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SYNTHESIS AND CHARACTERIZATION OF SILVER NANO PARTICLES BY USING ALOE BARBENDENSIS

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ABSTRACT :

An experiment was conducted entitled "Synthesis and characterization of silver nano particles by using Aloe barbendensis" with the objectives to standardize the protocol and to study the antimicrobial activity of nano particles prepared by using Aloe Vera gel. Fresh Aloe Vera gel was collected from the botanical garden of CABT, Hatta, Dist. Hingoli and all the Aloe Vera plant were 6 months old. Gel was extracted from the leaves of Aloe Vera and filtered by using traditional hand filtering procedure and treated with silver nitrate ($AgNO_{3)}$ and incubated at 37^0 C for 24hrs. Two bacterial and two fugal species were used to determine the antimicrobial activity of silver nanoparticles Different Conc. Of silver nanoparticles were used to study the antimicrobial activity The maximum activity was found against fungus at 100 µg/ml .The silver nano particles activity were determined on the basis of zone of inhibition. The maximum zone of inhibition were recorded was 29 mm in fungus and 22 mm in bacteria. The entire bacterial and fungal samples were isolated from pure culture brought from VNMKV, Parbhani.

KEYWORDS : *Aloe Vera, $AgNO_{3,}$ Nutrient Agar media and PDA media.*

INTRODUCTION

The field of Nanotechnology is one of the most active areas of research in modern material science. The world "*nano*" is used to indicate one billionth of meter. The term nanotechnology was coined by Taniguchi a researcher at the University of Tokyo, Japan. Nanoparticles exhibit completely new or improved properties based on specific characteristics such as size, distribution and morphology. New application of Nanoparticles and nonmaterial's are emerging rapidly.

Infectious diseases are the leading cause of death world-wide. So, antibiotics resistance has become a global concern but the clinical efficacy of many existing antibiotics is being threatened by the emergence of multidrug - resistance pathogens. Even though pharmacology industries have produced a number of new antibiotics in the last three decades, resistance to these drugs by microorganisms has increased. In general, bacteria have the genetic ability to transmit and acquire resistance to drugs, which are utilized as therapeutic agents.

Nanotechnology is now creating a growing Sense of excitement in the life sciences especially biomedical device and Biotechnology. Nanoparticles exhibit completely new or improved properties based on specific characteristics such as size, distribution and morphology. The Silver Nanoparticles have various and important application. Historically silver has been known to have a disinfecting effect and has been found in application ranging from traditional medicine to culinary items. It has been reported that silver Nanoparticles (SNPs) are non- toxic to humans and most effective against bacteria, viruses and other eukaryotic micro-organisms at low concentrations and without any side effects. Moreover, several salts of silver and their derivatives are commercially manufactured as antimicrobial agents. In small concentrations, silver is safe for human cells, but lethal for micro-organisms.

Nanoparticle is a microscopic particle with at least one dimension less than 100 nm. Nanoparticles investigation is currently an area of passionate scientific research due to a wide variety of potential

applications in biomedical, optical and electronic fields. Nanoparticles are of immense scientific interest as they are effectively bridge between bulk material and atomic molecular structure. To date metallic Nanoparticles are mostly prepared from Nobel metals. The use of metallic Nanoparticles in the field of catalysis optoelectronic, pinpointing biomedical troubles and exhibit device uncovered many significant findings. Among the Nobel metals, silver (Ag) is the metal of preference in the field of biological systems, living organisms and medicine.

OBJECTIVES

- To synthesized plant based nanoparticles using Aloe vera gel.
- To study antimicrobial activity of nanoparticles prepared by using Aloe Vera gel.
- To standardize protocol for synthesis of nanoparticles

MATERIALS AND METHODS

Materials:

The investigation described under this chapter was done at college of Agriculture Biotechnology Hatta, Tq. Basmat Dist. Hingoli various materials used during the present investigation described under following sub-headings.

Plant material: Fresh leaves of *Aloe barbadenesis*.

Instruments and Glassware:

mortar and pastel, stand, electronic balance, measuring cylinder, petriplate, glass spreader, filter paper discs, What's Mann filter paper, Aluminium foil, Funnel, cotton, conical flask, Glass rod, UV-Visible spectrophotometer, water bath, incubator, Cork Borer etc.

Chemical and Media:

Silver nitrate (AgNo3) was used to check the microbial activity with Aloe vere extract, Potato dextrose agar media, and Nutrient Agar Media for the growth of micro-organisms. All the chemical and media used during this project work were produced from Hi media Pvt.India and nice chemical Pvt.Ltd India.

