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Green synthesis Quantum Dots (GQD) from Coconut Husk(Cocos nucifera *L*)the Evaluation for Antibacterial& Cytological Activity

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Abstract--*In this paper, we document in the experienced synthesis of Graphene quantum dots (GQDs) from coconut husk, normal biomass as a biosynthesis precursor utilizing a single step hydrothermal carbonization. Structural and morphological characterization of these GQDs was carried out using XRD, Raman, and FTIR. As synthesized at the same time XRD results established their crystalline nature. Raman spectroscopic measurements exhibited the characteristic "D" (a thousand cm−1) and "G" (3500 cm−1) bands confirming the formation of low dimensional graphene nanostructures. Optical properties of these GQDs had been probed making use of UV-seen spectrometry and room temperature Photoluminescence measurements. The UV-vis spectrum confirmed a powerful absorption at 320 nm. These GQDs exhibited fluorescence regularly at 440 nm when excited at one of a kind wavelengths. The fluorescence of GQDs was observed to be sensitive to pH linearly over the pH range of four–12 which may also be exploited for pH sensor purposes. FTIR spectroscopy has proven the presence of hydroxyl and carboxyl practical moieties on the surface of the GQDs, which play a significant position in surface passivation leading to extra steady nanoparticle dispersions. Coconut Husk extract-Graphene quantum dots confirmed greatest antimicrobial undertaking towards several bacteria species akin to Pseudomonas aeruginosa, Streptococcus mutans, Streptococcus aureus, & E coli. Established on the findings of the learn, Coconut Husk might be exploited in developing talents bioactive pharmaceutical medicines for mighty therapy of cancer.*

Keywords--*UV- spectroscopy-Ray Diffraction Analysis (XRD), Fourier Transform Infrared(FTIR) Antibacterial.*

I. INTRODUCTION

Nowadays graphene quantum dots associated with the fluorescence have joined the class of carbonaceous materials together with graphene, fullerenes, and nanotubes[1]. GQDs kind of material attracted by a lot of researchers due to its outstanding properties like easy surface functionalization, tunable and broad emission wavelengths[2], high chemical stability, water solubility, long excitation ranges, photo stability[3], compared to traditional metal-based semiconductor quantum dots it has an environmental hazard is very low and low cytotoxicity[4].

Traditionally GQDs are synthesized by a lot of approaches like laser ablation, arc discharge [5], oxidation of candle soot, Pyrolysis, microwave mediated synthesis, electrochemical oxidation [19]. These methods are facing a lot of issues like tedious procedure, self passivation, strong acids, and sophisticated instruments [7].

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Currently self passivity fluorescent GQDs synthesized by single step hydrothermal carbonization method using biomaterials [8] like gelatin, egg albumin, cow milk, banana, ascorbic acid, citric acid, chatoyant, orange juice, food caramel[9], bovine serum albumin, watermelon peels, pomelo peel, starch, paper ash carbon source, coffee seeds, honey, soy milk, cellulose, grass have been reported 16_ 20–29 [10]. Based on the functionalities based on the surface, GQDs exhibit characteristic fluorescence [11].

Hydrothermal carbonization is a sort of an inexperienced synthesis approach with the low response temperature and biomass as carbon supply [12].In the Present method, a single step is enough to achieve both functionalization and carbonization [13]. Coconut husk is a biomass which is a light, fluffy material that falls off from thick mesocarp of coconut in (Cocos nucifera L) [14] fruit when it is shredded at the time of coir processing [15]. Important composition coconut husk is of the coconut husk constitutes and hemicelluloses constitute and lignin while tannins [16]. Poly hydroxyl compounds are in the amount of minor part of the total content [17]. Since hemicelluloses and cellulose are carbohydrates similar for glucose, it is used to synthesize the carbon dots [18].

In the current study,[19,20,21] endeavors were made to orchestrate GQDs from a natural source such as *Cocos nucifera L* showing to several properties of it such as antibacterial. Hydrothermal Flow Synthesis methodology was used in synthesizing *Cocos nucifera L*[22] based GQDs using hydrazine hydrate as a capping [23] agent because of its antibacterial property and reducing property. The synthesized GQDs were subjected to several characteristic studies, UV, XRD, FTIR &antibacterial studies.[24,25]

II. METHODOLOGY

Hydrothermal synthesis methodology was performed to synthesize GQDs from Cocos *nucifera L* a natural source. These GQDs were later analyzed for its characterization of UV, XRD, FTIR antimicrobial activity studies.

