy produced by the oxidation of organic or inorganic compounds into ATP by sequential reactions in which

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EVALUATION OF ANTIBACTERIAL ASSAY AND CHARACTERIZATION OF SILVER NANOPARTICLES PRODUCED BY GREEN SYNTHESIS METHOD USING HYLOCEREUS UNDATUS FRUIT EXTRACT

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Abstract
The present work mainly deals with the study pertaining to the synthesis, characterization and evaluation of antibacterial properties of silver nanoparticles (AgNPs) synthesized from the pulp extracts of Hylocereus undatus fruit (Pitahaya). The AgNPs were synthesized by using a rapid, single step green synthesis method. The synthesized AgNPs were characterized by various instrumental techniques such as ultraviolet-visible spectroscopy (UV-Vis), X-ray diffraction (XRD) and scanning electron microscope (SEM). The synthesized AgNPs were found to be spherical in shape with average diameter of 31 nm. The AgNPs have shown good antibacterial activity against Klebsiella aerogenes, E-coli, Staphylococus aureus andPseudomonas aerogenes.

***Keywords**: Hylocereus undatus, Pulp Extracts, SEM, XRD, Antibacterial Activity.*

I. Introduction

Nanotechnology is mainly deals with the production of nanoparticles and their uses in various fields of chemistry, physics, medicine, materials science, and engineering. It is rapidly growing by synthesizing nanoparticles and nano products. The nanoparticles differ significantly from other matter as they possess novel and size-related physico-chemical properties. Nanoscience is an interdisciplinary subject which [1] depends on the fundamental properties of nano size matter [2, 3]. Nanoparticles possess amazing optical, electronic, magnetic, and catalytic properties than the mass material owing to their high surface area to volume ratio [4, 5].The nanoparticles can be prepared by chemical methods by using chemical reducing agents such as hydrazine, sodium citrate and sodium borohydride [6] and bio reduction using extracts of yeast, fungi, bacteria and plant [7]. Recent studies have shown that green biologically based methods using microorganisms and plants to synthesize nanoparticles are safe, inexpensive, and an environment-friendly in nature. Green synthesis of nanoparticles uses water as solvent which replaces toxic organic solvents. Silver nanoparticles (AgNPs) have unique optical, electrical, and thermal properties and therefore these are used in various products that range from photo voltaic to biological and chemical sensors. AgNPs are widely used in the medicinal, pharmaceutical, agricultural industry and in water purification. Silver nanoparticles have received special attention because of their physico – chemical, catalytic, bactericidal and biological properties which found many applications in nano biotechnological research [8, 9]. AgNPs are used as antimicrobial agents in wound dressings [10–12], as topical creams to prevent wound infections [13], and as anticancer agents [14]. A number of plant extract mediated synthesis of AgNPs have been reported in the literature. For instance the use of Red Apple (*Malus domestica*)[15], M*yristica fragrans* (nutmeg) [16], *Avocado* [17], *Abelmoschus esculentus* [18], *Limonia acidissima* [19], and fruit extract of Andean blackberry [20].

In the present study the ***Hylocereus undatus*** fruit is selected for the synthesis of AgNPs. *Hylocereus undatus* (white-fleshed pitahaya) is a species of *Cactaceae* and is the most cultivated species in the genus. It is used both as an ornamental vine and as a fruit crop - the pitahaya or dragon fruit (Fig.1).

Fig.1: *Hylocereus undatus* fruit

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IN VITRO ANTIBACTERIAL AND ANTIOXIDANT ACTIVITIES OF BETEL LEAF MEDIATED SYNTHESIZED SILVER NANOPARTICLES

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ABSTRACT

An advanced approach for the synthesis of silver nanoparticles (AgNPs) is of appreciable importance because of its tremendous scope of applications in distinct fields including drug delivery and diagnostics. The presented study reported the synthesis and characterization of silver nanoparticles by *Piper betel* leaves extract and their potential biological evaluation. The main aim was to expand an inexpensive and eco-friendly synthesis technique of silver nanoprticles using aqueous extracts of *Piper betel* as a reducing and capping agent which has exhibited effect against pathogens such as *Staphloccocus* sp., *Pseudomonas* sp. and proven significant antioxidant activity. The betel leaves were collected and shade dried. The dried leaves powder was subjected to prepare extracts and which were used for the synthesis of silver nanoparticles. The synthesized nanoparticles were then further characterized by using techniques such as UV-visible spectroscopy, scanning electron microscope (SEM), energy-dispersive x-ray spectroscopy (EDS) and X-ray diffraction pattern (XRD) analysis. The average size of nanoparticles was found to be 22 nm. The *in vitro* antibacterial assay had shown the maximum activity against *Staphylococcus* sp., *Pseudomonas* sp. Antioxidant activity of synthesized silver nanoparticles in DPPH and FRAP assay shown maximum activity i.e., 84.048% and 99.109% respectively at 250 µl/ml concentrations. It can be concluded that the extracts of *Piper betel* leaves could be a better source of materials for the synthesis of silver nanoparticles which exhibited antibacterial activity against tested organisms. Significant results of this study will be opened a door for the development novel drugs from the *Piper betel* to treat various diseases.

