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SYNTHESIS OF SILICA NANOPARTICLES FROM *ORYZA SATIVA* AND *ELEUSINE CORACANA* FOR DRUG DELIVERY APPLICATION

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Abstract: *Widely Silver nanoparticles have been investigated because they exhibit unusual optical, electronic, and chemical properties, depending on their size and shape, thus opening many possibilities with respect to technological applications. The silver nanoparticle is one of the inorganic nano materials which is a good antimicrobial agents. The research found that the bactericidal nano materials have opened a new epoch in pharmaceutical industries. Silver nanoparticles are the metal of choice as they hold the promise to kill microbe's effectively and effect on both extracellularly as well intracellularly, the researchers by using different methods, manufactured silver nanoparticles with spherical.*

Key Words: *Silver nanoparticles, Antimicrobial, DPPH, Oryza Sativa and Photoluminescence.*

1. INTRODUCTION:

Green synthesis is an emerging area in the field of bio nanotechnology and provides economic and environmental benefits as an alternative to chemical and physical methods .In this method, nontoxic safe reagents which are ecofriendly and Bio safe are used. Silica nanoparticles have been great attention as it being evaluated for using in abundant fields and applications. Due to this significance, this research was conducted to synthesis silica nanoparticles using local agricultural waste. Silica nanoparticle or Nano silica has a wider application because of their stable innature, low toxicity and are surface functionalized by using bonding molecules and polymers[1]. The silica nanoparticles are synthesized using ragi husk and rice husk are some by products considered as waste materials. The silica present in the waste materials isolated using sodium silica fluoride as a precursor to form silica powder[2].

Silica nanoparticles in *Oryza sativa*

Rice is an important nutritional grain in the world. Its production leaves behind a large amount of waste called **rice husk**. Rice husk is the rich sources of minerals. Rice husk has more than 20 %of silica. Biogenic silica nanoparticles (25 -30 nm in diameter) were synthesized from rice husk. The characterization revealed that the silica nanoparticles were composed of smaller primary particles and their clustering led to a porous structure with a surface area of 164 m^2/g[3,4].

Silica nanoparticles in *Eleusine coracana*

Ragi husk can be an economically viable raw material for the production of silicates and silica. Ragi husk is a suitable source for silica preparation and expensive for preparation cost is to be less with equivalent properties to commercial silica and that silica xerogels with 52.32% and silica content and minimal mineral contaminants can be produced from ragi husk[5,6].

2. MATERIALS AND METHOD:

The *Oryza sativa* and *Eleusine coracana* are taken as a source and washed to be grained separately. Then the 10 g of each component are put into the double distilled water of 150ml in the beaker and made it to heat at 80 degree Celsius using Muffle furnace. This heating process is continued for one hour[7].

Then the extract is obtained from the above process using filter. That extract is used as a reducing agent and it is added to the sodium silica fluoride and mixed it using stirrer at minimumtemperature of 50 degree Celsius. It is continued for 5 hours. Then the mixed component kept evaporating at 80 degree Celsius. The silica powder is obtained finally[8,9].

The powder is in semisolid state and made it to dry at 120 degree Celsius to obtain the powder as the state of solid.

Then the annealing process is done at 600 degree Celsius to achieve the accurate crystal structure. And the silica powder is stored in an Eppendroff tube and it sent to laboratory for further characterization such as FTIR, UV, SEM, PL. Then the same componentis applied to the cancer cell application as a drug.

Antimicrobial activity

The antibacterial activity of the SiO2 NPs was investigated by the well diffusion method tested against G+ and G- bacteria (*S. pneumoniae*) and (*K. pneumoniae*) proceeding molten nutrient agar, according to the clinical and laboratory standards institute (CLSI). After inoculation, well loaded with 2 mg/ml of the test samples were placed on the bacteria-seeded well plates using micropipettes. The plates were then incubated at 37^0C for 24 hrs. The inhibition zone was measured. Amoxicillin (Hi-media) was used as the positive controls against G+ and G- bacteria (*S. pneumoniae*) and (*E. pneumoniae*) respectively[10,11].

