



ANVESHANA

RESEARCH PROJECTS 2023

Nurturing Researchers for Tomorrow

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Exploring the potential of natural bacterial consortium and green synthesized metal nanoparticles in the photocatalytic dye degradation: An integrated approach



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Overview

Environmental pollution caused by hazardous dyes has become a global concern, which makes it necessary for the development of effective and sustainable treatment methods. The textile industry employs around 10,000 different dyes and pigments, a majority of which, being hazardous and carcinogenic, are released into the environment annually. Unfortunately, due to their resilience, conventional wastewater treatment methods often fail to eliminate these dyes, allowing them to persist in the environment. This research work presents an integrated approach for the degradation of environmentally hazardous dyes using eco-friendly nano photocatalysts and microbial consortia. The study aims to assess the efficiency of this combined system in dye degradation and provide insights into the potential application of this approach for wastewater treatment and environmental remediation.

Key Results

The study revealed that using biological and photochemical methods alone had limited success in removing dyes in the sample containing a mixture of dyes. However, an integrated approach involving bacterial degradation and UV-metal oxide treatment demonstrated significant improvements, achieving up to 83.8% dye degradation. This two-step process showcased the effectiveness of a synergistic interaction involving enzyme activity, biosorption, and photocatalytic action.

Publication

Student researchers are in the process of writing the manuscript to be communicated to a peer reviewed journal.



It was a very rich experience to work on such a research project. The way I process information has changed. Instead of accepting facts and knowledge, the way it has presented, I am now able to question and understand why it is so? My research experience encourages me to further explore biotechnology and related topics so as to work on such a research again.

Sriranjani

Class 11, MES PU college



Engaging in science projects at a young age has not only heightened my passion for the subject but has also honed my problem-solving skills and teamwork abilities. The hands-on experience has been invaluable, enhancing my understanding and fostering patience. Additionally, presenting findings and writing scientific reports have contributed to developing effective communication skills. This early exposure to science has instilled a sense of accomplishment and set a strong foundation for future endeavors.

Shravani Basapur

Class 9, Venkat International Public School

This program has helped me a lot for my future in science and to gain knowledge about research. The most important thing to me about my research experience is that researching is not easy without full willingness and concentration. The results that we get from our research work were important for me to overcome some of the drawbacks of the existing methods. Overall, it was a great and unforgettable experience doing research.

Pushpavathi S

Class 9, Sai Krishna Vidyamandir School



Effect of Coating Seeds with Micronutrients and Bacterial Consortia on Stomatal Conductance and Yield of Cluster Bean



Dr. Venkata Krishna Bayineni
Senior Researcher, Prayoga



Harshita Nagesh,
Class 11, Bishop Cotton Girls' School, Bangalore



Vishal Vinod Kumar,
BSMS 3rd year, Indian Institute of Science Education and Research Tirupati

Overview

Obesity has emerged as a global health concern, necessitating the search for safe and effective anti-obesity agents. This research article presents an in-vitro screening study aimed at evaluating the potential anti-obesity properties of selected tropical plants. A total of 18 plant extracts were tested for their ability to inhibit pancreatic lipase, a key enzyme involved in dietary fat digestion and absorption.

Key Results

Leaves of *Salix cinerea* and flowers of *Combretum rotundifolium* extracts displayed the most potent lipase inhibitor, with the IC₅₀ value of 38.5 and 63.76 µg/ml respectively and both the extracts showed noncompetitive inhibition pattern. The overall results demonstrate promising anti-obesity activity in certain tropical plant extracts, suggesting their potential as natural alternatives for managing obesity. This study contributes valuable insights into the therapeutic potential of tropical plants in combating obesity and sets the stage for further investigations to identify bioactive compounds for future drug development.

Publication

Student researchers are developing an article that will be communicated to a peer-reviewed journal





This experience has taught me the importance of patience and time management. I learned about research methodologies, the extensive need for a literature review, handling various equipment, patience, and having a broad view of the outcome of the results. I have gained much more knowledge about the subject when compared to when I began. It has also helped me rethink my career choice and ponder what I am really passionate about.

Harshita Nagesh,

Class 11, Bishop Cotton Girls'
School, Bangalore

My experience at Prayoga was enriching and rewarding. I had the privilege of working on a project that involved screening tropical plant extracts for antiobesity properties, which was a novel and challenging topic. I was exposed to various techniques and protocols in the wet lab, and I gained skills in experimental design, data analysis, and result presentation. I was fortunate to have the guidance and mentorship of Dr. Venkata Krishna, my principal investigator, who supervised my work and gave me constructive feedback. I am grateful for the opportunity to work at Prayoga Institute, and I cherish the memories I made there.