KEYWORDS: Antioxidant, antibacterial, UV-Visible spectroscopy, Scanning Electron Microscope, Energy-dispersive X-ray spectroscopy, X-ray diffraction pattern.

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Research Article

GREEN ALLOY OF SILVER NANOPARTICLES FROM ENDOPHYTIC EXTRACTS OF *WITHANIA SOMNIFERA* AND STUDIES OF ANTIBACTERIAL AND ANTIMITOTIC ACTIVITY

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ABSTRACT

Objectives: The main aim is to elaborate a cost-effective and environmentally friendly synthesis of silver nanoparticles (AgNPs) by endophytic extracts isolated from *Withania somnifera* as a reducing and capping agent, which has proven antibacterial activity against *Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus,* and *Klebsiella* sp.

Methods: Characterization of AgNPs was carried out employing ultraviolet-visible spectrophotometry, scanning electron microscopy (SEM), and X-ray diffraction studies (XRD). Antibacterial activity of AgNPs was conducted by disc diffusion method antimitotic activity was also evaluated by determining mitotic index in *Allium cepa* root tips.

Results: Ultraviolet-visible spectroscopy was given a peak at 400 nm confirmed the AgNPs. The images of the SEM have confirmed the formation of AgNPs with an average size of 40 nm. XRD results were remarkable in confirmation of synthesized AgNPs with distinct XRD peaks at 2θ values of 38, 44, 64, and 77 lattice planes were observed which indexed the facts of silver (111), (200), (220), and (311), respectively. The AgNPs showed effective antibacterial activity against tested microorganisms at 100 µg/discs concentrations. A significant mitotic index (22.8 ± 1.4^b and 26.9 ± 0.9^b) was observed in *A. cepa* root tips at 10 mg/ml, 5 mg/ml concentration, respectively.

Conclusion: It can be concluded that the endophytes of *W. somnifera* can be a good source for AgNP synthesis and showed a significant antimicrobial activity against tested microorganisms, especially *E. coli* followed by *S. aureus* and *P. aeruginosa.* Suggestive results were found in antimitotic activity which one of screening methods for development of anticancer drugs. An important outcome of our study will be the extension of value-added products for the industries of biomedical and nanotechnology based.

Keywords: Silver nanoparticles, Antibacterial, Antimitotic.

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INTRODUCTION

Endophytes may be bacteria or fungal organisms colonizing inter- or intra-cellular inside the tissues of host plants, causing no discernible symptoms of disease to plants [1]. These endophytes will be having the same characteristics of the plants in which it fosters [2]. Endophytic fungi are an unexplored group of organisms with abundant biodiversity and present in most of the plant parts especially in the tissues of evidently healthy leaf, with expansive potentials for imminent pharmaceutical substances [3,4].

Biological synthesis of silver nanoparticles (AgNPs) with these endophytes is plain sailing and eco-friendly. Nanotechnology is a luxuriate and blossomed the human life in the field of physical, chemical, and biological sciences and is mainly concerned with the synthesis of nanoparticles of different sizes, chemical composition, shapes [5,6] and their potential uses for the welfare of human kind [7]. Nowadays nanoparticles are of appreciable importance with the mechanism of action from that of antibiotics, easy proliferation into cells with limited side effects, thus rendering safe, cost effective [8] and economical to combat the future challenges. Biological synthesis of nanoparticles is gaining attention compared to the chemical and physical method of synthesis [9]. Nanoparticles synthesized with these endophytes shows distinguished results in antitumor [10], antibacterial [11], antibiotic [12], antiseptic [13], antioxidant [14], anti-inflammatory [15], antifungal [16], antiapoptosis [17], etc.

Withania somnifera is a member of family *Solanaceae* and leaves contain active constituents mainly withanine, somniferine, somnine, somniferinine, withananine, pseudo-withanine tropane, pseudotropine, choline, anaferine, anahydrine, and isopelletierine [18]. Leaf juice encompasses anti-inflammatory, antitumor, antistress, antioxidant, mind-boosting, immune-enhancing, and rejuvenating properties [19]. The roots of *W. somnifera* are employed to treat constipation, rheumatism, loss of memory, and neurodegenerative disorders and people have a tradition of use of this plant as a medicinal agent [20,21].

Since many of the bioactive molecules are present in *W. somnifera* as reported earlier by many authors, in the present investigation we have focused on the isolation of endophytic fungi from *W. somnifera* leaves, preparation of endophytic extracts and its phytochemical analysis, synthesis of AgNPs using endophytic extracts, characterization of AgNPs, antibacterial and antimitotic assay which is not yet reported for the AgNPs.