Antioxidant Assay

The DPPH assay is popular in natural product antioxidant studies. One of the reasons is that this method is simple and sensitive. This assay is based on the theory that a hydrogen donor is an antioxidant. It measures compounds that are radical scavengers by which DPPH accepts hydrogen from an antioxidant. DPPH is one of the fewstable and commercially available organic nitrogen radicals. The antioxidant effect is proportional to the disappearance of DPPH in test samples. Monitoring DPPH with a UVspectrometer has become the most commonly used method because of its simplicity and accuracy. DPPH shows a strong absorption maximum at 517 nm (purple). The color turns from purple to yellow followed by the formation of DPPH upon absorption of hydrogen from an antioxidant. This reaction is stochiometric with respect to the number of hydrogen atoms absorbed. Therefore, the antioxidant effect can be easily evaluated by following the decrease of UV absorption at 517 nm[12,13].

Photoluminescence

Light matter interaction Photoluminescence spectroscopy works in a non- contact mode. It is a non-destructive technique of examining the materials electronic structure.

When light strikes a sample, it gets absorbed by imparting its excess energy to the material by the phenomenon known as photo-excitation. One manner method in which sample dissipates this excess energy is through light emission, i.e., luminescence. In case of photo-excitation, luminescence is known as photoluminescence[14].

3. RESULTS AND DISCUSSION:

SYNTHESIS OF SIO_2

The 10 g of Oryza sativa and Eleusine coracana husk was added with 100 mL of double distilled water and boiled at 80° C for 20 minutes. The obtained extraction was filtered using Whatman No 1 filter paper and the filtrate was collected in 250 mL Erlenmeyer flask and stored at room temperature for further usage.

Figure 1: Synthesis of SiO_2

For the preparation of SiO_2 NPs, 0.1 M of Sodium Silica floride (Na_2SiF_6) solute was added with 100 mL of *Oryza sativa* and *Eleusine coracana* husk extract, we get yellow colour homogeneous mixture solution. This solution was stirred constantly at a temperature of 80°C for 5 hrs. Finally, the precipitate was dried at 120°C, we get the SiO_2 Nano powder. Further the precipitates were annealed at 800 °C for 5h. Thus, SiO_2 NPs were obtained.

Anti microbial studies

The data obtained, through the determination of MIC, from the association of antibiotics with extracts observe any synergistic effect are presented in the below image. The results revealed variability in the inhibitory concentrations of each extract for given bacteria.

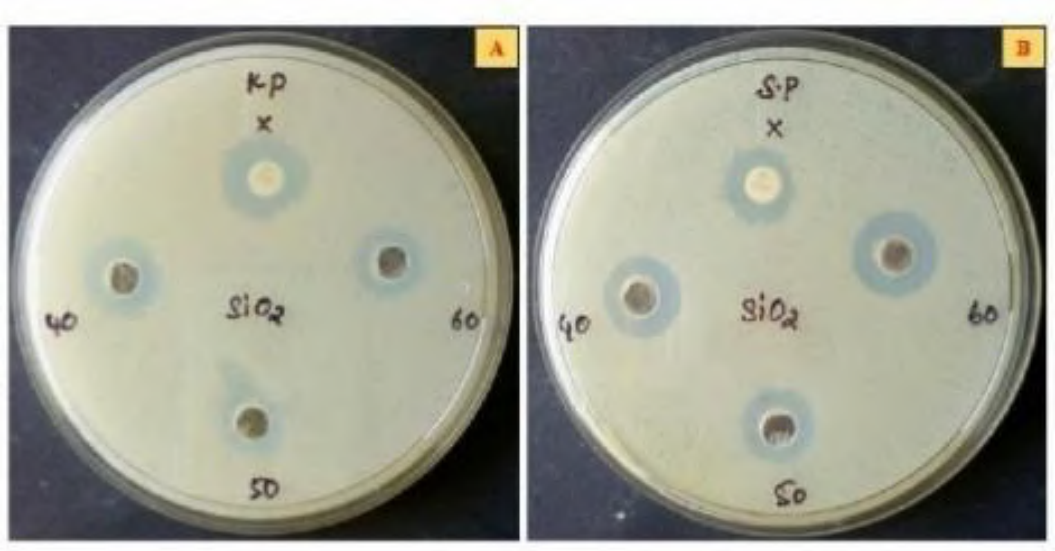

Fig 2 Antimicrobial activity

Antioxidant assay

Yellow color was obtained when powder(antioxidant) was added to the DPPH. the antioxidant activity was compared with the ascorbic acid as positive control.

