



*Anjuman Islam Janjira Degree College of Science
Murud-Janjira, District-Raigad, (MS) India, 402401.*

(Affiliated to University of Mumbai),

In Collaboration with

Rayat Shikshan Sanstha's

Veer Wajekar Arts, Science & Commerce College

Mahalan Vibhag, Phunde, Uran, Navi Mumbai, (MS) India, 400702

(Affiliated to University of Mumbai) and

M.S.P. M's D. G. Tatkare Mahavidyalay

Mangaon, District-Raigad, (MS) India, 402104.

(Affiliated to University of Mumbai),

SOUVENIR

**Vth INTERNATIONAL CONFERENCE ON
RECENT TRENDS IN CHEMICAL SCIENCE, PHYSICAL
SCIENCE, LIFE SCIENCE AND COMPUTER TECHNOLOGY**

(9th – 10th Feb 2026)

(HYBRID MODE – ONLINE & OFFLINE)





Anjuman Islam Janjira Degree College of Science
Murud-Janjira, District-Raigad, (MS) India, 402401.

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**Vth INTERNATIONAL CONFERENCE ON
RECENT TRENDS IN CHEMICAL SCIENCE, PHYSICAL
SCIENCE, LIFE SCIENCE AND COMPUTER
TECHNOLOGY**

Chief Editors

<p><i>Dr. Sajid F. Shaikh</i> I/C Principal Anjuman Islam Janjira Degree College of Science Murud Janjira 402401 Mo. No. 7038601376</p>	<p><i>Dr. Aamod N. Thakkar</i> I/C Principal Veer Wajekar Art, Science & Commerce College Phunde, Uran, Navi Mumbai 400702 Mo. No. 9322891200</p>	<p><i>Dr. B.M. Khamkar</i> Principal D.G. Tatkare Mahavidyalay, Mangaon, Raigad 402104 Mo. No. 9075610653</p>
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<i>Mr. Tamseel Shahjahan</i> Co-Convener	<i>Prof. Dr. Anil Palve</i> Co-Convener	<i>Ms. Mehreen Dawre</i> Co-Convener
<i>Mr. Altaf Fakir</i> Organising Secretary	<i>Dr. Gurumeet Wadhava</i> Organising Secretary	<i>Ms. Vishakha Pawar</i> Organising Secretary
<i>Mr. Rahim Bagwan</i> Treasurer	<i>Dr. Zelum Zende</i> Treasurer	<i>Mr. Bhanuprasad V</i> Treasurer
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<i>Miss. Bismah Killedar</i> Member	<i>Mr. Bhushan Thakur</i> Member	<i>Mrs. Urmila Khopragade</i> Member

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SCHEDULE OF CONFERENCE

*FOR OFFLINE PARTICIPANTS

Day-1 (09 February 2026)		Day-2 (10 February 2026)	
Time	Event	Time	Event
09:30 am to 10.30 am	Registration and Breakfast	9.00 am to 9.30 am	Breakfast
10:30 am to 11.10 am	Inaugural Function Chief Guest Dr. Dnyandev Mhaske	09:30 am to 10.30 am	Poster/Oral Offline Presentation
11.15 am to 12.00 pm	Keynote Address by Dr. Shivram Garje	10.30 am to 11.30 am	Excursion Tour at Murud Janjira Fort*
12.10 pm to 1.00 pm	Invited Talk 1 by Dr. Partha Palit	11:30 am to 11:45 am	Break
01.00 pm to 02.00 pm	Lunch Break	11:45 am to 12:30 pm	Invited Talk 4 by Dr. Aksha Memon
02.00 pm to 02.45 pm	Invited Talk 2 by Dr. Basem E. Keshta	12:30 pm to 01:15 pm	Invited Talk 5 by Dr. Shakeelur Raheman
02:50 pm to 04:15 pm	Study Tour at Phansad Wildlife Sanctuary* & Invited Talk 3 by Dr. Dnyandev Mhaske	01:00 pm to 02:15 pm	Lunch Break
04:30 pm to 06.00 pm	Online Oral Presentation	02:15 pm to 03:30 pm	Online Presentation (Room wise)
6.00 pm to 7.00 pm	Excursion at Kashid Beach*	03:30 pm to 04:30 pm	Validictory Function at Harihareshwar*
8.00 pm to 9.00 pm	Dinner		

