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Chair Alireza Heidari President (AISI) | USA

Session Introduction

Title: Light-emitting diodes: As external stimulus for plant-mediated biosynthesis and biological activities of silver nanoparticles

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Light-emitting diodes: As external stimulus for plant-mediated biosynthesis and biological activities of silver nanoparticles

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he trend of using biological entities particularly plant extracts for nanoparticles (NPs) synthesis has expedited in recent years due to environmental safety, cost effectiveness, simplicity and sustainability of green route. Moreover, the morphology of NPs could be fine-tuned by applying abiotic factors such as LEDs which enhance the bio-reduction of precursor salt and excites phytochemicals during the green synthesis. Given this, in present study the green synthesis of AgNPs was carried out using by Dalbergia sissoo leaves extract under the illumination of red, green, blue, yellow and white LEDs. Phytochemical analysis revealed that D. sissoo was enriched with phenolic (23.6 ± 0.76 mg GAE/g DW) as well as flavonoids content (1.65± 0.01 mg QE/g DW) which attributed to high FRSA (80.84 ± 0.87 %). The phytochemical profile reflected upon the effective synthesis of AgNPs as alcohols and phenols were mainly involved in capping and bio-reduction revealed from FTIR analysis. Moreover, XRD analysis showed face center cubic crystalline nature of AgNPs with interesting finding that LEDs helped in reducing the size of AgNPs significantly. Y-DS-AgNPs (34.63 nm) being smallest in size as compared to control (87.35 nm). LEDs not only reduced the size of AgNPs but SEM analysis showed synthesis of non-agglomerated differently shaped AgNPs including spherical, triangular, hexagonal as compared to mixed shape control AgNPs. Theses green biocompatible AgNPs showed extraordinary therapeutic potential specially B-DS-AgNPs resulted in highest anti-oxidant (FRAP 485.6 ± 9.6 μM TEAC; CUPRAC 588.1 ± 8.4 μM TEAC; ABTS 323.4 ± 10.4 μ M and ORAC 469.2 ± 11.3 μ M TEAC), anti-glycation $(63.3 \pm 2 \%$ and $33.1 \pm 3 \%$ inhibition of vesper lysine-like AGEs and pentosidine-like AGEs) as well as anti-bacterial activities. While Y-DS-AgNPs effectively inhibited HepG2 cells growth (cell viability 26.01 ± 1.56 %) by inducing intracellular ROS/RNS generation (3807.62 ± 236.63

relative DHR-123 fluorescence), disrupting mitochondrial membrane potential (1839.29 \pm 162.45 RFU) via caspase-3 gene activation (419.15 \pm 106.51 log 2-fold change) and enhanced caspase-3/7 activity (137.26 \pm 41.13 RFU/mg protein). Lastly, these NPs showed mild toxicity towards brine shrimp and caused moderate hRBCs hemolysis, showing their biosafe nature which can be enhanced at lower concentrations. Here we conclude that external factors such as LEDs are effective in controlling the morphology of AgNPs which reflects upon their enhanced biological efficacy.

Recent Publications

- Sumaira Anjum, Mariam Hashim, Sara Asad Malik, Maha Khan, José M Lorenzo, Bilal Haider Abbasi, Christophe Hano. Recent Advances in Zinc Oxide Nanoparticles (ZnO NPs) for Cancer Diagnosis, Target Drug Delivery and Treatment. Cancers. 2021; 13(18): 4570
- Amna Komal Khan, Sidra Kousar, Duangjai Unununium, Christophe Hano, Bilal Haider Abbasi, Sumaira Anjum. Nano Elicitation as an Effective and Emerging Strategy for In Vitro Production of Industrially Important Flavonoids. Applied Sciences. 2021; 11(4): 1694
- Faryal Saeed, Muhammad Younas, Hina Fazal, Sadaf Mushtaq, Faiz Ur Rahman, Muzammil Shah, Sumaira Anjum, Nisar Ahmad, Mohammad Ali, Christophe Hano, Bilal Haider Abbasi. Green and chemically synthesized zinc oxide nanoparticles: effects on in-vitro seedlings and callus cultures of Silybum marianum and evaluation of their in-vitro activities. Artificial cell Nanomedicine and Biotechnology. 2021; 29(1):450-460.

Speaker Biography

Sumaira Anjum has her expertise in synthesis and biomedical applications of Nanoparticles. She has synthesized a large variety of metallic and metal oxide nanoparticles and evaluate their activities for treatment of various diseases. She is having published many papers in International Journals regarding the Nanotechnology and Nanomedicines.

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Young Research Forum

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Process optimization and characterization of green synthesized silver nanoparticles using leaves extract of *Azadirachta indica A. Juss*.

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 ${\bf N}$ anotechnology, one of the most dynamic areas of research and fastest growing market, has increased exponentially now as days because of its application in various fields. The development of ecofriendly products using available resources to acquire maximum production, better yield and stability is a great challenge for nanotechnology. In this study, silver nanoparticles were synthesized via green method using leaves extract of Neem (Azadirachta indica A. Juss.) plant as reducing and capping agent. The effects of various factors responsible in controlling the synthesis process i.e., reaction pH, time, temperature, reagent concentration, volume of plant extract including its preparation method and solvent type were studied. The formation of nanoparticles was confirmed through UV-spectrophotometer and the product showed absorbance peak in range of 420-440 nm. The size of nanoparticles was determined by zeta sizer proved to be 22-30 nm and the functional groups attached to stabilize the nanoparticles were also investigated using FTIR technique. Other techniques such as SEM, EDX and XRD were also employed to study the characteristics of developed nanoparticles. It is concluded from the results that using the plant resources in synthesis of silver nanoparticles is a simple, single step, fast, cost effective and nontoxic approach for synthesis of silver nanoparticles can be applied in agriculture, biomedical and other fields.

Recent Publications

- Madeeha Ansari, Sumera Javad, Azeem Haider, Muhammad Mohsin Alam. Microwave Assisted Extraction of L-fenchone from Foeniculum vulgare Mill. in Hexane. 2021; 2
- Shakil Ahmed, Rida Ali, Madeeha Ansari, M Nauman Ahmad. Fluoride-induced abnormalities and modulations in growth parameters of Solanum Melongena L. (Brinjal, Bengun, Aubergine, Eggplant). Fluoride. 2020; 53(3): 1-12
- Iqra Akhtara, Sumera Javada, Madeeha Ansari, Nadia Ghaffar, Amina Tariq. Process optimization for microwave assisted extraction of Foeniculum vulgare Mill using response surface methodology. 2019; 32(2): 1451-1458.

Speaker Biography

Madeeha Ansari is currently working as a Ph.D. research scholar since 2017 at the Institute of Botany, University of the Punjab, Lahore, Pakistan. She has been doing her research work in the field of nanotechnology. Her studies focus on the synthesis of metallic nanoparticles via green method, their characterization and applications in agriculture specifically as nano fungicide. She is interested in improving the nutritional quality of food and the elimination of biotic and abiotic stresses of plants using nanomaterials and to assess the risk to environment. She also has experience in the field of biochemistry while dealing with different extraction methods for production of natural compounds for pharmaceutical industry.

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