METHODS

Isolation of endophytic fungi from *W. somnifera*

Fresh leaves of *W. somnifera* were collected from village Dibbur, Tumkur, Karnataka, India, using sterile polythene bags and authenticated by the Department of Botany, Tumkur University, Tumakuru, Karnataka, India. These were incised into 0.5 mm pieces and surface sterilized for 1 min using 0.01% mercuric chloride solution followed by washing

RESEARCH ARTICLE OPEN ACCESS

Green synthesis of silver nanoparticles from Endophytic fungus *Aspergillus niger* isolated from *Simarouba glauca* leaf and its Antibacterial and Antioxidant activity

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ABSTRACT
The field of nanotechnology is the most promising area of the research. In our present study we report the biological method of synthesis of silver nanoparticles by endophytic extracts isolated from the leaf of *Simarouba glauca*. The surface Plasmon resonance characteristic of silver nanoparticles was revealed by the UV-Vis spectrum at 400 nm. The crystalline nature of silver nanoparticle was confirmed by X ray diffraction studies. Spherical shaped and monodispersed nanoparticles were found in Scanning electron micrograph. The average size of silver nanoparticles was 41.9 nm as determined by dynamic light scattering. The peak in silver region confirming the presence of elemental silver was determined by Energy dispersive X-ray spectroscopy analysis. Antibacterial activity of silver nanoparticles utilized in this study was found to be more significant than standard Taxim antibiotic against multidrug resistant bacteria such as *Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus* and *Klebsiella pneumonia.* Endophytic based silver nanoaprticles were found to possess significant antioxidant activity.

Keywords: silver nanoparticles, endophyte, multidrug, Taxim, Antioxidant.

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I. INTRODUCTION

Nanotechnology has acquired colossal propulsion in harmonizing metals into nanosized, shapes and controlled disparity owing to their prospective use for human benefits [1]. Due to cost effective and environment friendly nature, biological method of nanoparticles synthesis takes advantage over physical and chemical synthesis [2, 3]. For the synthesis of nanoparticles, many micro organisms such as bacteria (4), fungi (5), yeasts (6), plant extracts (7), and biological particles (8) have been exploited. As the fungi can secrete large amount of enzymes, in the synthesis of metal nanoparticles they are preferred as ideal candidates [9]. Silver is an effective antimicrobial agent with diverse *in vitro* and *in vivo* applications with greatest advantage to humans [10]. Currently topical dressing with silver based is widely used in treating chronic ulcers and open wounds [11]. Silver nanoparticles have found potential application in many fields such as, antibacterial, drug delivery, biological sensors, textiles and filters [12, 13]. *Simarouba glauca* is one of the important traditional medicinal plants due to the presence alkaloids, flavonoids, carbohydrates, glycosides, a phenolic compound, tannins, terpenoids, cardenolides, saponins, fixed oils which can usually account for their therapeutic action including Antibacterial, antiviral, anti-inflammatory, antiprotozoal and antitumor activities [14]. But never synthesized and characterized silver nanoparticles by the extracts of *Simarouba glauca.* Therefore, In the present article we emphasizes on the synthesis of silver nanoparticles from the endophytes contained in *Simarouba glauca* leaf, as these endophytes harbour inter or intra cellularly with the similar characters and also using these endophytes helps in maintaining ecological balance as if the plants are used in bulk synthesis of silver nanoparticles there is the risk of endangering of the particular plant thus entering into endophytic synthesis of nanoparticles can overcome this problem. In this study we prioritize on antimitotic assay, which is not yet reported for the

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IN VITRO AND *IN SILICO* ANTIOXIDANT, ANTI-INFLAMMATORY AND ANTIBACTERIAL ACTIVITY OF METHANOL LEAF EXTRACT OF *RANDIA SPINOSA*

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ABSTRACT

Randia spinosa leaves are using for treating skin diseases and they having important potent bioactive compounds. The methanol leaf extract yielded biologically important compounds viz., glycosides, phytosterol, alkaloids, flavonoids, phenol, tannins, athraquinones. The GC-MS of the same extract yielded nine biologically important compounds. The methanol leaf extract significantly showed strong antioxidant activity in DPPH and FRAP assays. The extract also inhibited the bacteria tested and also strong anti-inflammatory activity by inhibiting the heat induced albumin denaturation and red blood cells membrane stabilization, proteinase inhibition, BSA anti-denaturation and HRBC membrane stabilization. The *in silico* activity, Pyranol[4,3]benzopyron-1,9-dione, 5a-methoxy-9a-methyl-3-(1-propenyl) perhydro) and benzoic acid, 2-[2-methoxyethoxy)-5 (2,2-dimethylpropanolamine showed the highest binding affinity with high score and good hydrogen bond interactions with active site residues. The activities demonstrated by two compounds suggest that they could be useful in management of oxidant molecules, inflammation and growth of the bacteria.

KEYWORDS: *Randia spinosa*, phytochemicals, antioxidant, anti-inflammatory, antibacterial, molecular docking.