ADVISORY COMMITTEE

Dr. Vasant Pandit Mali, Principal, J. Watumull Sadhubella Girls College, Ulhasnagar

Dr. Kalpana P. Jain, Principal, Royal College of Arts, Commerce and Science, Thane

Dr. H.R. Kulkarni, Director GH Rasoni College, Pune

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Dr. Dharap Sadanand Bhaskar, Principal, Bhausahab Nene ASC College, Pen

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Dr. M. A. Badgujar Principal, JSM College, Shivle, Thane.

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Dr. Rajendra P. Patil, M.H Shinde College, Tisangi, Kolhapur, Maharashtra India

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Dr. Aditi Taunk, University of Sydney

Dr. S. D. Tupare, K.E.S Anandibai Pradhan College, Nagothane, Raigad, India

Dr. B. L. Chavan, Dr. B.A.M.U, Aurangabad, India

Dr. Priya A. Assistant Professor, Catholicate College, Pathanamthitta, Kerala.

Dr. Mustafa F. Kocaeli University Istanbul, Turkey. – Aman sir

Prof (Dr) M M Gahatge, MBSK K Mahavidlyai Kadegaon Sangli

Dr. Rajan Tanwar Govt. College Arki, District Solan, Himachal Pradesh.

Dr. Dipak Kumar Gupta M.L.T. College Sahrasa, Bihar.

Dr. Avinash Bapurao Ade, Professor in Botany, Savitribai Phule Pune University, Pune

Dr. Gaurav M. Lohar, HOD, Physics, Lal Bahadur Shastri College, Satara, India

Mr. Arjun Patil, HOD, B.Sc.IT, Veer Wajekar College, Uran

Prof. Sagar D. Delekar, Director, Innovation, Incubation and Linkages , & IQAC, Shivaji University, Kolhapur

CHIEF PATRONS



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CHAIRMAN,
ANJUMAN ISLAM JANJIRA
DEGREE COLLEGE OF SCIENCE,
MURUD JANJIRA



Hon. Mr. Chandrakant N. Dalvi
CHAIRMAN,
RAYAT SHIKSHAN SANSTHA,
SATARA



Hon. Adv. Rajiv Ashok Sable
PRESIDENT
M.S.P.M's
D. G. TATKARE
MAHAVIDYALAY, MANGAON

ABOUT US...

ANJUMAN ISLAM JANJIRA DEGREE COLLEGE OF SCIENCE MURUD JANJIRA



It is one of the prime educational institution affiliated to University of Mumbai. The college is run by Anjuman Islam Janjira presumably one of the largest educational trust. It was established in 1907 with the vision of attainment of socio-economic upliftment of minority community by imparting quality education. The college has played an important role in the overall development of Murud Janjira since past 16 years. The college offers B.Sc. and B.Sc. in computer Science, B.A.S. and B.A.T at UG level and M.Sc. Organic Chemistry & Botany Programmes at PG level. In near future Research Centre in Chemistry will start. It underwent assessment and accreditation by NAAC in second cycle and achieved B+ Grade with 2.69 CGPA. This college received best college award by different organizations.

VEER WAJEKAR ARTS, SCIENCE & COMMERCE COLLEGE, PHUNDE-URAN



Royal Shikshan Sanstha's Veer Wajekar Arts, Science & Commerce College, Phunde, Tal-Uran, District-Raigad, was established in 1989 and is affiliated with the University of Mumbai. Managed by Royal Shikshan Sanstha, a renowned educational trust founded by Padmabhushan Dr. Karmveer Bhaurao Patil, the college offers undergraduate and postgraduate programs in Arts, Science, Commerce, Information Technology, and Management. Accredited with a B++ grade (CGPA 2.99) by NAAC in 4th Cycle 2025, the college has received the Best College Award from the University of Mumbai an. With a highly qualified faculty recognized for their research achievements, the institution continues to foster academic excellence and career growth, driven by a progressive and supportive management.

