# BIOSYNTHESIS AND CHARACTERISATION OF ZINC OXIDE NANO PARTICLE USING PLANTAIN FLOWER BRACT EXTRACT

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***Abstract:*** In this study we synthesized the zinc oxide nano particles in ecofriendly way using plantain flower bract aqueous extract. The plantain flower is a waste material obtained from banana flower. The objective of this study is to evaluate the potential of the plantain flower bract extracts for the synthesis of zinc oxide nano particles and their characterization. The synthesized nano particles were characterized using UV-Vis spectroscopy and they showed the maximum absorbance peak at 340 nm. SEM analysis was done and they revealed that the particles were spherical in shape. The chemical group association of nano particles was analysed using FTIR studies. Further they can be studied for their antibacterial activity in future.

**Key words:** *Zinc oxide nano particles, Plantain flower bract, UV Visible Spectroscopy, FTIR and SEM.*

## I. INTRODUCTION

Nano particles are the part of nano materials that are defined as a single particles 1–100 nm in diameter. There are large number of physical, chemical, biological, and hybrid methods available to synthesize different types of nano particles. Physical and chemical methods are more popular in the synthesis of nano particles; the use of toxic chemicals greatly limits their biomedical applications, particularly in clinical fields. Zinc oxide nano particles are the foremost and widely used in the field of biotechnology. Bionanotechnology is the integration between biotechnology and nanotechnology for developing biosynthetic and environmental friendly technology for the synthesis of nano materials. The powder zinc oxide is widely used as an additive in numerous materials and products including ceramics, glass, cement, rubber (e.g., car tyres), lubricants, paints, ointments, adhesives, plastic sealants, pigments, foods (source of Zn nutrient). Zinc oxide is often called II-VI semiconductor in materials science because zinc and oxygen belong to the 2nd and 6th groups of the periodic table. Nanoparticles are unique in their properties and it is very much suitable for drug delivery applications due to their good interaction with biological activity. Different chemical methods used for the synthesis of Zinc oxide nano particles. But the chemical synthesis method has some toxic effect to the human. So now a day the biosynthesis or the green synthesis methods are used. Green synthesis procedure involves the plant based synthesis of nano particles. Green synthesis techniques make use of pollutant-free chemicals for synthesis of nanostructures. It embraces the use of ecofriendly and safe solvents such as water and natural extracts. The biological approaches using microorganisms and plants or plant extracts for synthesis of nano particles have been suggested as safe alternatives to chemical methods. In biogenic synthesis of nano particles, several biological systems including bacteria, fungi, and yeast have been used safely. In present time "green method" synthesis of nano particles has greatly is of interest because the conventional chemical methods are expensive and require the use of chemical compounds as reducing agents which are toxic as well. Although physical and chemical methods are quick and easier for nano particles synthesis, the biosynthesis technique is better and ecofriendly. Musa paradisiaca L is evergreen tropical herbacious plant belongs to family Musaceae, (Paul etal., 2013; Sanjeev etal., 2012) commonly known as Vana laxmi, Kadali, Rambha, Banana, Kadalamu, Valei, Vala, Bali hannu and Plantain (Mohammad and Saleha 2011). Traditionally Musa paradisiaca is used in abscess, alopecia (female), burns, cancer, diarrhoea dysentery, dog bites, snake bite, dyspepsia, fracture, gangrene, hematuria, hemiplegia, haemoptysis, haemorrhage, lizard bites, migraine, ringworm, shingles, smallpox, syphilis, tuberculosis, tumour, uraemia, psoriasis, urticaria and wounds (Sanjeev etal., 2012). In this study we synthesized and characterized the Zinc oxide nano particles using the aqueous extracts of Plantain flower bracts.

## II. MATERIALS AND METHODS

Zinc acetate, plantain flower bract and distilled water were used in the zinc oxide nano particle synthesis. The plantain flower was purchased from the local Tirupattur market and used its Bract as reducing agent.

### Preparation of Plantain flower Bract extract

25g of fresh plantain flower bract was taken and washed thoroughly with double distilled water. Then the plantain flower bract was boiled with 500ml of double distilled water for 20min at 60°c and then it was cooled and filtered. The supernatant was used as reducing agent and stabilizer for preparing Zinc oxide nano particles. The extract was refrigerated and stored at 4°c for the further use.

*Fig.1 Plantain flower*

*Fig.2 Plantain flower bract extract*

**Synthesis of Zinc oxide nanoparticles**

10ml of the plant sample extract was added to 1g of zinc acetate in Erlenmeyer flask. The flask was kept on a magnetic stirrer at 100˚C temperature and the colour of the solution changing indicates the formation of ZnO nano particles.