INTRODUCTION

Randia spinosa (Poir.) belongs Rubiaceae is a large shrubs or small trees. The plants seeds are using as tonic to treat induce appetite. The plant is given in diarrhoea and dysentery; skin diseases, gastrointestinal; snake and scorpion bite and wound healings.[1] The plant showed the presence of randia acid, saponin, oleanolic acid, leucocyananidin and mannitol, sapogenin, ursosaponin, ursolic acid, triterpenoid saponin, mucilage, resin, scopolectin, d-mannitol, randinoside, galioside, deacetylsperulosidic acid methyl ester, scandoside methyl ester, geniposide, gardenoside, The plant extract exhibited anti-inflammtory.[2,3] antitumor.[4] antimicrobial.[5-7] Mahabaleshwara et al.[8] have worked on phytochemicals analysis in methanol leaf extract of *Randia spinosa*.

The present investigation was aimed to know the role of methanol leaf extract in antibacterial, anti-inflammatory and antioxidant in in vitro and *In silico* methods.

MATERIALS AND METHODS

Collection and processing of plant

Rhe fresh leaves of *Randia spinosa* were collected from hill station of Devarayanadurga, Tumkur district, Karnataka, India in the month of June, 2014 and identified based on the characteristics. The plant material was washed with distilled water, shade-air dried (26 ± 2°C) and pulverized to a coarse powder in a mechanical grinder, passed through a 40 mesh sieve and stored in air tight container for further work.

Preliminary solvent extraction

Dried leaves of *Randia spinosa* extraction was done with methanol at 5 g/15ml (W/V). The methanol extract was dried after extraction and preliminary phytochemical analysis was carried out using standard procedures to identify constituents as described by Harborne.[9] Trease and Evans.[10] and Sofowara.[11]

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"Characterization and Green Synthesis of Silver Nanoparticles from *Plumeria* Leaves Extracts: Study of Their Antibacterial Activity".

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***Abstract**: In the present work, the stable silver nanoparticles were synthesized by the bioreduction method. Aqueous leaf extracts of the Plumeria plant was used as reducing and as capping agent. The color change in reaction mixture from bright green to dark brown color was observed which indication of the reduction of Silver ions into Silver nanoparticles. The formation of silver nanoparticles (AgNPs) was characterized by UV-vis spectroscopy, FT-IR, SEM and XRD studies. The synthesized AgNPs exhibited good Antibacterial potential against gram positive and gram negative bacteria.*

***Keywords:** Plumeria, Silver nanoparticles, UV-vis, XRD, SEM, Anti bacterial activity.*

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I. Introduction

Nanotechnology is a science and engineering branch involving the synthesis of nanoparticles at the nanoscale, i.e. 1 to 100 nm. Nanoparticles possess high surface to volume ratio due to their small size, which gives very distinctive features to the nanoparticles. The study about Nanoscience and nanotechnology provides the well developed application of exceptionally miniature things and be capable of the encroachment of all the fields of scientific research and development like Physics, Chemistry, Materials and Metallurgy engineering, Biology and also in Biotechnology [1, 2]. At present, there is an emergent need to develop environmentally benevolent nanoparticles synthesis routes, which can be proceeded by biological method instead of chemical methods. The use of ecologically beneficial materials like plant leaf extracts, bacterial cell extracts, fungi and enzymes for the synthesis of nanoparticles proposes abundant benefits in terms of eco -friendliness and compatibility for a wide range of pharmaceuticals. Accordingly, the researchers in the field of nanoparticles synthesis and assembly have turned to biological systems for inspiration [3]. Currently, the use of green synthesis methods for the synthesis and production of engineered nanomaterials in both industrial application and the scientific research has achieved a massive amount of interests [4]. Green synthesis method is beneficial over other methods which are implemented for the synthesis of nanoparticles. Green synthesis methods are eco-friendly approach and compatible for pharmaceutical and other biomedical applications, as the toxic chemicals are not used in these methods [5]. While chemical synthetic procedures can lead to the generation of toxic chemical by-products or require high temperatures and/or pressure, biosynthesis of nanoparticles using plant extracts provides a facile and 'green' method of nanoparticle synthesis.[6,7] Silver Particles are of more interest in their colloidal perpetrations because of their distinctive properties, like chemical stability, conductivity, catalytic and antibacterial activities [8]. Silver in different forms and as nanoparticles have been used in medicine for dental materials, wound treatment, coating on stainless steel materials, water purification and in sunscreen lotions [9]. Silver has long been recognized as an antiseptic and anti-biotic since is having an inhibitory effect towards many microorganisms [10]. Many researchers are have used variety of plants for the synthesis of silver nanoparticles. The following plants and their extracts have been used for green synthesis; leaves extract of castor oil (*Ricinus Communis)*, khat (*Catha Edulis*) and sun flower (Helianthus Annuus)[11], O*cimum sanctum*[12], *Aspergillus oryzae*[13], *Crinum asiaticum*[14], Azadirachta indica aqueous [15,16], Bamboo [17], *Dodonaea viscosa* and *Capparis deciduas*[18], *Bryophyllum pinnatum*[19] and fruit extract of Andean blackberry [20].

