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GC-MS Analysis of Methanol Extraction (Leaf) and FESEM Analysis of Synthesized Zinc Oxide Nanoparticle Using *Ricinus Communis* Plant

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ABSTRACT

Plant *Ricinus communis* which belonging to the *Euphorbiaceous* family and also is called as castor oil plant. Is a medicinal plant, the different plant components, such as leaves, bars, seeds, roots as well oil remain utilized aimed at some reasons. In India it has been used for treatment of aggravation and liver issue. To investigate the antioxidant in plant, one way is to screen phytochemicals. The primary stage in recovering and separating phytochemicals from plant leaf material is extraction; the yield of the process relies on the solvent that is employed. Methanol is employed in the extraction process. The results of the GC-MS study were 4H-Pyran-4-one, 2,3-hydro-dihydro-3,5-dihydroxy-6-methyl-, 2,3-diaminooctadec-7-ene-1,3-diol butane boronate, pentanoic, 2,3-dihydro-4-methoxy-1-methyl-2-oxo 1-[2-(2,2,6-trimethyl-bicyclo [4.1.0]hept-1-yl)ethyl]-vinyl ester of ethanoic acid. Nanotechnology is a technique used for various applications. It involves the synthesis having one of the dimensions in the range of 1-100nm.To synthesis a Nanoparticles various techniques were involved. To overcome the chemical synthesis green synthesis is used because of the nature of eco-friendly, less expansive, free chemical contaminants for medical and biological applications. Zinc oxide Nanoparticle are widely studied due to their simplicity, non – toxic, bio-safe. In this study *Ricinus communis* plant parts like leaf, stem, fruit, root is used to synthesis a Zinc oxide Nanoparticle. The characterization study of Zinc oxide NP also carried out by FESEM and EDX reveals that 55-97nm in leaf, 52-77nm in stem, 245-303nm in fruit, 50-93nm in root and peak shows the presence of zinc oxide nanoparticle.

1. Introduction:

Ricinus communis is a plant which is also known as castor oil plant or marvel tree. It is an everlasting plant and comes under the family *Euphorbiaceous.* It comes from Africa and was employed by earliest romans also Egyptians. It contains toxic substances namely ricin which is more toxic found in all plant parts and also act as a strong insecticide and the agglutin which is less toxic [1]. The plant components such as leaves and roots and the seed oil are employed in the handling of aggregation as well as liver problems In India [2]. The technique that has been utilized to find antioxidant chemicals in plants is phytochemical screening. [3] One technique for obtaining phytochemicals from the chosen plant sources is extraction. The number of phytochemicals produced is influenced by both the extraction method and the extraction solvent [4]. Methanol had the greatest extraction yield, according to a study. Lower molecular weight polyphenols can be extracted more successfully thanks to this method. It was discovered that methanol extracted a significant number of phenolic chemicals more efficiently than ethanol [5]. Recent advances in Phyto-nanotechnology have opened up new pathways for the production of nanoparticles. This technique is eco-friendly, easy to use, quick, stable, and economical. a nanoparticle made from widely available plant material that is derived from plants [6]. Because chemicals are typically used to create nanoparticles, there is a serious need to develop environmentally friendly methods to achieve the goal. To fill this gap, biological approaches are emerging, like green synthesis, which makes advantage of biological as the extracts' molecules derived from plant sources and outperforms both biological and chemical methods [7]. Greek word nano is the source of the prefix nano. In order for something to be considered a nanotechnology object, at least one of its dimensions must be less than 100 nm. Due to their unique chemical and physical characteristics, one of the significant components of zinc oxide nanoparticles metal oxides that are widely used. In comparison to other oxides, ZnO has demonstrated to have tremendous potential for the biosynthesis of nanoparticles for clinical use [8]. ZnO Nanoparticle has synthesized by *Ricinus communis* plant seed part to study the impact of cytotoxicity of the ZnO nanoparticle [9]. ZnO Nanoparticle has synthesized by *Ricinus communis* leaf extract using Zinc nitrate as a precursor to study the antimicrobial activity [10].

Materials and Methods:

Extract preparation and Phytochemical analysis:

The gathered leaves were thoroughly dried in the shade for 10 to 15 days before being ground to a powder using an electric mortar. Next, the powdered dry leaf was dissolved in 50ml concerning methanol and heated to between 60 and 70^{o} C for three hours in a magnet stirrer running at maximum speed. Using ordinary filter paper, the extract was filtered after the setup was left alone for a full day. The filtrate was kept there for methanol evaporation on transparent petri plates, and the sample was supplied for GC-MS analysis. [11].