Vishal Vinod Kumar,

BSMS 3rd year, Indian Institute of
Science Education and Research
Tirupati

From Molecules to Medicine: Synthesizing and Studying a Neurological Drug



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Class 9, Sai Krushna Vidya
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Svayam Kulkarni,
Class 11, Real Learning Centre,
Bengaluru.



Pranav Krishna Kumar,
Class 10, PSBB Learning
Leadership Academy,
Bengaluru

Overview

The project focused on the synthesis and characterization of Phenytoin, an endeavor that offered profound insights and educational value in the field of medicinal chemistry. The project underscored the importance of comprehensive research and practical application in advancing knowledge and innovations within this field. The project commenced with a thorough literature survey, establishing a foundation in medicinal chemistry, the synthesis of Phenytoin, epilepsy-related disorders, and in-silico drug discovery techniques. This comprehensive background knowledge was instrumental in guiding the subsequent experimental work.

Key Results

A significant milestone was achieved through the successful synthesis of Phenytoin, followed by its characterization utilizing advanced analytical techniques such as Fourier Transform Infra-Red Spectroscopy (FTIR) and High-Resolution Mass Spectrometry (HRMS). The outcomes of these analyses confirmed the purity of the synthesized Phenytoin. Furthermore, the assessment of Phenytoin's drug-like properties using the SwissADME web tool marked a critical juncture in this project. The results were exceptionally encouraging, hinting at Phenytoin's potential as a promising drug candidate. This project transcended theoretical learning by showcasing the practical applications of interdisciplinary approaches and hands-on experimentation in the realm of medicinal chemistry and drug discovery.

Publication

A manuscript from this project is being prepared for publication in peer-reviewed journals.



"This Anveshana project has given me skills like problem solving and knowledge of chemistry, science, and research as a whole. It has helped me learn time management, organization skills, equipment usage methods, teamwork, and many more." You can summarize these results and give them a paragraph."

Pranav Krishna Kumar,
Class 10, PSBB Learning Leadership
Academy, Bengaluru



"This research experience helped me gain a deeper understanding of how to go about conducting research and a love for chemistry. A hands-on experience and experimental learning helped me find out career options."

Svayam Kulkarni,
Class 11, Real Learning Centre,
Bengaluru.

"I gained knowledge of research, finding out new things uniquely, learning new methods to operate instruments, and doing different experiments. I have got an amazing experience which I ever had before."

Poornima K,
Class 9, Sai Krushna Vidya Mandir
School, Hosadoddi Village, Bengaluru



Optimization of the Hydrothermal Reaction Parameters for the generation of semiconducting Bismuth Tungstate Nanoparticles



Dr Pradeep Shanbogh
Researcher, Prayoga



Ms Padmini K U
Research associate,
Prayoga



Vittal Iyenger
Class 9, Inventure Academy



Guhan Annamalai
Class 9, National Public School

Overview

This project aims to closely examine how various factors such as temperature, time, acidity, the amount of starting ingredients, and pressure can influence the creation of Bi_2WO_6 . The ultimate objective of this study is to determine the impact of each of these variables on the quality and outcome of Bi_2WO_6 .

Key Results

Making Bi_2WO_6 is complex but, by fine-tuning the conditions, we can get top-quality nanoparticles useful for advanced purposes. This research guides how to reliably make Bi_2WO_6 for practical uses. Optimal conditions for pure Bi_2WO_6 synthesis include a temperature of $200\text{ }^\circ\text{C}$ and a reaction time of 7 hours. By maintaining a neutral pH (7) it creates pure Bi_2WO_6 , while excessive ingredient amounts can lead to impurities. The most favorable results occur in spaces filled 60-80%, yielding a mix of round clumps and plate or rod shapes in the final particles.

Publication

Students are currently finishing the final section of their paper. It will be communicated to a journal soon.



I have learned valuable research skills, subject knowledge, integrity, and patience in an enjoyable manner over the past three months. Participating in this project has given me a hands-on experience with science that I thoroughly enjoyed.