Plumeria is a genus of flowering plants in the family Apocynaceae. *Plumeria* is related to the Oleander, Nerium oleander, and both possess an irritant, rather similar to that Euphorbia. The leaves of *Plumeria* are narrow and corrugated dark-green color. The various species of *Plumeria* are known to have medicinal properties and have a long history of use by indigenous and tribal people in India. The medicinal

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Effect of *Citrus medica* L Fruit Peel Extract on Genotoxicity Induced by Cyclophosphamide in Mice Bone Marrow Cells

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Abstract: Fruit waste reutilization is one of the fore most routes of employing it in many peculiar products. Here, we have evaluated the effect of *Citrus medica* L. fruit peel extract on genotoxicity induced by cyclophosphamide in mice bone marrow cells using micro nucleus assay. Mice were orally pretreated with solutions of *citrus medica* L peel extract prepared at different doses (Low dose: 5mg and High dose: 10mg) for 5 successive days. Then on the sixth day mice were injected intraperitoneally with cyclophosphamide and after 24hr the mice were killed for assessment of micronucleated polychromatic erythrocytes (MnPCEs) in bone marrow cells. Cyclophosphamide and its metabolites may be involved in the toxic reactions and cause DNA damage, inducing genotoxic effects in the cells. In our study, administration of *citrus medica* extract suspension for 5 days resulted in a dose dependent inhibition of micronuclei formation induced by cyclophosphamide in mouse bone marrow cells. *Citrus medica* extract suspension significantly reduced the frequency of MnPCEs to show a protective effect against the side effects of cyclophosphamide. The strong antioxidative activity of citrus extract contributed to reduction in the genotoxicity induced by cyclophosphamide.

Key words: Genotoxicity · Micro Nucleus · Antioxidant · DNA · Dose Dependent.

INTRODUCTION

Genotoxicity is defined as a destructive effect on a cell's genetic material (DNA, RNA) affecting its integrity by damaging them irreversibly [1-3].

Cyclophosphamide (CYP) is a cytotoxic alkylating agent used to treat sarcomas and carcinomas of the lung and mammary organs in animals. Since the CYP causes a serious side effects such as genotoxic impacts, renal and hepatic damage, thereby limiting its therapeutic use. Its cytotoxic impacts result from the responsive metabolites that alkylate DNA and form an assortment of DNA adducts that adequately modify DNA structure or capacity prompting to arrangement of chromosomal deviations and micronuclei development [4]. Subsequently, the cyclophopshamide was utilized in our review for instigating genotoxicity in mice.

Citrus medica L. (citron) belongs to family, Rutaceae is widely distributed in Himalayas and hill areas in India and also this herb is found in many parts of the tropical world, Mediterranean, south and central America [5].

Citrus medica contains citroflavonoids that have been found to possess antidiabetic activity [6]. In ayurvedic practice, the dried rind or citrus juice is used in kapha and vata diseases, as a vermifuge, for asthma and digestive disorders, as antiscorbutic and also used to counteract nausea, to increase appetite and as an antimicrobial agent [7-9]. Limited studies are available in the scientific literature on effect of *Citrus medica* peel extract on genotoxicity. Therefore, it was aimed to evaluate the possible effect of peel extract of *Citrus medica* on genotoxicity in mice bone morrow cells by micro nucleus assay.

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Original Article

ANTIBACTERIAL ACTIVITY OF SYNTHESIZED SILVER NANOPARTICLES BY *SIMAROUBAGLAUCA* AGAINST PATHOGENIC BACTERIA

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ABSTRACT

Objective: The present study outline the plant-mediated synthesis of silver nanoparticles (AgNPs) using leaf extract *Simaroubaglauca*, which act as both reducing and stabilizing agent.

Methods: Formation of silver nanoparticles was confirmed by primarily by Ultraviolet/visible spectroscopy. X-ray diffraction studies revealed the crystallinity of the nanoparticles. The scanning electron microscopy was carried out to determine the mean particle size, as well as the morphology of the NPs and the composition of elements, was studied with Energy Dispersive X-ray analysis (EDS).

Results: The silver nanoparticles were spherical in shape with a mean size of 23 nm. The EDS showed strong optical absorption peak at 3keV and it was confirmed the formation of AgNPs. The synthesised AgNPs further utilized for the evaluation of antibacterial activity and shown significant antibacterial activity against *Escherichia coli, Pseudomonas aeruginosa, Enterobacter* and *Klebsiella pneumonia* at 50 µg/ml and 100µg/ml concentrations.

Conclusion: The synthesised silver nanoparticles have been characterised by UV-vis, SEM-EDAX and XRD to determine the sizes and shapes of the silver nanoparticles.

Keywords: *Simaroubaglauca,* Silver nanoparticles, Leaf extract, Bioreductant, Antibacterial

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INTRODUCTION

Every person will suffer from either one or other diseases caused by various bacteria at least once in his or her lifetime that shows resistance against one or two existed antibiotics and which leads a severe public health problem [1, 2].

Hence, there is top-priority to develop alternative treatments for bacterial diseases. Silver was being used in the field of medicine for antimicrobial applications such as burn therapy [3, 4], removal of microbes on textile fabrics [5-7], and inhibition of colonization of bacteria on catheters [8-10]. As antimicrobial agents, Nano-silver systems offer many advantages. They own a very high effect towards a broad range of microbes and parasites, even at low doses and does not shows toxicity in humans and relatively inexpensive.