2.1 Synthesis of GQDs

The *Cocos nucifera L* have been cleaned, crushed and arid in a hot-air oven at 80. After drying, 0.1 g of Cocos *nucifera L* sample is taken with 1 ml of hydrazine hydrate also dissolved in 10 ml of water in an ultrasonic water bath around half an hour. This resolution was transferred to a 25 ml Teflon lined stainless autoclave. This used to be then heated between one hundred fifty-200 in an electric oven and stored for six-10 h moreover. This water-soluble GQD product sample was cooled to 37°c and then drained via 0.22 mm micro-porous membrane to expel the insoluble carbon products from the sample. Further, these samples were dialyzed using a dialysis bag for 2 days to expel the unfused small molecules from the sample. These purified black colored GQDs were later died at 80 with a yield of nearly 33% and moreover utilized for basic portrayal and property measurements.

III. STRUCTURAL CHARACTERIZATION

3.1 UV spectroscopy analysis

UV spectrometry used to the sample was analysed.The slit was maximum 2nm maintained at room temperature 100mm.300-800 nm the uv light wavelength used to the sample was examined at particular time. Then

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the sample was centrifuged at 3000 rpm for 10 mins. The what man filter paper used to filter the sample.1:10 ratios the sample was diluted in solvent.

3.2 X-ray diffraction

The crystallinity and phase purity of the synthesized GQDs was analyzed by making use of X-ray diffraction (XRD) analysis. X-ray diffraction sample used to be located by way of making use of Shimadzu (XRD - 6000, Japan) instrument. X-ray pattern organized with Cu k _ radiation (= 1.5406 Å)with the precise voltage of 45 kV and present of forty mÅ.

3.3 FTIR analysis

FTIR used to the functional groups are identified in the sample. The maximum absorption spectrum was analyzed in the sample. Dry potassium bromide (KBr) was added in the extract. The KBr was fully mixed with in 2mins.Then the sample was analyzed in the Bruker, Germany Vertex 70 infrared spectrometer. The IR spectrum was scanned from 4000 to 400 cm-1.The highest peak value was analyzed in the sample.

3.4 The Antibacterial potential of Cocos *nucifera L*

The Cocos *nucifera L* was estimated for the activity of antibacterial against bacterial strains such as *Escherichia coli, Streptococcus mutans*, *Staphylococcusareaus* and *Pseudomonas aeruginosa* by the agar diffusion methods. The bacterial cultures were swapped on the Petri plates surface contain Mueller Hinton Agar and then with the help of cork borer the holes were made. To those holes, 20 µl of every dissolved extracted solvent in DMSO was inoculated.10 µg of Ampicillin used to be utilized because of the positive manage and negative control as DMSO. The inoculated plates had been incubated at 37ºC for 24 hours. Finally, the zones of inhibition formation have been evaluated.

3.5 Cytotoxic effect of the Cocos *nucifera* extract by MTT assay

MCF 7 cell line used to be gathered from the country wide center for Cell Sciences, Pune (NCCS). The received cells had been saved in DMEM more advantageous with 10% FBS, penicillin (one hundred U/ml), and streptomycin (one hundred µg/ml) in a humidified nature of fifty µg/ml CO2 at 37 °C. Cells (1 × one hundred and five/good) have been plated in 24-well plates and maintained in an incubator at 37˚C with 5% CO2. On the point when the cell achieves the conjunction, more than a few concentrations of the seed residues extending from 7.85-1000 µg/ml have been inoculated and maintained in the incubator for 24 hours. The incubated pattern used to be expelled from the well and washed with phosphate-buffered saline (pH 7.4) or DMEM without serum. A hundredµl/well (5mg/ml) of 0.5% three-(4, 5-dimethyl-2-thiazolyl)- 2,5-diphenyl-tetrazolium bromide (MTT) used to be inoculated and maintained in incubator for four hours. After4 hours, 1ml of DMSO used to be delivered to all the wells. The absorbance at 570 nm was once estimated with UV-Spectrophotometer utilizing DMSO as the clean solution. Cytotoxicity estimations were performed and the 50% inhibition (IC50) awareness was once concluded graphically. The viability cell percentage was decided by the equation:

Cell viability = Treated cell of A570/ controlled cells of A570 X 100

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IV. RESULT & DISCUSSION

4.1 UV spectroscopy analysis

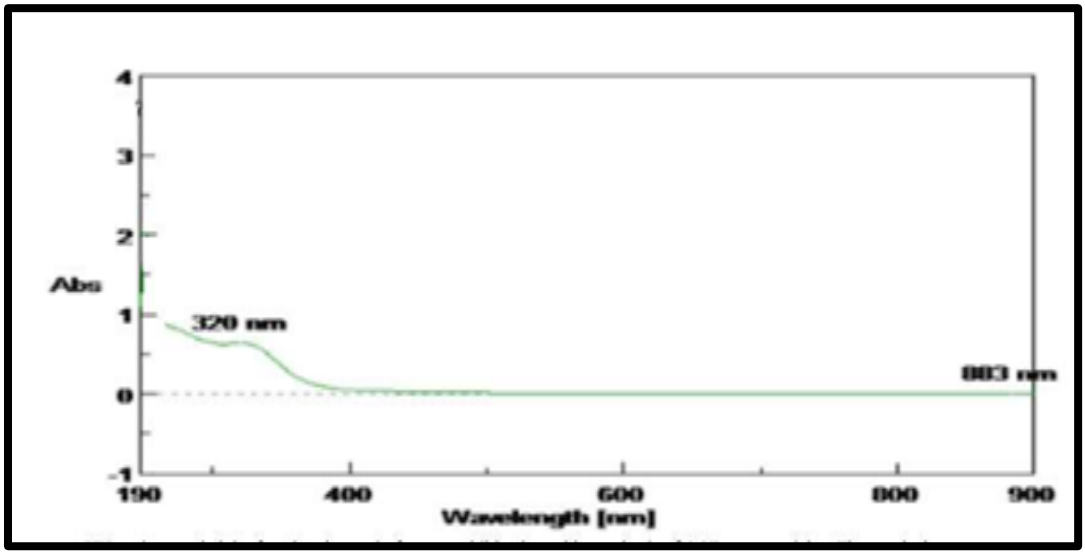

Fig 1 UV Spectrum Graph of the biosynthesized GQDs*Cocos Nucifera L*

The UV study of the synthesized GQDs nanoparticles revealed that the natural source *Cocos nucifera* Exhibit the stable synthesis of GQD nanoparticles. The UV spectrum graph (*Fig. 1*) shows the maximum absorption of the synthesized GQDs nanoparticles at about 320 nm.

4.2 X-ray diffraction

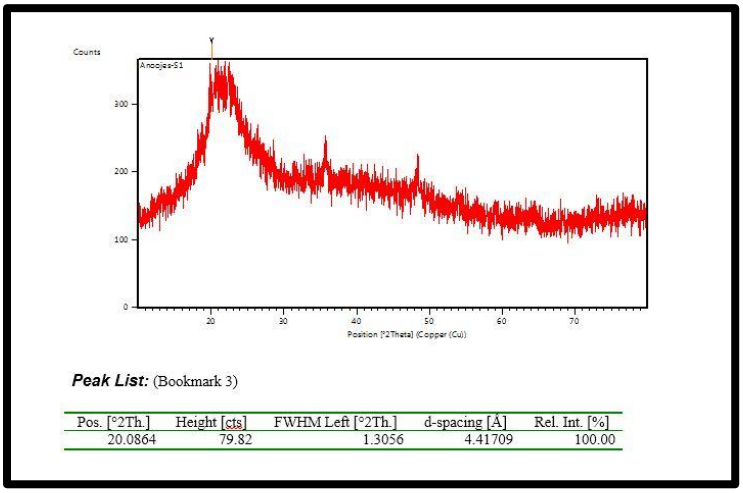

Fig. 2: XRD pattern of the biosynthesized GQDs *Cocos nucifera L*of seeds

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XRD pattern (*Fig. 2*) with sharp peaks at 2h = 32.36, 45 and 71.69 corresponding to representing the face-centered cubic structure of carbon was obtained. The average crystallite size predicted using the Debye-Scherrer formula was observed to be about 6.1 nm. This is identified with the polycrystalline nature of the nanoparticles. XRD pattern exposed the FCC structure of the synthesized GQDs