## Characterization Of Zinc oxide nano Particles

*UV –Visible spectrophotometer*

The nano particles synthesized were confirmed by recording the UV-Vis spectra from 200 -700nm and the maximum absorption was noted.

*FTIR Analysis*

FTIR analysis was performed to classify the groups that are responsible for reduction of the material and for the stabilization of nano particles.

*SEM Analysis*

Scanning Electron Microscopy (SEM) was done, to get the morphology of the synthesized ZnO nano particles**.**

## III. RESULTS AND DISCUSSION

**UV –Visible spectrophotometer**

The nano particles synthesized are confirmed by recording the UV-Visible spectra at periodic time intervals until the absorption maximum reached saturation. The absorption maximum for our sample was observed at 324nm. Similar result was obtained by Snehal Yedurkar, etal., 2016 in the Biosynthesis of zinc oxide nano particles by using *Ixora Coccinea* leaf extract.

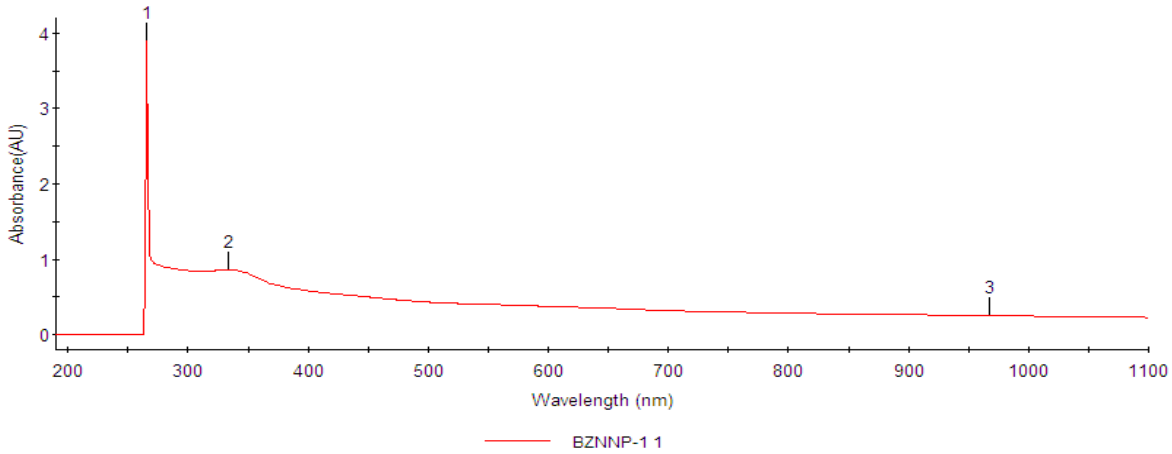


*Fig .3 UV visible spectrum of ZnO nano particle synthesized using plantain flower bract extract*

**FTIR Analysis**

The FTIR analysis was performed to study the groups that are present along with the nano particles and spectrum was depicted in Fig.4.

*Tab.1 FTIR spectrumof ZnO nano particles synthesized using plantain flower bract extract and corresponding functional groups*

| Characteristic Absorption(s)($cm^{-1}$) | Functional Group |
|---|---|
| 3421.64cm-1 | Alcohol/phenol O-H stretch |
| 2935.15 cm-1 | Alkyl C-H stretch |
| 1584.02 cm-1 | Aromatic C=C Bending |
| 801.95 cm-1 | Aromatic C-H Bending |
| 617 cm-1 | ZnO nano particles |