Thus Silver has been suspended within a wide variety of materials, under various forms such as salts, immobilized ions or metallic nanoparticles [11-13]. Plasma membrane, many important enzymes and DNA of the bacteria are important targets for silver ions [14-18].

Simaroubagluca is one of the important traditional medicinal plants due to the presence alkaloids, flavonoids, carbohydrates, glycosides, a phenolic compound, tannins, terpenoids, cardenolides, saponins, fixed oils which can usually account for their therapeutic action includingAntibacterial, antiviral, anti-inflammatory, antiprotozoal and antitumor activities [19]. But never synthesized and characterized silver nanoparticles by the extracts of *Simaroubaglauca.*

Here, we synthesized silver nanoparticles using an aqueous leaf extract obtained from *Simaroubaglauca.* In addition, to consider the biological application of our work, antibacterial evaluation was carried out.

MATERIALS AND METHODS

Preparation of leaf extract

Silver nitrate ($AgNO_3$) was purchased from sigma-aldrich and fresh *Simaroubagluca* leaves were collected from Shridevi Institute of Engineering and Technology Campus in Tumakuru of Karnataka, India. The collected leaves were washed thoroughly and cut into small pieces. Finely incised *SIMAROUBAGLAUCA* leaves (20g) were weighed and transferred to 500 ml conical flask containing 100 ml of distilled water and gently mixed and boiled for 5 min.

The obtained extract was collected filtered through Whatman No.1 filter paper and the filtrate was collected in 250 ml Erlenmeyer flask and stored at 4 °C for further use.

Fig. 1: ***Simaroubaglauca***

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BIOSYNTHESIS OF SILVER NANOPARTICLES USING LEAVES EXTRACTS OF *ACALYPHA HISPIDA* BURM.F. AND STUDY OF THEIR ANTIBACTERIAL ACTIVITY

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ABSTRACT

The synthesis of metal nanoparticles is an expanding research area due to their potential applications for the development of novel technologies. In this study, we have described a cost effective, green and environment friendly technique for synthesis of silver nanoparticles (AgNPs) and their antibacterial activity. The aqueous Ag^+ ions from 5mM silver nitrate solution were reduced into AgNPs when treated with the leaves extracts of Acalypha hispida. The synthesized AgNPs were characterized by UV–visible spectroscopy, Fourier transform infra-red spectroscopy (FTIR), X-ray diffraction (XRD) and Scanning electron microscopy (SEM) analysis. The phytochemical analysis of the plant Acalypha hispida leaves extracts reveals the presence of flavonoids, saponins, alkaloids, phenols, tannins and cardiac glycosides. The silver nanoparticles were tested for antimicrobial activity and AgNPs have shown good antibacterial activity against Staphylococus aureus, Pseudomonas aeruginosa, Escherichia -coli and Klebsiella aerogenes.

Keywords: Acalypha hispida, Leaves extracts, AgNPs, XRD, SEM, Antibacterial activity.

Corrosion Characterization Of ZA-27 / Red Mud Metal Matrix Composites In Sodium Chloride Solutions

Jayaprakash, H.V, Chandrasekhar N, M.K.Veeraiah, P.V.Krupakara

Abstract: The present investigation aims to evaluate the corrosion characteristics of red mud metal in sodium chloride solution. Metal matrix composites [MMC] are heterogeneous systems containing matrix and reinforcement. Matrix may be alloy or metal or polymer. Reinforcement may be particulate or fiber or whisker. Their physical and mechanical properties can be tailored according to requirement. They are used in automobile, aircraft and marine industries because of their increased corrosion resistance. In this study weight loss corrosion tests and Potestiodynamic polarization studies by using potestiostat are conducted on ZA-27/ Red Mud metal matrix composites in different concentrated sodium chloride solutions. Both matrix and reinforcements are commercially available. Composites are prepared by liquid melt metallurgy technique using vortex method. Composites containing 2, 4 and 6 percent of preheated but uncoated red mud are prepared. Cylindrical specimens and rectangular specimens are machined. Studies are carried out in 0.035%, 0.352% and 3.5% solutions of sodium chloride. In all the tests the composites were less prone to corrosion than the matrix. Hence the composites can be used in the marine environment.

Key words: ZA-27, Red Mud, Vortex, Corrodent, Sodium chloride, MMC.

1. INTRODUCTION

Metal Matrix Composites (MMCs) are being extensively used in automotive, aerospace and mining engineering, etc. as they are reported to possess high strength–to-weight ratio at elevated temperatures, improved shock-resistance properties, relatively higher wear resistance, toughness, etc.