Guhan Annamalai
Class 9, National Public School



During my time working in the lab, I gained experience handling various pieces of equipment such as centrifuges, hot air ovens, vortex mixers, and hot plate stirrers. I also developed strong data analysis skills through the use of tools like Origin Pro. These experiences have given me a greater understanding of chemistry and materials, as well as improved my experimental skills. Furthermore, these projects have taught me about taking on responsibility and have provided me with insight into my future career path. Additionally, I have learned valuable skills related to report writing.

Vittal Iyenger
Class 9, Inventure Academy



Bio-material thin films for resistive switching non-volatile memory



Dr. Omprakash
Senior Researcher, Prayoga



Suryaansh K K,
Class 10th Vijaya Bharathi
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Bengaluru



Aditya A. Kaushik,
Class 12th, The Valley School
KFI, Bengaluru



Anirudh Bhat,
Class 11th Real Learning
Centre, Bengaluru

Overview

This research project explores the integration of biomaterials, specifically lotus leaves, into RRAM devices. The fabrication process involves depositing lotus leaf-based thin films on conductive substrates, resulting in FTO/Lotus leaves/Ag sandwiched structures. The thin film fabrication process is straightforward and demonstrates the material's potential for electronic applications.

Key Results

Characterization of the biomaterial-based memristor devices reveals promising resistive switching behavior. The devices exhibit a bipolar switching mechanism, with stable and repeatable responses over numerous voltage sweep cycles. The resistive switching characteristics are influenced by factors such as lotus leaf particle size, annealing temperature, and film thickness. Notably, a 10 μ m thickness and annealing at 150°C yield optimal device performance, showcasing the potential for fine-tuning biomaterial-based RRAMs for specific applications.

Publication

A detailed project report was submitted to Prayoga Institute of Education Research.



“Practical independent research improved my confidence for conducting experimental studies. The hands-on instruments handling opportunities helped to achieve new skills. Also the viva helped to improve my presentation skills.”

Suryaansh K K,

Class 10th Vijaya Bharathi Vidyalaya
CBSE School, Bengaluru



“The project taught me the basics of research and scientific method. The interactions with senior researchers helped me get an insight of how a research methodology is carried out. Also, working with high end instruments helped me gain confidence in pursuing a scientific research activity in the future.”

Aditya A. Kaushik,

Class 12th, The Valley School KFI, Bangalore

“The reality of how a research work is conducted was understood through this project work. Learning new scientific techniques and handling various instruments was a very good learning curve for me. This project helped me understand the importance of a strong literature review for a very good research outcome.”

Anirudh Bhat,

Class 11th Real Learning Centre, Bengaluru



ANVESHANA

Nurturing Tomorrow's Researchers

With education being primarily coursework-based, students excel in environments where learning outcomes are known or certain. We need to provide opportunities and support students in acquiring the competencies necessary to become world-class researchers. This broadens their scope for exploration and fosters a culture of discovery within the educational framework.

The Anveshana program nurtures the next generation of researchers for the country. High School Students (grades 9-12) passionate about a career in science are encouraged to apply to this unique student-researcher program.

Students participate in research projects guided by senior researchers at Prayoga. They are introduced the process and products of science research, developing competencies necessary to become world-class researchers. This broadens their scope for exploration and fosters a culture of discovery within the educational framework.



Research builds capabilities to deal with unknown outcomes and the attitudes to deal with uncertain paths in acquiring knowledge.

Under the guidance of experienced researchers, students researchers of the Anveshana program are encouraged to conduct innovative scientific research under five areas of thematic research



Green Chemistry



Advanced and Functional Materials



Earth Sciences



Wellness



Food & Agriculture

For Prayoga, Anveshana is an Education Research Project. How does science research impact learning outcomes? Do the skills learnt during the research process affect students' attitudes toward science as a whole?

The impact of research in developing competencies and performance is assessed through this initiative which will help us evolve a framework to develop and nurture the next generation researchers for the nation.

For Anveshana Student-Researchers, the learning experience includes



Exposure to Scientific Research
in Contemporary Domains



Experience the
Joy of Discovery



Expert Guidance from
Prayoga Research Mentors



Develop Reports with
Opportunities for
Publication



Access to State-Of-The-Art
Laboratory Facilities



Interaction with Eminent
Scientists

This is a unique opportunity for students interested in pursuing scientific research as a career to engage with senior researchers, explore their areas of interest and hone skills and competencies required to thrive in a research and academic environment.

