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Green synthesis of zinc oxide nano particles using flower extract cassia densistipulata taub.

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Abstract:- Green synthesis of metal nanoparticles is an interesting issue of the nanoscience and nanobiotechnology. There is a growing attention to biosynthesis the metal nanoparticles using organisms. Among these organisms, plants seem to be the best and they are suitable for large scale biosynthesis of nanoparticles. Nanoparticles produced by plants are more stable, and the rate of synthesis is faster than that in the case of other organisms. The present investigation was carried out to green synthesis of zinc oxide nanoparticles by using the medicinal plant cassia densistipulata taub. The flower was collected from the campus of Anantapuramu, Andhra Pradesh and their petals were separated. The petals were taken and cleaned with dimeneralized water and soaked for an hour on dry cloth to remove moisture from the petals.

Synthesis of Zinc Nanoparticles was done by mixing 5gms of Zinc Nitrate with 50ml of aqueous extract of cassia densistipulata taub petals. The formation of nanoparticles was monitored by visualizing color changes and it was confirmed by Electron microscope (SEM), UV-Vis spectrophotometer and Fourier Transform Infra-Red (FT-IR) spectroscopy. The results of various techniques confirmed the presence Zinc oxide nanoparticles.

Keywords:- Cassia densistipulata taub, Zinc nitrate, UV-Vis spectrophotometer, SEM, FTIR.

I. INTRODUCTION

The field of nanotechnology is one of the most active researches in modern material science. Nanotechnology is emerging as a rapid growing field with its applications in science and technology for the purpose of manufacturing new materials at the nanoscale level. Synthesis of nanoparticles can be performed using a number of routinely used chemical and physical methods. However, altogether, these methods are energy and capital intensive, and they employ toxic chemicals and no polar solvents in the synthesis procedure and later on synthetic additives or capping agents, thus precluding their applications in clinical and biomedical fields. Therefore, the need for the development a clean, reliable, biocompatible and ecofriendly process to synthesis of nanoparticles leads to turning researchers toward green chemistry and bioprocess. The use of plant systems has been considered a green route and a reliable method for the biosynthesis of nanoparticles owing to its environmental friendly nature. Bhattacharya D and gupta RK studied that there is a growing need to develop clean, nontoxic and environmentally friendly ("green chemistry") procedures for synthesis and assembly of nanoparticles. The use of biological organisms in this area is rapidly gaining importance due to its growing success and ease of formation of nanoparticles. Presently, the potential of bio-organisms ranges from simple prokaryotic bacterial cells to eukaryotic fungus and even live plants. In this article we have reviewed some of these biological systems, which have revolutionized the art of nano-material synthesis.

II. MATERIALS AND METHOD

A. Collection of Plants

The whole plant cassia densistipulata taub was collected from JNTU Anantapur campus.

B. Preparation of the leaf extract

Fresh flowers were collected from cassia densistipulata taub plants in the JNTU Anantapur campus. The leaves were washed several times with water to remove the dust particles and then sun dried to remove the residual moisture. The extract used for the reduction of zinc ions (Zn2+) to zinc nanoparticles (Zn0) was prepared by placing 5g of washed dried fine cut leaves in 250 ml glass beaker along with 200 ml of sterile distilled water. The mixture was then boiled for 60 minutes until the colour of the aqueous solution changes from watery to light yellow. The extract was cooled to room temperature and filtered using filter paper. The extract was stored in a refrigerator in order to be used for further experiments.

C. Preparation of zinc nanoparticles

For the synthesis nanoparticle 50 ml of Cassia auriculata leaves extract was taken and boiled to 60-80 degree Celsius using a stirrer heater. 5 grams of Zinc Nitrate was added to the solution as the temperatures reached 60 degree Celsius. This mixture is then boiled until it reduced to a deep yellow coloured paste. This paste was then collected in a ceramic crucible and heated in an air heated furnace at 200 degree Celsius for 2 hours. A light yellow coloured powder was obtained and this was carefully collected and packed for characterization.

D. Characterization of UV-Vis spectroscopy analysis of Zinc oxide Nanoparticles

Electromagnetic radiation such as visible light is commonly treated as a wave phenomenon, characterized by a wavelength or frequency. Wavelength is defined on the left below, as the distance between adjacent peaks (or troughs), and may be designated in meters, centimeters or nanometers (10-9 meters). Visible wavelengths cover a range from approximately 200 to 400 nm.