GC-MS Analysis:

The Ricinus communis leaf methanol extract was subjected to GC-MS analysis using a fused silica column filled with Elite-5MS (5 percent biphenyl, 95 percent dimethylpolysiloxane, 30 m 0.25 mm ID 250 m df). Helium was used as the carrier gas, with an injection volume of 1 l and a steady flow rate of 1 ml/min. The injector temperature was set to 260 °C and the ion source temperature to 240 °C with a scan duration of 0.2 seconds and a scan interval of 0.1 seconds. The component spectrums were compared to the GC-MS NIST (2008) library's database of component spectra.

Plant parts for Zinc oxide Nanoparticle synthesis:

Ricinus communis plant parts namely Leaf, stem, fruit with seed, root, were taken for the Synthesis of nanoparticle.

Preparation of plant extract for Nanoparticle synthesis:

Freshly collected different plant parts were taken separately washed with distilled water. Then cut into small pieces and smashed using motor and pestle. A known amount of squashed plant parts was added into the distilled water separately and boiled. Then filtered to obtain the aqueous extract.

Preparation of Zinc oxide nanoparticle:

Synthesized zinc oxide nanoparticles were produced. by adding a Zinc nitrate hexahydrate in an aqueous extract in the ratio of 10:1 and maintained at 60-80^{o}c in a water bath. The initial color was noted. Finally, the color was changed this is the indication of the presence of nanoparticle synthesis. Kept as such in a room temperature for overnight for settle down of the nanoparticles [12].

FESEM:

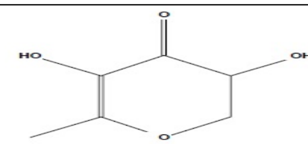
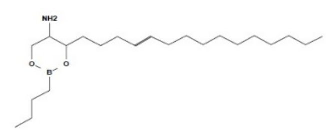
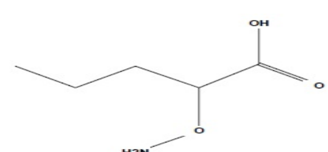
The structural morphology of zinc oxide nanoparticle was examined and measured by FESEM analysis. An energy dispersive spectrum analyzer (EDS) was attached to the device to verify the existence of zinc oxide nanoparticle.

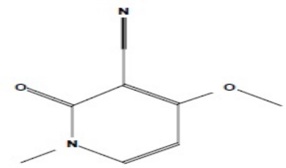
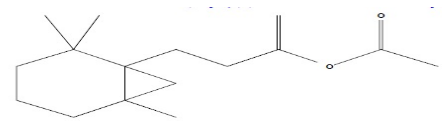
Results and Discussion:

Due to their availability source and their bioactive activity molecules within numerous sectors, phytocomponents in plants are becoming more often identified. The entire result was disclosed using the GC-MS method. There were (Table-1) 5 compounds in the *Ricinus communis* leaf methanol extract, namely Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl was identified at 14.563 RT, along with a chemical formula of $C_6H_8O_4$. 2-amino-octadec-7-ene-1,3-diol butane boronate was identified at 18.110 RT with a molecular formula of $C_{22}H_{44}O_2NB$. Pentanoic,2-(aminooxy)- compound was identified at 21.586 RT with a molecular formula $C_5H_{11}O_3N$ and also it shows a high percentage area covered by this compound. 3-pyridinecarbonitrile, 1,2-dihydro-4-methoxy-1-methyl-2-oxo compound was identified at 25.117 RT, a molecular formula $C_8H_8O_2N_2$. Acetic acid, 1-[2-(2,2,6-trimethyl-bicyclo [4.1.0]hept-1-yl)-ethyl]-vinyl ester compound identified at 28.674 RT, a chemical formula $C_{16}H_{26}O_2$. [13] literature showed that the phytocompounds from the *Ricinus communis* leaf by ethanol extraction. When compared to this present study there is no similar compounds identified. There are no chemicals that have been found that are comparable to this study. Only a small number of studies have demonstrated the use of *Ricinus communis* leaf in phytocompound analysis. The chromatographic analysis of methanol extraction using *Ricinus communis* leaf has not been documented. Here, we found many phytocompounds and also referenced the literature on the action of bioactive chemicals. [14] and identified the bioactive compound of 4H-Pyran-4-one,2,3-dihydro-3,5-dihydroxy-6-methyl- by methanol extraction of

