

BIOGENIC SYNTHESIS OF METAL NANOPARTICLES AND CHECKING IT'S ANTIBACTERIAL TENDENCY

Submitted in partial fulfillment of the requirements for the award of Bachelor of
Engineering / Technology degree in Biotechnology

By

Sudhir Sakthi Raja A (39230049)

Syed Ibrahim (39230051)



**DEPARTMENT OF BIOTECHNOLOGY
SCHOOL OF BIO AND CHEMICAL ENGINEERING
SATHYABAMA**

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with Grade "A" by NAAC JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

MAY - 2022

DECLARATION

I **A.SUDHIR SAKTHI RAJA , SYED IBRAHIM** hereby declare that the Project Report entitled **BIOGENIC SYNTHESIS OF METAL NANOPARTICLES AND CHECKING IT'S ANTIBACTERIAL TENDENCY** done by me under the guidance of Dr. /Prof./ Mr./Ms. **(Internal) RAMESH KUMAR and SATHISH (External) at AVIGEN BIOTECH LAB , CHROMPET** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering / Technology degree in **B.Tech Biotechnology**

DATE: 29-04-2022

PLACE: CHENNAI
CANDIDATE

SIGNATURE OF THE

SUDHIR

SYED IBRAHIM



DEPARTMENT OF Biotechnology

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of A.SUDHIR SAKTHI RAJA(39230049) AND SYED IBRAHIM(39230051) who carried out the project entitled BIOGENIC SYNTHESIS OF METAL NANOPARTICLES AND CHECKING IT'S ANTIBACTERIAL TENDENCY " under my / our supervision from 15.4.2022 to 28.4.2022

RAMESH KUMAR

Internal Guide

SATHISH

External Guide

Head of the Department

Submitted for Viva voce Examination held on 29-04-2022

Internal Examiner

External Examiner

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of SATHYABAMA for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to Dr.**RAMESH KUMAR.**, Dean, School of **BIOTECHNOLOGY** and Dr.**RAMESH KUMAR**, Head of the Department, Dept. of **BIOTECHNOLOGY** for providing me necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Project Guide Dr./ Mr.**SATHISH** for his valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work.

I wish to express my thanks to all Teaching and Non-teaching staff members of the Department of **BIOTECHNOLOGY** who were helpful in many ways for the completion of the project.

ABSTRACT:

We used *Fragaria ananassa* (strawberry) leaf extract as a source of natural reducing, stabilizing agents to develop an eco-friendly, and safe process for the biosynthesis of metal-based nanoparticles including silver, copper, iron, zinc and magnesium oxide. To confirm the successful formation of nanoparticles different techniques applied. UV-Vis spectroscopy Fourier Transformed Infrared Spectroscopy (FT-IR) was used to study the structure and properties of biosynthesized nanoparticles. The results show the successful formation of metal-based particles in the range of nanometers, confirmed by characterization techniques. Hence, we used this nanoparticles on wound healing bandages and we also made antifungal gel to apply on places affected by fungal infection.

CONTENTS

- Introduction
- Literature survey
- Aim and Scope of the present investigation
- Experimental or materials and methods; algorithms used
- Results and Discussion, Performance Analysis
- Summary and Conclusions

INTRODUCTION

This project is based on the production of metal nanoparticles using leaf extracts such as pomegranate leaves , mango leaves , blackcumen . The aim is to produce nanoparticles such as Gold , Silver , Zinc and Copper and check it's antibacterial nature . There are many applications - we are making a antibacterial bandage with the help of these metal nanoparticles containing antibacterial nature .

Metal Nanoparticles:

Metal nanoparticles are submicron scale entities made of pure metals (e.g., gold, platinum, silver, titanium, zinc, cerium, iron, and thallium) or their compounds (e.g., oxides, hydroxides, sulfides, phosphates)

Cell Culture:

Cell culture refers to the removal of cells from an animal or plant and their subsequent growth in a favorable artificial environment.