ABOUT US...

D. G. TATKARE MAHAVIDYALAY MANGAON



A milestone- D.G. Tatkare Mahavidyalay, Mangaon, District- Raigad (Maharashtra) was laid by Late. Ashoka dada Sable in 1993, with the exclusive purpose of offering education to students in rural areas and upliftment of society. Since its establishment, the holy work of providing education to about 1500 poor students of rural areas is being done. The college has been re-accredited by NAAC with B+ Grade (Second Cycle CGPA 2.64). The college is affiliated to the University of Mumbai and offers 6 Undergraduate and 6 Postgraduate programs. The college is determined and committed to provide an excellent education in elevated region and dedicated to fostering a diverse and inclusive learning environment that emphasize ethical practice, and lifelong learning, empowering our graduates and post-graduates to lead in a dynamic scenario.

About Conference

This International Conference on recent trends in chemical science, physical, life sciences and Computer technology is a brain storming to furnish on opportunity to academics aspiring scientist and research scholars from various discipline of science to interact and present their research execution in their respective field. This conference will be platform to highlight research achievement in the field of chemical science, physical science, life science and Computer Technology. Recent research trends of stated topics will be discussed

SUB-THEMES FOR CONFERENCE

Green Chemistry	Mixed Metal Oxides	Material for electronic devices
Polymer Chemistry	Synthetic Chemistry	Scope of Computer technology
Smart Computers	Artificial intelligence	Cyber Security
Ethical Hacking	Plant Diversity	Medicinal Plants
Bioorganic Chemistry	Sensor	Biodiversity
Agro-tourism	Nano material for future	Semiconductors
Bio fertilizers & organic farming	Environmental Sustainability	Electronic & Magnetic Property
Pure and Applied Mathematics	Statistics and Data Analytics	Mathematical Science
All other allied Subjects with Science and Technology		



Anjuman Islam Janjira
Established in 1907

ANJUMAN ISLAM JANJIRA DEGREE COLLEGE OF SCIENCE

Janjira Murud, Dist. Raigad, Pin.402401

(Affiliated to University of Mumbai)

ISO 9001:2015 (Quality Management Systems)

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Phone. 7038601376/ 9270083578

NAAC
Re-Accredited With
2.69 CGPA
B+ Grade

**Best College
Award 2019-20**
By Jolly Club- Raigad

Chief Patron

SIR. SIDDI AHMED KHAN



HIFZURREHMAN NAZIR
Secretary

ALTAFA H MALIK
Treasurer

AZIM KHANZADA
Murud Halqa
President

S. ZAINUDDIN KADIRI
CDC Chairman

Dr. SAJID SHAIKH
I/C Principal

Ref. No. AIJDCM/

Date:



Chairman Message

It is with great pleasure and a profound sense of academic commitment that I extend my warm greetings on the 5th International Conference on Recent Trends in Chemical Science, Physical Science, Life Science and Computer Technology (ICRTCPLCT-2026).

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad, established in 2009 as the first science institution in the taluka, has consistently pursued academic excellence and holistic institutional development. The college successfully completed the Second Cycle of NAAC Accreditation in 2024, earning a 'B+' Grade with a CGPA of 2.69, which reflects the collective dedication and sustained efforts of the faculty, administrative staff, and management in maintaining quality standards in higher education.

The institution presently offers undergraduate programmes in **Chemistry, Botany, Computer Science, and Management**, and has further strengthened its academic portfolio by introducing postgraduate programmes in **M.Sc. Chemistry and M.Sc. Botany**. These initiatives underline the college's commitment to advancing higher education, promoting research culture, and encouraging scientific inquiry among students and faculty members.