Mentha viridis seeds mentioned that this compound act as an anti-diabetic and anti-oxidant property and also [15] identified the same compound present in Sukri, Barhi, Rothana variety of dates and also present in methanol extraction Peels of *Musa paradisiaca* [16] 2-amino-octadec-7-ene-1,3-diol butaneboronate compound identified in Barhi and Rothana variety of dates and [17] also identified in *Bark of Terminalia arjuna*, *Fruit of Vitis venifera and floral extract of Mudhuca longifolia.* [18] identified the identical substance which remained present in the extraction of methanol of Peels of *Musa paradisiaca*. The presence of this compound in the peels used as a bio-adsorbant of heavy metal chromium in contaminated water. Pentanoic,2-(aminooxy)- this same compound also identified in *Musa acuminata* of flower extract [19]. In this study this compound Pentanoic,2-(aminooxy)- it covers the high area percentage.

TABLE 1: GC-MS identification of phytocomponents in the methanolic extract of *Ricinus communis* (leaf)

SI.NO	RT	Name of compound	Molecular formula	Molecular weight	Structure
1	14.563	4H-Pyran-4-one,2,3 -dihydoxy-3,5-dihydroxy -6-methyl-	$C_6H_8O_4$	144	
2	18.110	2-amino-octadec-7-ene -1,3-diol butaneboronate	$C_{22}H_{44}O_2NB$	365	
3	21.586	Pentanoic,2-(aminooxy)-	$C_5H_{11}O_3N$	133	

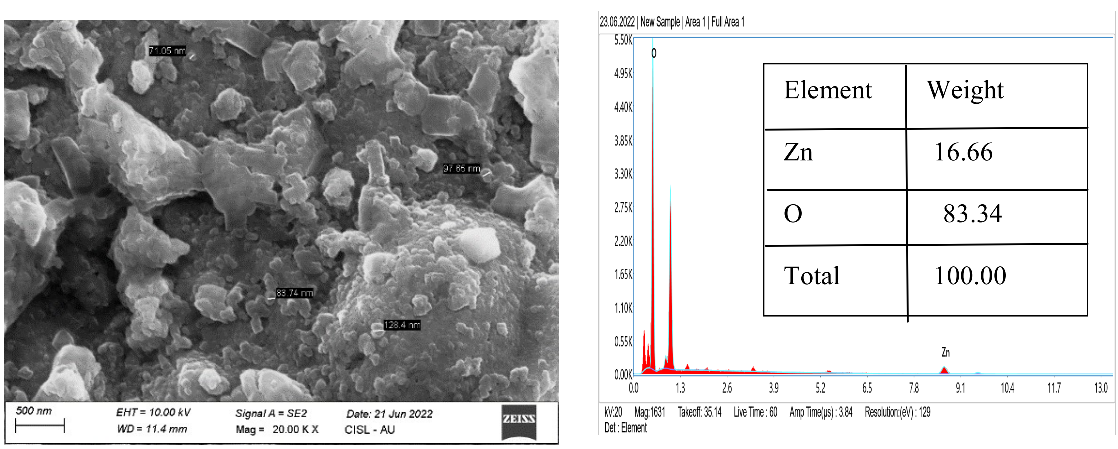
4	25.117	3-pyridinecarbonitrile, 1,2-dihydro-4-methoxy -1-methyl-2-oxo	$C_8H_8O_2N_2$	164	
5	28.674	Acetic acid, 1-[2-(2,2,6 -trimethyl-bicyclo[4.1.0] hept-1-yl)-ethyl]-vinyl ester	$C_{16}H_{26}O_2$	250	

The green synthesis of nanoparticle is an innovative, cost-effective, and environmentally friendly method [20]. The synthesis of Zinc oxide nanoparticle by *Ricinus communis* plant leaves, stem, fruit and root extraction identified by the color change (figure:1a) and after adding a precursor of zinc nitrate hexahydrate into the extract it gave an end product of golden yellow into dark brown precipitate in leaf part, white (colorless) into light brown color precipitate was formed in stem part, dark brown into dark brown precipitate in fruit part, brown color into dark brown precipitate was formed in root part which indicates a presence of zinc oxide nanoparticle (figure.1b). The precipitate was taken into hot air oven for drying. After drying all products gives a yellow powder formed and packed for FESEM with EDS to analysis of structural and elemental compounds present in the given sample (figure.1c).