E. SEM analysis of Zinc oxide Nanoparticles

Size and structure of the nanoparticles analysis was done by using Scanning Electron Microscope machine. Sample was placed in sample holder in a specimen chamber, then adjusting voltage and current knobs on the control panel will get sample image on the screen. By increasing magnification we get spherical shape of sample on the screen.

F. FTIR Spectra analysis

Two milligram of Zno nanoparticales were prepared by mixing with 200 mg of spectroscopic grade KBr. FTIR spectra were recorded using a Nicolet 520P spectrometer with detector at 4000-500 cm-1 resolution and 20 scans per sample.

III. RESULS AND DISSCUSSION

Fig.1: Plant extract solution

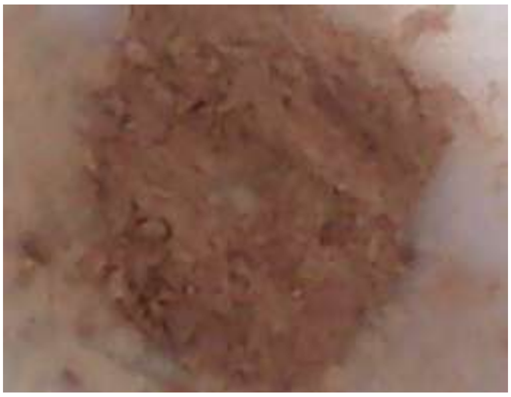

Fig.2: Zinc nanoparcticle powder

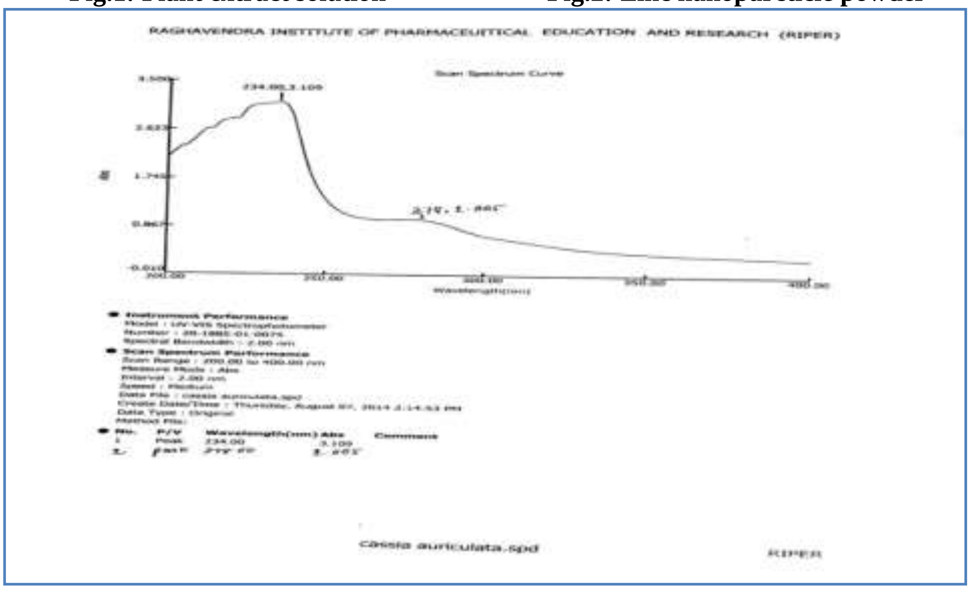

Fig .3: UV-Vis spectroscopy analysis of ZnO nanoparticles

Fig 3 **that** there was intensive absorption in the ultraviolet band of about 200-400 nm. The absorption wavelength at about 234 nm of ZnO suggested the excitonic character at room temperature.