In alignment with this academic vision, the college is proud to organize **international conference** envisaged as an interdisciplinary platform that brings together **researchers, academicians, scientists, and students** from diverse scientific domains. The conference aims to facilitate the dissemination of research findings, foster the exchange of innovative ideas, and encourage meaningful scholarly discussions across disciplines.

I am confident that this conference will serve as a valuable forum for **young researchers, faculty members, and students**, promoting scientific temperament, collaborative research, and academic enrichment. The technical sessions, research presentations, and deliberations are expected to contribute significantly to the advancement of contemporary scientific knowledge.

On this auspicious occasion, I sincerely appreciate the efforts of the **Conference Organizing Committee**, faculty members, staff, and all contributors whose dedication has made this event possible. I extend my best wishes for the grand success of **ICRTCPLCT-2026** and trust that the conference will achieve its academic and research objectives.

Chairman

Anjuman Islam Janjira Degree College of Science



CHAIRMAN
ANJUMAN ISLAM JANJIRA
DEGREE COLLEGE OF SCIENCE
JANJIRA MURUD DIST RAIGAD

Secretary Message

It gives me great pleasure to extend my warm greetings to all the delegates, academicians, researchers, and students participating in the **5th International Conference on “Recent Trends in Chemical Science, Physical Science, Life Science and Computer Technology”**, jointly organized by **Veer Wajekar Arts, Science & Commerce College, Phunde, Uran** and **M.S.P.M.’s D. G. Tatkare Mahavidyalay, Mangaon**, affiliated to the University of Mumbai, to be held on **9–10 February 2026 in hybrid mode (online & offline)**.

In the present era of rapid scientific and technological advancement, platforms that encourage interdisciplinary dialogue and research dissemination are of immense importance. This international conference serves as a **brainstorming forum**, offering valuable opportunities to academicians, aspiring scientists, and research scholars from diverse scientific disciplines to interact, exchange innovative ideas, and present their research outcomes.

The conference aims to **showcase recent research achievements and discuss emerging trends** in chemical science, physical science, life science, and computer technology. Such academic initiatives significantly contribute to strengthening research culture, fostering innovation, and preparing young minds to address contemporary scientific and technological challenges.

I sincerely appreciate the efforts of the organizing institutions, the organizing committee, and all faculty members involved in planning and executing this prestigious event. I am confident that the deliberations, keynote lectures, and scholarly presentations will be intellectually enriching and will add value to the academic and research community.

I convey my best wishes for the grand success of this international conference and hope it will inspire meaningful collaborations, innovative research, and sustained academic excellence.

Hon. Mr. Vikas Deshmukh, IAS (Retd.)

Secretary

Rayat Shikshan Sanstha, Satara

Chairman Message

It gives me immense pleasure to convey my warm greetings to all the delegates, academicians, researchers, and students participating in the **5th International Conference on “Recent Trends in Chemical Science, Physical Science, Life Science and Computer Technology”**, jointly organized by **Veer Wajekar Arts, Science & Commerce College, Phunde, Uran** and **M.S.P.M.’s D. G. Tatkare Mahavidyalay, Mangaon**, affiliated to the University of Mumbai, scheduled on **9–10 February 2026** in **hybrid mode (online & offline)**.

In the present knowledge-driven era, science and technology play a pivotal role in shaping sustainable development and improving the quality of human life. This international conference is a commendable **brainstorming initiative**, providing a valuable opportunity for academicians, aspiring scientists, and research scholars from various scientific disciplines to interact, exchange ideas, and present their research work on a common platform.

The conference aims to **highlight significant research achievements and discuss emerging trends** in chemical science, physical science, life science, and computer technology. Such interdisciplinary academic forums are essential for nurturing scientific temper, encouraging innovation, and promoting collaboration among institutions and researchers at national and international levels.

I sincerely appreciate the efforts of the organizing institutions, the organizing committee, and all faculty members involved in successfully planning this prestigious academic event. I am confident that the deliberations, keynote addresses, and research presentations will be intellectually enriching and will contribute meaningfully to the advancement of scientific knowledge.