S. No	Tested sample concentration (µg/ml)	OD Value at 517 nm (in triplicates)		
1.	Control	0.612	0.620	0.625
2.	5	0.610	0.562	0.562
3.	25	0.523	0.546	0.537
4.	50	0.490	0.477	0.467
5.	250	0.408	0.358	0.347
6.	500	0.339	0.328	0.297

Table 1: OD value of antioxidant assay

Photoluminescence's studies

The photoluminescence (PL) spectra of the green synthesized SiO_2 NPs samples documented at the excitation wavelength of 325 nm. In PL spectra of the SiO_2 NPs emission peaks at 368 and 438 nm. The emission peak is observed at 360 and 438 nm, which is corresponding to near band edge emission and blue emission respectively.

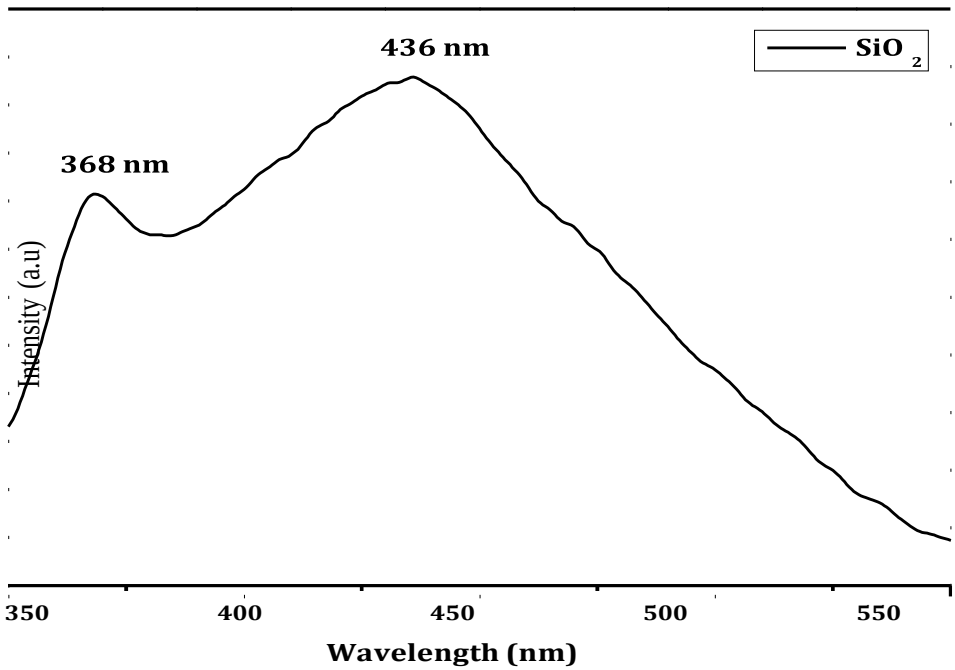

Figure 3: PL Spectra of SiO2 Nps

Applied research on Ag NPs in the biomedical field has been actively conducted, of which only a portion has been introduced in this research. Although AgNPs have been focused on therapeutic purposes, further research is inevitable in animal models to confirm the mechanisms and to gain a comprehensive picture of biocompatibility vs. toxicity of AgNPs. Finally, if we succeed in all these studies, it would help the researchers of the nanoscience and nanotechnology community to develop safer, biocompatible, efficient cancer or anti-angiogenic agents containing AgNPs.

Hence, due to their benign and stable nature and antimicrobial property, these AgNPs may be well utilized in industrial and remedial purposes

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