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Corrosion can affect the metal matrix composite in a variety of ways which depend on its nature and the environmental conditions prevailing [1]. Metal matrix composites are engineering combination of two or more materials (one of which will be metal or alloy) where tailored properties are achieved by systematic combination of different constituents. Composites are metal frameworks comprising of a blend of at least two constituents insoluble in each other and contrasting in shape and material composition. They are heterogeneous materials comprising of at least two phase, which are in intimate contact with each other on a microscopic scale. They are additionally homogeneous material in sense that any piece of it will have the same physical properties on an microscopic scale. Zinc alloys are feasible matrices for MMCs and are suitable replacements for cast iron, brass or alluminium alloys. These alloys have excellent pressure tightness, good bearing and wear properties [2]. Among the zinc based foundry alloys; the ZA family of alloys has been used increasingly during the past few years. The three common ZA casting alloys are ZA-8, ZA-12 and ZA-27. These alloys present advantages in comparison with alluminium based alloys, especially because of their high strength and low casting temperatures and have been used for lower cast replacements of bronze and brass castings. ZA-27 alloys have been used in bearings and bushing applications as a replacement for bronze bearings because of their lower cost and equivalent or superior bearing performance [3]. Red mud was brought from Noranda Mines Limited, Renikoot District, Utthar Pradesh, India and used for the preparation of ZA-27 alloy. The Red mud is selected because of its low initial cost, excellent foundry castability, good mechanical properties and good machinability. The corrosion behaviour of the composites in the various environments that the material likely to encounter is one important consideration when choosing a suitable material for a particular purpose. There is very little information available about the corrosion behaviour of zinc-based composites. According to various researchers [4], [5] the corrosion behaviour of alluminium alloy reinforced with graphite has received relatively little attention. But corrosion behaviour of ZA-27 reinforced with graphite [6] in hydrochloric acid and SAE40 engine oil has

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One-step green synthesis of silver nanoparticles using flower extract of *Tabebuia argentea* Bur. & K. Sch. and their antibacterial activity.

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ABSTRACT

Green synthesis is one of the rapid, reliable, and best methods for the synthesis of silver nanoparticles at ambient temperature without application of hazardous agents. The present study described the formation of silver nanoparticles by the flower extracts of *Tabebuia argentea*. Synthesized silver nanoparticles were characterized by UV-vis spectroscopy, Scaning electron microscopy and X-Ray diffraction studies. Silver nanoparticles synthesized have shown significant antibacterial effect and the outcome of our study propose that the produced silver nanoparticles bestow superior substitutes in drug development.

Keywords: *Tabebuia argentea*, flower extract, UV-vis, SEM, XRD, antibacterial.

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ECO-FRIENDLY APPROACH FOR THE GREEN SYNTHESIS OF SILVER NANOPARTICLES USING FLOWER EXTRACTS OF *SPHAGNETICOLA TRILOBATA* AND STUDY OF ANTIBACTERIAL ACTIVITY

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ABSTRACT

In the present study, the Silver nanoparticles (AgNPs) were synthesized through green route using flower extracts of Sphagneticola trilobta. The aqueous silver ions were reduced into AgNPs as mixed with the Sphagneticola trilobta flower extracts. Synthesized AgNPs were characterized by UV–visible spectroscopy, Fourier transform infra-red spectroscopy (FTIR), X-ray diffraction (XRD) and Scanning electron microscopy (SEM) analysis. The phytochemical analysis of the plant Sphagneticola trilobta flower extracts reveals the presence of flavonoids, alkaloids, cardiac glycosides and saponins. The synthesised silver nanoparticles (AgNPs) have shown good antibacterial activity against E-coli, Klebsiella aerogenes, Staphylococus aureus and Pseudomonas aerogenes.

KEY WORDS

Flower extracts, silver nanoparticles (AgNPs), antibacterial activity UV-Vis, FT-IR, XRD and SEM.

I. INTRODUCTION

Nanotechnology is the creation, control and utilization of materials at the nanometer measure scale (1 to 100 nm). At this size scale, there are significant differences in many material properties that are typically not found in similar materials at bigger scales. In spite of the fact that nanoscale materials can be created utilizing an assortment of customary physical and concoction forms, it is currently conceivable to naturally blend materials through condition amicable green science based methods. As of late, the union amongst nanotechnology and science has made the new field of nano biotechnology that consolidates the utilization of natural elements, for example, actinomycetes green growth, microscopic organisms, parasites, infections, yeasts, and plants in various biochemical and biophysical forms. The organic blend by means of nano biotechnology procedures have a critical potential to help nanoparticles generation without the utilization of, toxic and expensive chemicals usually utilized as a part of customary physical and compound procedures. Nanoparticles are of great interest due to their novel physicochemical, magnetic, and optoelectronic properties that are governed by their size, shape, and size distribution [1–6]. In recent years, noble metal nanoparticles have been the subject of focused research due to their unique mechanical and chemical properties that are significantly different from those of bulk materials [7]. Silver nanoparticles have many important applications such as these can be used as an antimicrobial agent, used in textiles, in home water purification systems, medical devices, cosmetics, electronics, and household appliances [8]. Other than their antimicrobial properties the silver nanoparticles exhibit strong optical features making the nanoparticles suitable for biological sensing and imaging [9]. Since the Silver nanoparticles possess high conductivity, these are used in conductive inks, adhesives and pastes for a range of electronic devices [10].