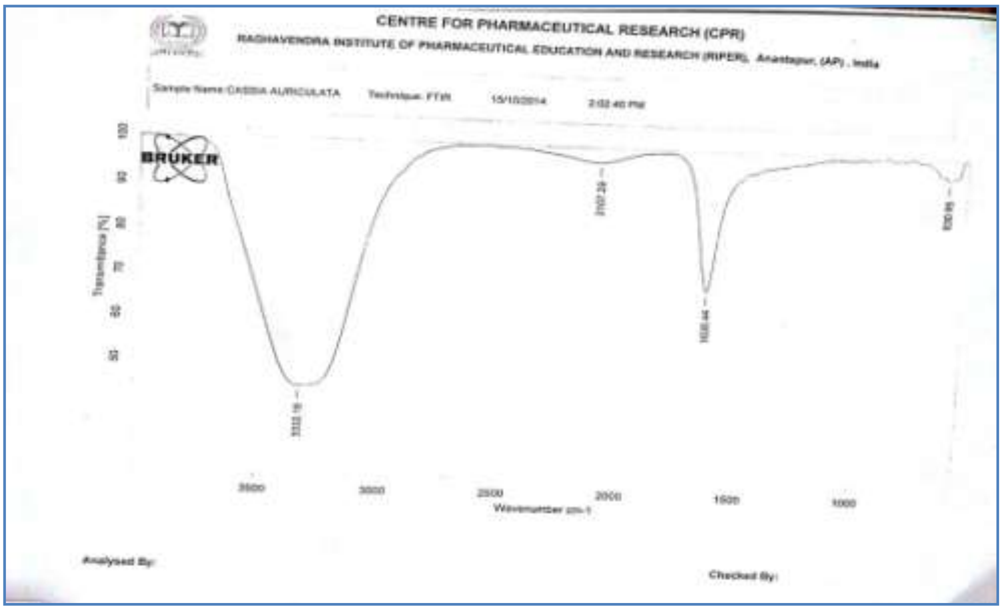

Fig 4: FTIR ananlsis of ZnO nanoparticles

FTIR spectra were recorded using a Nicolet 520P spectrometer with detector at 4000-500 cm-1 resolution and 20 scans per sample. From fig 4 we get ZnO nanoparticles at 1634 cm^{-1} and remaining peaks indicates bimolecular responsible for capping and stabilization of metal nanoparticles.

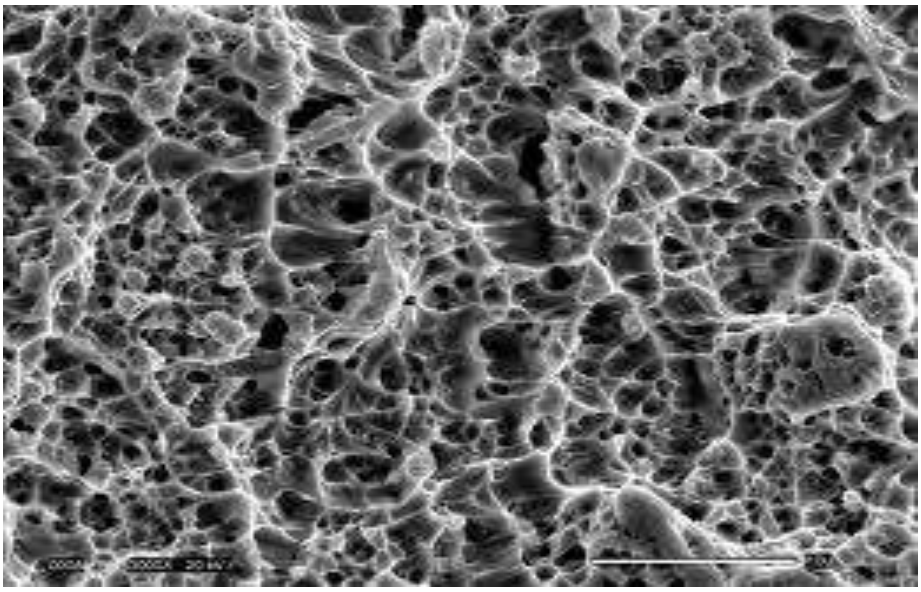

Fig.5: SEM analysis of ZnO nanoparticles

SEM studies were revealed to visualize the size and shape of Zinc oxide nanoparticles and (Fig 5) and show the typical bright –field SEM micrograph of the synthesized Zinc oxide nanoparticles. In this study, it was appeared with that most of spherical in shape.

IV. CONCLUSION

Our findings could be targeted for the promising potential applications including biosensing devices, and nanoelectronic because of its pollution free and eco –friendly approach. This green synthesis approach shows that the environmentally begin and renewable leaf extract of Cassia densistipulata taub can be used as an effective stabilizing as well as reducing agent for the synthesis of zinc oxide nanoparticles.

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