I extend my best wishes for the grand success of this conference and hope it will inspire new ideas, meaningful collaborations, and future research endeavors among all participants.

Mr. Chandrakant Dalvi, IAS (Retd.)

Chairman

Rayat Shikshan Sanstha, Satara

दूरध्वनी क्रमांक: २६३०३९ ॥ शील परं भूषणम् ॥ दूरध्वनी क्रमांक: २६१४४४

माणगांव शिक्षण प्रसारक मंडळ

माणगांव - रायगड.

संस्था नोंदणी क्र. एफ - २७ र. नं. Bom 7 / 1958 KLB Dated 7 - 11 - 1958

डॉ. राजीव साबळे श्री. राजन चुनिलाल मेथा श्री. कृष्णा रुपचंद गंधी
 प्रेसिडेंट स्कूल कमिटी चेअरमन सेक्रेटरी
 ☎: 263999, 263044, Mob. 9422494044 Mob. 9422693970 ☎: 263162, Mob. 9423382829



President Message

The late Ashok Dada Sable established D. G. Tatkare Mahavidyalaya in 1993 with the sole intention of providing education to youngsters in rural areas in order to improve society. The sacred task of education has been carried out since its founding. The college received a grade B+ (second cycle CGPA 2.64) and was recredited by NAAC. Six UG and six PG programs are offered by the college, which is connected to the University of Mumbai.

It is truly a delight to learn that Anjuman Islam Janjira Degree College of Science, Murud Janjira Raigad in collaboration with D. G. Tatkare Mahavidyalaya, Mangaon Raigad and Veer Wajekar Arts, Science & Commerce College, Phunde is taking the initiative to host the international E-conference on Recent Trends in Chemical Science, Physical Science, Life Science, and Computer Technology on 9th & 10th February 2026 and is producing a souvenir to commemorate the event.

As the president and on behalf of the Executive Council & entire College Development Committee, we are extremely proud of the cooperation between the three organizations in planning this important event. We hope that this conference will encourage students, aspiring researchers, and young scientists to follow their dreams in the future. This conference will provide instructors and students from both universities with important insights. We would like to express our gratitude to the team that helped organize the event and wish them the best of luck at the conference.

Adv. Rajiv Ashok Sable

President



Anjuman Islam Janjira
Established in 1907

ANJUMAN ISLAM JANJIRA DEGREE COLLEGE OF SCIENCE

Janjira Murud, Dist. Raigad, Pin.402401
(Affiliated to University of Mumbai)
ISO 9001:2015 (Quality Management Systems)
E-mail: aijcollege@gmail.com Website: www.aijdegrecollege.edu.in
Phone. 7038601376/ 9270083578

NAAC
Re-Accredited With
2.69 CGPA
B+ Grade

**Best College
Award 2019-20**
By Jolly Club- Raigad

Chief Patron
SIR. SIDDI AHMED KHAN



HIFZURREHMAN NAZIR
Secretary

ALTA F H MALIK
Treasurer

AZIM KHANZADA
Murud Halqa
President

S. ZAINUDDIN KADIRI
CDC Chairman

Dr. SAJID SHAIKH
I/C Principal

Ref. No. AIJDCM/4238/2026

Date: 05/02/2026

Principal Message



It gives me great pleasure to welcome you all to the 5th International Conference on "Recent Trends in Chemical Science, Physical Science, Life Science and Computer Technology", scheduled to be held on 9th-10th February 2026 in hybrid mode (online and offline) at Anjuman Islam Janjira Degree College of Science, Murud-Janjira.

This prestigious international conference is jointly organized by Anjuman Islam Janjira Degree College of Science in collaboration with Veer Wajekar Arts, Science & Commerce College, Phunde-Uran, and M.S.P.M's D. G. Tatkare Mahavidyalay, Mangaon. The conference aims to provide a dynamic platform for academicians, researchers, scientists, and students to exchange innovative ideas, share research outcomes, and deliberate on emerging trends across diverse scientific disciplines.