Table: Compositionof Potato Dextrose Agar media:

S. N.	Component	Weight in Gram
01	PDA Powder	39
02	Agar agar Powder	15
03	D/W	1000

Table: Composition of Nutrient Agar Media:

S.N	Component	Weight in Gram
01	Peptone	10.0
02	Beef Extract	10.0
03	Agar powder	15.0
04	pH	7.0
05	D/W	1000ml

Microbial Culture: We have used two bacterial Bacillus subtillis, Escherichia Coli, and two fungal speciesAspergillusniger, Aspergillusflavus.

Table: Morphological Characterization:

Organisms	Size (µm)	Shape	Colour	Gram Nature
Bacillus subtilis	4-10	Rod-Shaped	White	+ve
Escherichia coli.	0.5-4	Rod-Shaped	Cream	-ve
Aspergillus niger	45-55	Sub-globes	Black	+ve
Aspergillusflavus	50-55	Radiate	Yellow Green	-ve

Methods:

Collection and preparations of plant material:

Leaves of Aloe *barbadenesis* were collected from the botanical garden of college of Agriculture Biotechnology, Hatta.

Collection of pathogens:

Microorganisms were isolate in the laboratory of CABT Hatta from soil and sewage water by growing on selective and then pure cultures were obtained from the isolate plate.

Preparations of plant extracts:

Fresh Aloe Vera were collected. The gel was extract from the levels using traditional Hand filleting procedure. 25 g of gel was chopped into pieces and grinded using morter and pestle. The gel was mixed with equal volume of distilled water and heated at 85^{o}C for 10 minutes. The mixture was filtered by using whattman filter paper no.1. The extract was stored 4^{o}C and used for further experiment.

Preparations of silver nitrate (AgNo3) solutions:

1m M silver nitrate solution was prepared by adding 0.0169gm AgNo3 in 100ml of distilled water.

Synthesis of silver Nanoparticles:

0.1M silver nitrate solutions was prepared in distilled water.20ml of the AgNo3 solutions was taken in a glass beaker and kept in magnetic stirrer for 15min at 65^{o}C 1ml of plant extract was added drop wise in different volume of AgNo3 solution with continuous stirring. The mixture was kept on magnetic stirrer for 15 minutes and Silver nitrate solutions keeping at incubation in dark for 24 hrs. To observe color change to reddish brown, change in color indicates synthesis of silver nanoparticles

The bioreduction of silver ions in aqueous solutions was monitored by periodic sampling of aliquots (3ml) and subsequently measuring UV-visble spectra of the solutions by using UV visible spectrophotometer.

Antimicrobial activity of Aloe *barbadenesis* and Silver Nanoparticles:

Antimicrobial activity of the silver nanoparticles either extract of Aloe barbadenesis. Leaves wasteasted by well diffusion method. Potato dextrose agar and Nutrient agar was prepared and poured 20ml each in petriplate of 9 cm diameter and allowed to solidify. A quantity of 0.1 ml from above over night grown micro-organisms containing approximately 10^{6}- 10^{8} CFU/Plate was used in Inoculums, spread over plate by spread plate method - one well of 6 mM size made in the Nutrient agar and PDA Plate with the help of sterile cork borer, the were located within 25, 50, and 100 micro liter of SNPs either extract of Aloe Vera leaves. Plates were incubated at 37^{o}C of 24 hrs. After incubation, the plate observed for the formation of clear zone of growth inhibition around the well presence of zone of inhibition indicates. Antimicrobial activity of the zone of inhibition was calculated by measuring the millimeter of zone around the well.

RESULTS

The results of this investigation are described below.

Yellowish- brown colour in the reaction vessels suggests the formation of silver nanoparticles (SNPs). The synthesis of SNPs had been confirmed by measuring the UV-Vis spectrum of the reaction media. The UV-

Vis spectrum of colloidal solutions of SNPs synthesized from Aloe *barbadenesis* have absorbance peaks at 360nm, 450 nm respectively and the broadening of peak. Indicate that practical's are poly-dispersed. Nanoparticles produced by Aloe Vera (Aloe *barbadenesis*).