Aim and Scope:

AIM:

To biologically synthesize different metal nanoparticles using leaf extracts of pomegranate , mango and blackcumen

SCOPE:

The scope of our project is to produce antibacterial bandages with the help of AgNPS (Silver nanoparticles) , AuNPS (Gold nanoparticles), ZnNPS (Zinc nanoparticles) , CuNPS (Copper nanoparticles)

MATERIALS AND METHODS:

MATERIALS:

Basic Equipment :

- Cell culture hood (i.e., laminar-flow hood or biosafety cabinet)
- Incubator (humid CO₂ incubator recommended)
- Water bath
- Centrifuge

Additional Supplies:

- Cell culture vessels (e.g., flasks, Petri dishes, roller bottles, multi-well plates)
- Pipettes and pipettors
- Syringes and needles
- Waste containers
- Media, sera, and reagents
- Leaf Extracts

METHODS:

- Cell extraction using water bath and whattman's filter paper
- UV Spectroscopy - To identify the presence of nanoparticles
- Cell Culture - Bacterial Cell growth (In Laminar Air Flow)
- Incubation

Extraction:

First ,we need to take the strawberry leaves , cut them into some pieces and make them dry/ keep in a hot air oven for 3-4 hours.

Then it will be dried and crushed in a mortar and made into an extraction powder.

The extract was prepared by mixing 10 g powder of dried leaves with 100 mL distilled water boiling, centrifugation and filtration of the obtained extract.

Boil the extract for 20 mins and maintain the temperature from 60-80 degrees by keeping in a water bath .

After boiling

- Filter the extract using Waltermans filter paper .
- After filtration pour the filtered extract in test tubes and centrifuge at 9000rpm for 20mins.
- And discard the supernatant and collect the pellet from all of the test tubes .
- Add 1 ml in each test tubes for seven metal nanoparticles.
- And take test and control and name on the test tubes.
- In test sample make up to 5 ml of distilled water.
- Metal nanoparticles of silver (Ag), copper (Cu) , Zinc (Zn) , and are added to control sample .
- In control add metal nanoparticles of 1ml and make upto 5ml .
- And observe the changes one by one for all samples .
- And observe on UV - spectrometer for around 5 days .

Mango and Pomegranate



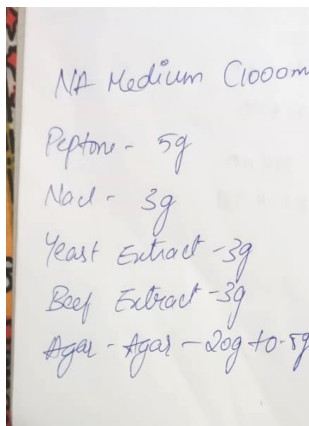
Blackcummin Extract



Copper Extract

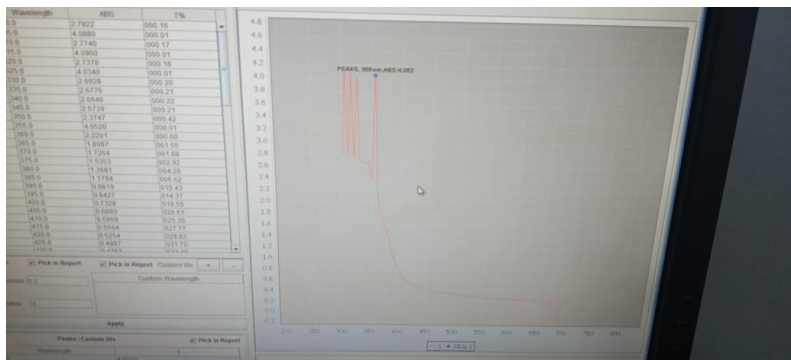


- The cell culture is done by first preparing the nutrient agar medium ,
- The medium is poured in a petri plate and then allowed to solidify for 20 minutes.
- Then we work in the laminar airflow and divide the bacterial culture into 4 parts and put one well in each part.
- Then a control is added (Gentamicin) - 20 μ l
- Then all the four samples - 100 μ l of AgNPS , AuNPS , ZnNPS , CuNPS are poured inside those wells .
- After this the culture is kept in the incubator for 24 hours and the result is seen



Results and Performance Analysis:

First the results that we got in the UV - Spectrometry are observed .



Then extract which gives the best peaks are taken and then added in the nutrient agar medium containing the bacteria - Tests are done for both gram positive (Bacillus Subtilis) and Gram Negative (Ecoli)

Ecol: 28/10/22

Ag	Au	Cu	Zn
1.6cm	10	1.7cm	2cm
16mm	zone	17mm	20mm

Baillus (BS)

Ag	Au	Cu	Zn
1.1cm		1.5cm	16mm
11mm		15mm	
		15mm	