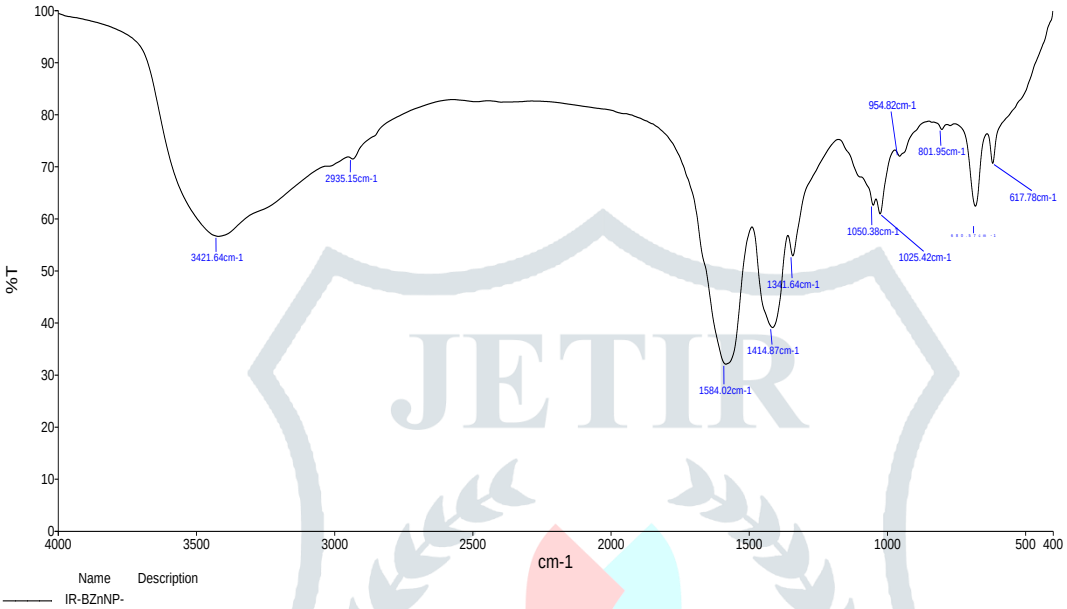


*Fig .4 FTIR spectrums of ZnO nano particles synthesized using plantain flower bract extract*

The band at 617 corresponds to zinc oxide nano particles reported similararly by Divya Rao etal., 2016 in the Facile bio-inspired synthesis of zinc sulphide nano particles by using *Chlamydomonas reinhardtii* cell free extract.

**SEM Analysis**

Scanning Electron Microscopy (SEM) predicted that synthesised Zinc oxide nano particles are of spherical as that of Geetha etal., 2016 report in the Green Synthesis of antibacterial Zinc oxide nano particles by using biopolymer *Azadirachta indica* gum.

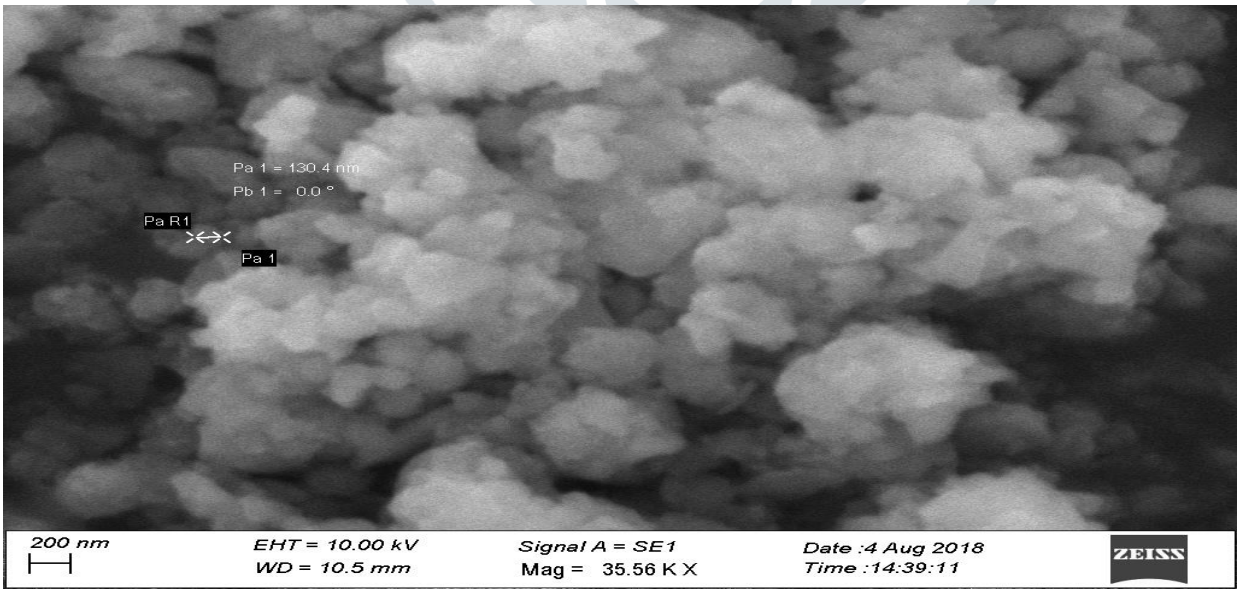


*Fig .5 SEM image of ZnO nano particle synthesized using plantain flower bract extract*

## IV. CONCLUSION

The Zinc oxide nano particle was synthesized by using aqueous extact of plantain flower bract. It is simple and cost effective method. The ZnO nano particles were characterized by various techniques such as UV Visible, FTIR and SEM. UV Visible absorbtion peak at 324 nm is confirmed the presence of Zinc oxide in our sample. FTIR peak at 617cm$^{-1}$ confirm the presence of Zinc oxide. SEM analysis shown that synthesised Zinc oxide nano particles are of spherical in shape.

## V. ACKNOWLEDGEMENT

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