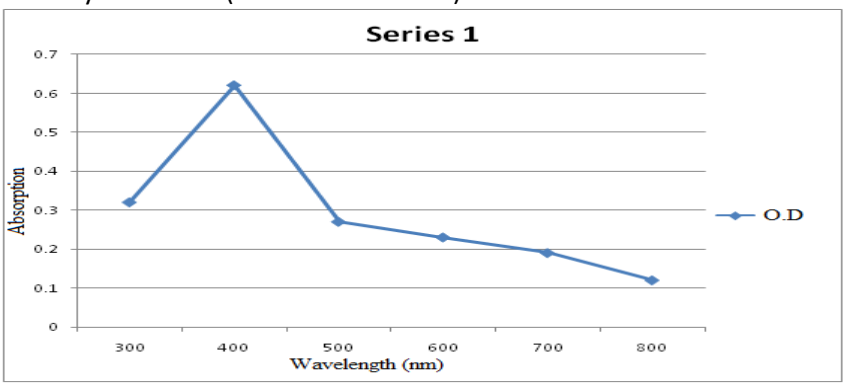

Fig: 3.1.1 Absorbance peak of silver nanoparticles synthesized by using *Aloe barbadenesis.*

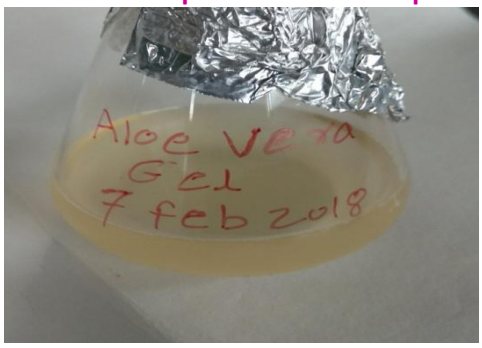

Fig: Aloe vera extract.

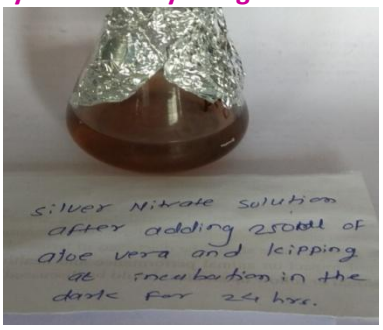

Fig: Silver nanoparticles.

Fig.3.3 Antimicrobial activity of silver nanoparticles on Aloe *Barbadenesis*

Fig: Zone of inhibition in *Bacillus subtilis.*

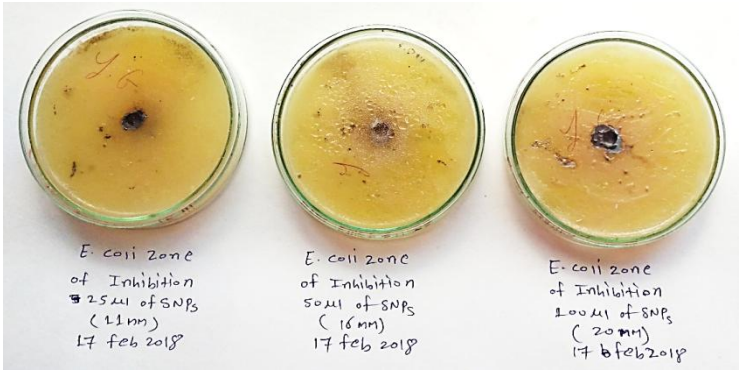

Fig: Zone of inhibition in *Escherichia coli.*

Fig: Zone of inhibition in *Aspergillusnigar*

Fig: Zone of inhibition in *Aspergillusflavus*

Table: Antibacterial and Antifungal activity of SNPs.

Sr.no	**Conc. Of AgNo3 nanoparticles from *Aloe barbadenesis***	**Zone of inhibition (mm)**			
	(µg/ml)	***B. subtillis***	***E.coli***	***A.niger***	***A.flavus***
1	25	12	11	19	15
2	50	16	16	20	19.1
3	100	22	20	29.1	26.2
4	Control	Nil	Nil	Nil	Nil

The synthesized silver nanoparticles were found effective against fungal species minimum effective conc. Was 100 µm/ml and maximum zone of inhibition was recorded in A. niger species which is 29.01mm where as in control no. zone of inhibition was observed.

OUTCOMES OF THE PROJECT

Development of antibiotic resistant or multi drug resistant pathogens is the serious problem in medical field at present investigation of new drugs is somewhat tedious and long terms job there for researchers for us in their research over synthesis of new drugs which are safe effective and reasonable. Aloe Vera plant is natures gift to humans which have strong antimicrobial properties.In present study Silvarnanoparticle were synthesized by using aloe Vera gel and there antimicrobial activities work observed. Such type of studies provides based for further research and prove helpful in the search of effective and reasonable drugs with no side effect. The production of nanoparticle was successful and activity shows in various research paper.

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