FTIR spectra of the *Cocos nucifera L*

Cocos nucifera L showed the presence of hydroxyl groups (OH)at 3227 cm^{-1}; alkane groups(C-H) at 2920 and 2856 cm^{-1}. A small peak corresponding to carbonyl stretch(C=O) was observed at 1730cm^{-1}. The peak at 1692 cm^{-1}represented amide I group(C=C).Peak recorded at 1509 cm^{-1}representsnitro compounds (N-O). Similarly, peaks recorded at 1459 $cm^{-1}$and 1076 cm^{-1}were attributed to aromatic (C=C) and alcohol (C-O) groups. The results are found to be similar to the IR spectra of aril and mace of *Cocos nucifera L*.

4.4 The Antibacterial potential of *Cocos nucifera L*

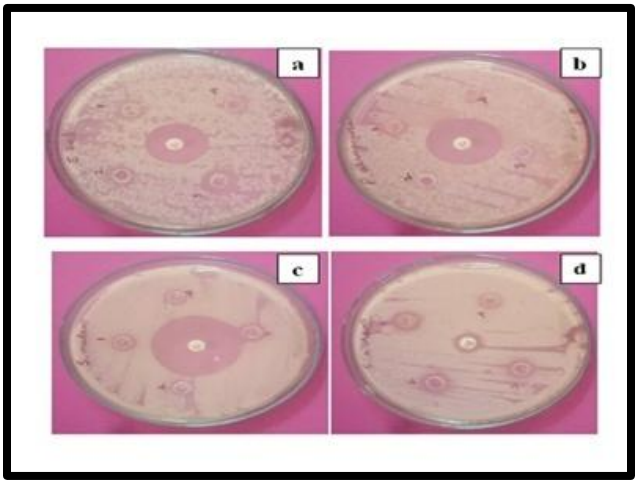

Fig 4

Growth inhibition activity of the *Cocos Nucifera L* against (a)*E. coli*; (b) *Pseudomonas aeruginosa;* (c) *S. mutans and* (d) *S. aereus***.**Our results Studies have suggested that GQDs lack antibacterial property, How ever GQDs exhibited species detailed exercise towards Staphylococcus aureus (S. Aureus), consisting the antibacterial-tolerant persisters. The observed activity may just correlate with a GQD's ability to disrupt bacterial cellphone envelop. Surface Gaussian-curvature suit between a GQD and a goal bacterium could play a significant position within the association of the GQD with the bacterial cell surface, the preliminary step for cell-envelop-disruption, suggesting the value of both GQDs' source substances and the bacterial form

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4.5 Cytotoxic effect of the Cocos *nucifera* extract by MTT assay