a) Plant extract b) Synthesized Nanoparticle c) ZnO NPs

Figure 1 – Diagrammatic illustration of ZnO NP Synthesis with Ricinus communis plant extract

The ZnO NPs that Ricinus communis produced leaf contained spherical shape with 55.82nm-106.6nm in size and EDS showed weight of zinc 16.66% and Oxygen 83.34%. In stem contained spherical shape with 201.3 – 268.0nm in size and EDS showed weight of Zinc 32.28% and oxygen 67.72%. In fruit contained perfect spherical shape with 120.5nm – 185.8nm in size and EDS 7.45 % of Zinc and 92.55 % oxygen. In root it contains spherical shape 59.34nm-95.07nm in size and EDS 37.57% of zinc and 62.43% of oxygen.



Element	Weight
Zn	16.66
O	83.34
Total	100.00

Figure 2. FESEM with EDS images of ZnO NPs Synthesized by *Ricinus communis* Leaf

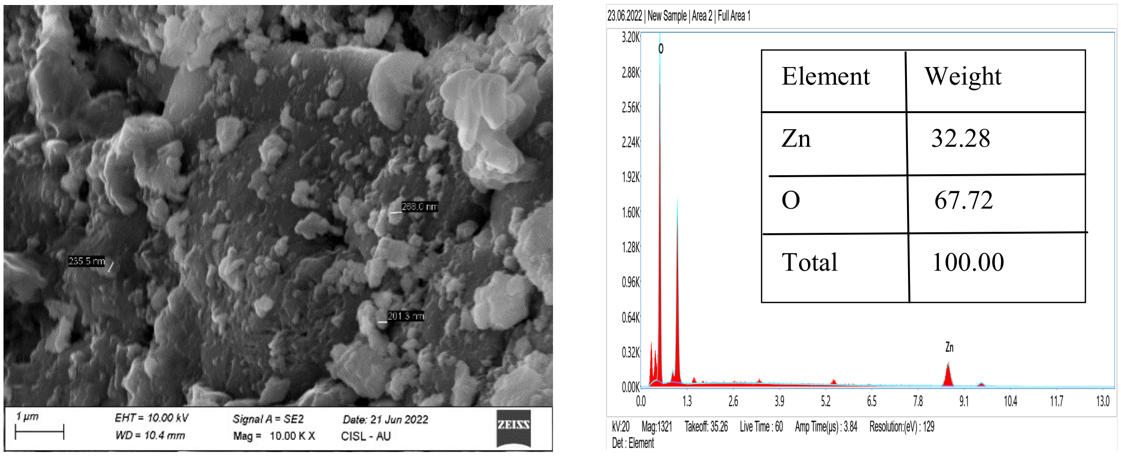


Figure 3. FESEM with EDS images of ZnO NPs Synthesized by *Ricinus communis* stem

Figure 4. FESEM with EDS images of ZnO NPs Synthesized by *Ricinus communis* fruit

Figure 5. FESEM with EDS images of ZnO NPs Synthesized by *Ricinus communis* root

Based on the FESEM analysis Ricinus communis leaf and root showed a nanoparticle size which is 1-100nm compared to the fruit and stem part of the plant.

IV. Conclusion:

GC-MS examination of methanol extraction of Leaves of *Ricinus communis* extracted result reveals that new phytocompounds which was not same in previous studies. At the same time some bioactive compounds were same in different plant extract which showed some biological activity. The new innovation of Zinc oxide nanoparticles is produced biologically utilizing *Ricinus communis* plant extract gives a safety of the environment, plain, less toxic. Utilizing plants extract stays away from using dangerous chemicals. In this study, Nanoparticles of zinc oxide were successfully created utilizing *Ricinus communis* plant a portion of leaf, stem, fruit and root. The resultant nanoparticles were characterized using FESEM with EDX. There are no findings in synthesis of Zinc oxide nanoparticle using *Ricinus communis* stem and root. Here our findings reveal that ZnO nanoparticle synthesis is still in its infancy, and additional study of the mechanism of nanoparticle formation is required. This could lead to the process of creating nanoparticles using rigorous command over the dimensions and structure characteristics.

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