In today's rapidly evolving scientific landscape, interdisciplinary research and collaboration play a crucial role in addressing global challenges. This conference is an earnest effort to promote research culture, academic excellence, and meaningful interaction among scholars from various fields of science and technology.

I am confident that the deliberations, keynote lectures, and research presentations during this conference will be intellectually stimulating and will contribute significantly to knowledge enhancement and societal progress. I extend my sincere appreciation to the organizing committee for their dedicated efforts and wish the conference a grand success.

I warmly welcome all the participants and wish them a fruitful, enriching, and memorable conference experience.

With best wishes,



(Handwritten signature)
5/2/26

Dr. Sajid F. Shaikh
I/C Principal

Anjuman Islam Janjira Degree College of Science
Murud-Janjira **I/C PRINCIPAL**

Anjuman Islam Janjira
Degree College of Science
Murud, Dist. Raigad

Principal's Message

It gives me immense pleasure to welcome you all to the **5th International Conference on "Recent Trends in Chemical Science, Physical Science, Life Science and Computer Technology"**, jointly organized by **Veer Wajekar Arts, Science & Commerce College, Phunde, Uran** and **M.S.P.M.'s D. G. Tatkare Mahavidyalay, Mangaon**, affiliated to the University of Mumbai, to be held on **9–10 February 2026** in **hybrid mode (online & offline)**.

In the present era of rapid scientific and technological advancement, interdisciplinary research has become the cornerstone of innovation and sustainable development. This international conference is envisioned as a **brainstorming platform** that provides an excellent opportunity for **academicians, aspiring scientists, researchers, and scholars from diverse scientific disciplines** to interact, exchange ideas, and present their research work in their respective fields.

The conference aims to **highlight recent research achievements and emerging trends** in chemical science, physical science, life science, and computer technology. Such scholarly gatherings not only promote the dissemination of knowledge but also encourage collaboration across disciplines, institutions, and nations, thereby strengthening the global scientific community.

I am confident that the deliberations, keynote lectures, oral and poster presentations during this conference will be intellectually stimulating and will contribute significantly to the advancement of scientific research and academic excellence. I sincerely appreciate the efforts of the organizing committee, coordinators, faculty members, and students for their dedication and hard work in making this event a success.

I extend my best wishes to all the participants for fruitful discussions and a rewarding academic experience, and I hope this conference will inspire new ideas, meaningful collaborations, and future research endeavors.

Dr. A. N. Thakkar

I/C Principal

Veer Wajekar Arts, Science & Commerce College,
Phunde, Uran, Navi Mumbai (MS), India

Accredited by NAAC with Grade-B-2.17(2014) B+ - 2.64 (2022) Permanently Affiliated to University of Mumbai

॥ शीलं परं भूषणम् ॥
 प्र. शि. प्र. मंडळ
 १९९३-१९९४
 मंगळगाव - रायगड
 Estt. 14th July 1993
 Reg. No. 3664/93

Mangaon Shikshan Prasarak Mandal's
D. G. Tatkare Mahavidyalay
 Arts, Science, Commerce.
 Tal. Mangaon, Dist. Raigad. 402 104
 Off. 02140 - 263928,
 Mob. : 9075610653

Dr. Baban M. Khamkar
 Principal

Late Ashokdada Sable
 Founder - (Ex. M. L. A.)

Shri. Rajiv Sable
 President

Shri. Krishna Gandhi
 Secretary

Website :- www.mangaonseniorcollege.com E-mail :- mspmangaonseniorcollege@gmail.com



Principal Message

It is truly a delight to learn that Anjuman Islam Janjira Degree College of Science, Murud Janjira Raigad in collaboration with D. G. Tatkare Mahavidyalaya, Mangaon Raigad and Veer Wajekar Arts, Science & Commerce College, Phunde is taking the initiative to host the international E-conference on Recent Trends in Chemical Science, Physical Science, Life Science, and Computer Technology on 9th & 10th February 2026.