“ I could see in the students an interdisciplinary approach to the projects undertaken. The students have truly developed into inquiring minds, equipped with terms and concepts, in a bold search for new insights and truths.

Dr P R Krishnaswamy

Former Chief of Pathology, Jaslok Hospital

Visiting Professor, Cornell University

Special invitee - Nobel Committee for Physiology and Medicine, 1985

International Cancer Union Fellow

Applications for Anveshana are open once a year between January and March.

To learn more about the program, visit: www.prayoga.org.in/anveshana

For further information and queries, contact: anveshana@prayoga.org.in

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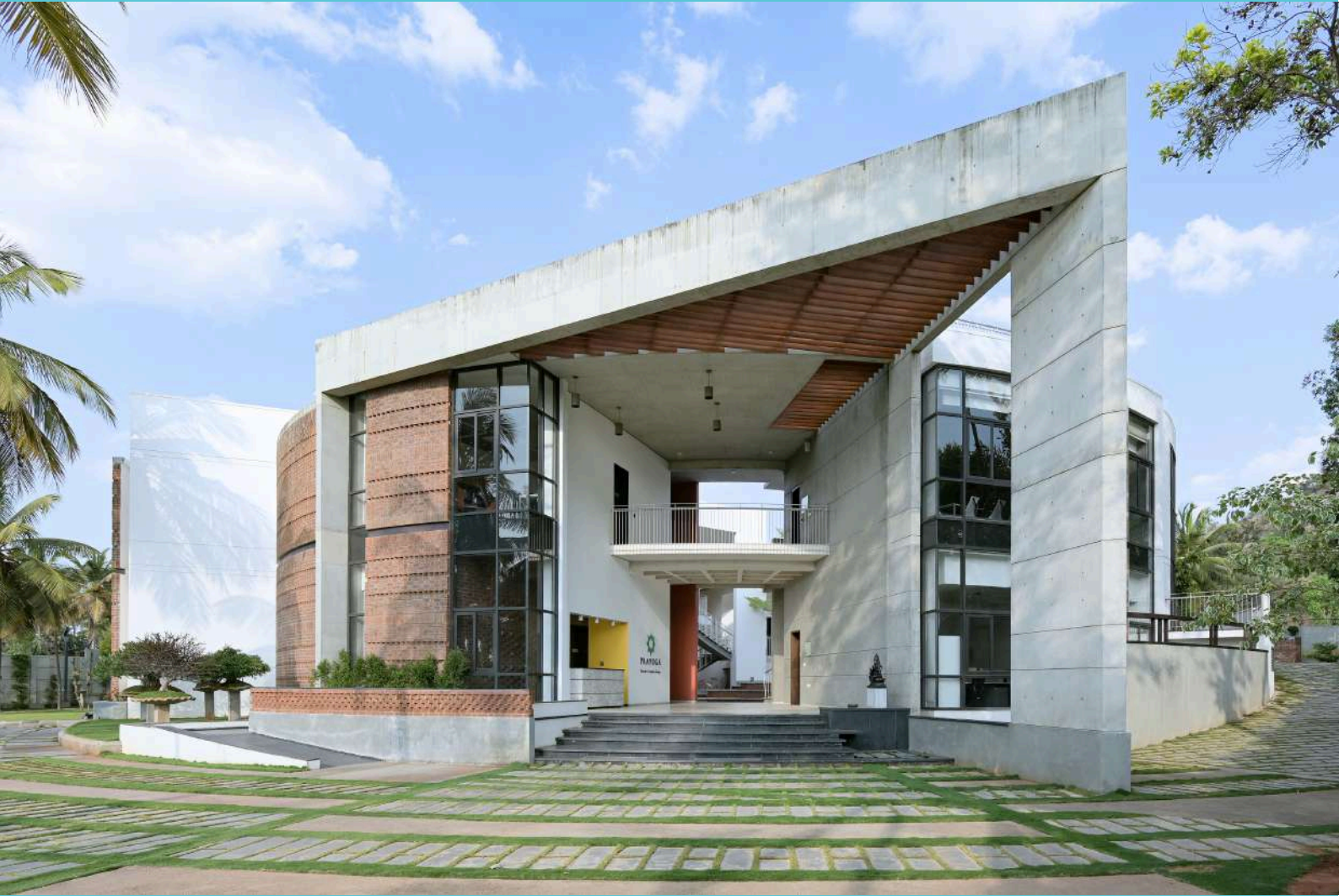
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