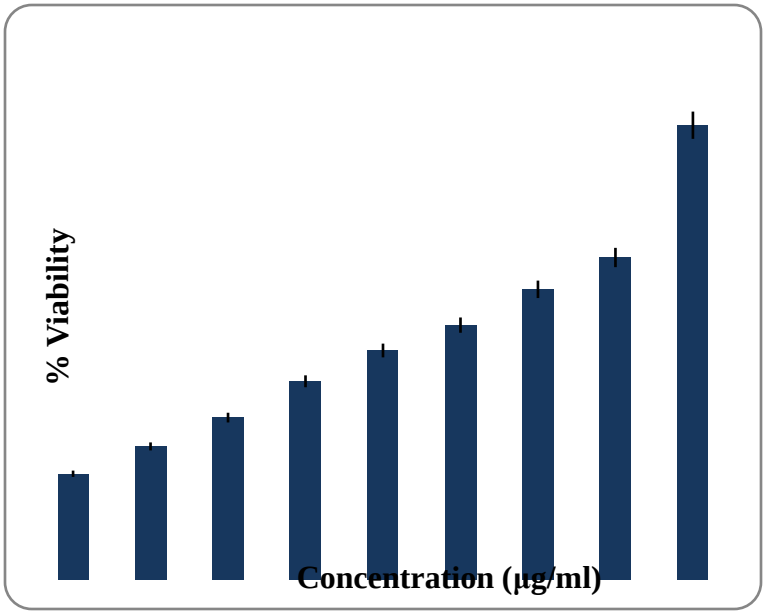

Fig 5a. Cytotoxic effect of the *Cocos nucifera L* against MCF-7 cell line

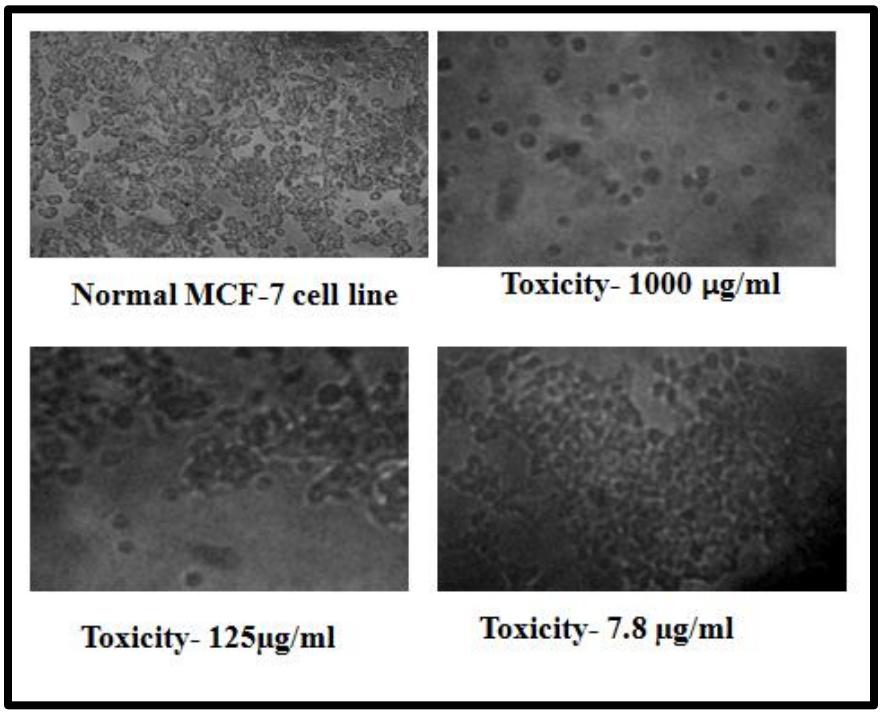

Fig 5b. Microscopic view of MCF-7 cell treated with different concentration of the *CocosnuciferaL* extract

Fig 5a shows the cell viability of the cocos Nucifera leaf extract on MCF-7 cell lines. In the incubation time of assay the sample with each and every concentration shown its tocxicity affects on the cancer lines. It shows the sample is having cytotoxicity effect and can be used for medicinal purposes. Fig 5b shows the microscopic image of cell lines in which how the cells get disrupted in every concentration.

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V. CONCLUSION

Despite the difficulties in the production of high-quality GQDs, Hydrothermal approach, using Hydrazine hydrate is considered to be one among the best methods owing to its high scale of production and easy purification methods have described the synthesis of GQDs using continuous Hydrothermal Flow Synthesis (CHFS) which has proved to be an ecological and new approach for the synthesis of the large scale of GQDs [38]. Similarly, have taken natural source extracts which have a high carbon and nitrogen contents have high effects in fabricating nitrogen doped GQDs

GQDs synthesized with *Cocos nucifera L* in the present study showed maximum absorption at 320 nm, as illustrated in several studies which suggest that GQDs has strong optical absorption in the UV region which is 260-320 NMR. The absorption characteristics of GQDs can be successfully altered by functional groups and surface passivation. Similar studies have also shown that GQDs are at an average range of 270-390 nm which exhibit a shoulder peak.

In this study, GQDs synthesized *Cocos nucifera L*with evaluated for its antimicrobial activity against *E. coli, Pseudomonas aeruginosa, S. mutans and S. aereus these pathogens.* The cytotoxic effect against MCF-7 cells has proven its potentiality in preventing diseases. Many research works are still in progress which is aiming to study the physical and medical properties of such GQDs synthesized with natural substitutes. This would definitely bring out the possible advantages of GQDs like drug or gene delivery, bioimaging, optical sensing, and Theranostic.

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