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Research Journal of Pharmaceutical, Biological and Chemical Sciences

Production and Partial Purification of Staphylokinase from *Staphylococcus hominis.*

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ABSTRACT

Staphylokinase (SAK) is an amino acid enzyme activates plasminogen to form plasmin, which digest fibrin clots. This disrupts the fibrin meshwork which can often form to keep an infection localized. Staphylokinase was isolated from Staphylococcus hominis having therapeutic function to dissolve the blood clots. Staphylococcus hominis was isolated from curd. Staphylococcus spp was confirmed by morphological, biochemical and molecular techniques such as 16s rDNA sequencing. Satoh's medium was used for the production Staphylokinase. Cells were separated from culture broth by centrifugation and the supernatant fluid was added to 3 volume of acetone. After centrifugation of the mixture, the resultant precipitate was purified by ion exchange column chromatography (DEAE Cellulose). Sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) was done by using 10 to 20% gradient polyacrylamide gel and a 4% stacking gel at 4°C. The purity of the Staphylokinase was determined by SDS-PAGE and HPLC. The proteolytic and the plasmolytic activity of the enzyme produced by the isolated staphylococcus hominis was screened by Casein hydrolysis assay and heated plasma agar assay respectively.

Keywords: Staphylokinase, fibrin clots, *Staphylococcus hominis,* Satoh's medium, SDS-PAGE.

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Silver nanoparticles: Synthesized by leaves extract of Avocado and their antibacterial activity

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Abstract— **The present work mainly deals with the study pertaining to the synthesis, characterization and evaluation of antibacterial properties of silver nanoparticles (AgNPs) synthesized by the leaves extracts of Avocado*(Persia americana)*. The silver nanoparticles were synthesized by using a rapid, single step and completely green synthetic method. The synthesized silver nanoparticles were characterized by using various instrumental techniques such as ultraviolet-visible spectroscopy (UV-Vis), Fourier transformed infrared spectroscopy (FTIR), X-ray diffraction (XRD) and scanning electron microscope (SEM). The synthesized silver nanoparticles were found to be spherical in shape with average diameter of 35.6 nm.The synthesised silver nanoparticles (AgNPs) have shown good antibacterial activity against *E-coli, Klebsiella aerogenes, Staphylococus aureus* and *Pseudomonas aerogenes.***

Key words— **Avocado, Leaves extracts, silver nanoparticles (AgNPs), antibacterial activity.**

I. INTRODUCTION

Nanotechnology is the one of fastest growing areas of manufacturing nanoparticles in recent days. Many researchers have witnessed biosynthesis of nanoparticles and their applications in catalysis, chemical sensing, bio-sensing, photonic, electronics, area of medicine and drug delivery [1-5]. There is increasing optimism of nanotechnology has applied to medicine, will bring significant advances in the diagnosis and treatment of diseases. One of the fields in which nanotechnology finds extensive applications for nanomedicine, an emerging new field which is an outcome of a fusion of nanotechnology and medicine. Nanotechnology can improve our understanding of the living cells and molecular level interactions. A number of nanoparticles based therapeutics has been approved clinically for vaccines, infections and renal diseases. One of the applications of silver nanoparticles in drug discovery, drug delivery and new drug therapies has declared war on dreadful diseases and they use on body natural transport pathway and natural mechanism of uptake of drug by the diseased cell. Nanoparticles can be synthesized by using various methods including physical, chemical, and biological methods. Although chemical method of synthesis requires a short period of time for synthesis of nanoparticles in large quantity, environmental nontoxic synthetic for nanoparticles synthesis leads to developing interest in biological approaches, which are free from the use of toxic chemicals as a by products. Many biological approaches for intracellular and extracellular nanoparticles synthesis have been reported till date using microorganisms including plants, fungi and bacteria. Plants have been providing a better platform for synthesis of nanoparticles, they are free from toxic chemicals and providing a natural capping agents. A number of plant extract mediated synthesis of AgNPs have been reported in the literature. For instance the use of Red Apple (*Malus domestica*)[6], M*yristica fragrans* (nutmeg)[7], *Portulaca oleracea*[8], *Piper betle* leaves[9], *Adansonia digitata* leaf extract[10], *Adansonia digitata* leaf extract[11], *Aeglemarmelos [12], Murraya koenigii[13], Cardiospermum halicacabum* L. leaf extract[14].

The Avocado *(Persia americana)* is a tree that is native to south central Mexico [15], classified as a member of the flowering plant family Lauraceae. *Avocado* additionally refers to the tree's fruit, which is botanically a large berry containing a single seed. In India, *Avocado* is not a trade fruit crop. This plant was introduced from Sri Lanka in the twentieth century. A very small scale and in a scattered in different directions, it is grown in Karnataka, Maharashtra, Tamil Nadu, Kerala in the south-India and in eastward Himalayan state of Sikkim.

Varieties: All the three horticulture races make suitable to tropical and sub-tropical conditions those are Mexican, Guatemalan and West Indian have been tried in Indian country. The selective breeds of West Indian race are grown in Karnataka, Maharashtra and Tamil Nadu.