This conference aims to highlight the most recent advancements in science and technology. Right now, we live in an innovative era. Extensive research, which is now an essential component of higher education, leads to innovations. The growth of humanity and the health of our environment are greatly aided by scientific and technological research. For upcoming scientists, this conference is essential as it promotes research projects. By planning such an event, a forum is established for novice researchers and seasoned professionals to exchange viewpoints and participate in insightful conversations, thereby promoting high-caliber research.

I extend my warm wishes to all delegates, participants and students to this conference and wishing best luck for further discussion.

Dr. B. M. Khamkar
 Principal

MESSAGE BY ORGANIZING COMMITTEE

It's our great pleasure and honour for us to welcome you all to the 5th International Conference on "Recent Trends in Chemical Science Physical Science Life Science and Computer Technology (ICRTCPLCT – 2026)" on 9th – 10th February 2026.

We are very happy that this institute is bringing the distinguished scientists, researchers and budding research scholars together for this conference. We hope these efforts of this institute will explore the recent innovations and provide new directions for the research in this area.

On behalf of organizing committee, we thank and welcome to all the persons of eminent scientists from different areas of Chemical Science, Life Science, Physical Science and Computer Science from different international and national institutions, faculties from various colleges and research students.

We also extend our sincere thanks to College Development Committee and The Principal of this institute for their constant support.

Thanks to all.

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Conservation of Biodiversity for Sustainable Future

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Abstract

Biodiversity forms the foundation of life on Earth, sustaining ecological balance, ecosystem services, and human well-being. Among the various indicators of biodiversity, avian diversity plays a crucial role due to birds' sensitivity to environmental changes, their position in food webs, and their contribution to ecosystem functioning. Birds occupy diverse habitats ranging from forests, wetlands, grasslands, agricultural landscapes, and urban ecosystems. Their presence, abundance, and behavior serve as reliable bioindicators of habitat quality, climate change, and ecological disturbances. The lecture highlights how avian diversity reflects the overall health of ecosystems and underscores the urgent need for biodiversity conservation in the face of habitat loss, urbanization, pollution, climate change, and unsustainable development practices. Bird watching, traditionally viewed as a recreational activity, has evolved into a powerful tool for biodiversity assessment, conservation awareness, and citizen science. This lecture emphasizes the role of bird watching in generating valuable ecological data, monitoring migratory patterns, documenting species distribution, and identifying threatened and endemic species. With the integration of digital platforms, mobile applications, and global databases, bird watchers today actively contribute to large-scale biodiversity documentation and conservation research. The lecture also explores the educational value of bird watching in promoting environmental ethics and ecological literacy among students and young researchers. By fostering curiosity, observation skills, and interdisciplinary learning, bird watching bridges biology, ecology, geography, climate science, and environmental policy. Institutions of higher education play a vital role in integrating biodiversity studies and bird watching activities into curricula, field-based learning, and research programs to nurture environmentally responsible citizens. From a conservation perspective, the lecture discusses national and global initiatives aimed at protecting avian biodiversity, including habitat restoration, protected area networks, community participation, and policy frameworks aligned with sustainable development goals. Special emphasis is given to the Indian subcontinent, recognized as one of the world's mega-biodiversity regions, hosting rich avifaunal diversity with numerous resident and migratory species. Wetlands, coastal regions, forest corridors, and agro ecosystems are highlighted as critical habitats requiring urgent conservation attention.

The lecture further addresses the role of universities and academic leadership in promoting biodiversity conservation through research, outreach, and policy advocacy. Universities can serve as biodiversity knowledge hubs by encouraging interdisciplinary research, supporting long-term ecological monitoring, collaborating with governmental and non-governmental organizations, and engaging local communities in conservation initiatives. Bird watching clubs, biodiversity cells, nature interpretation centers, and green campus initiatives are presented as effective institutional strategies. In addition, the lecture reflects on bird watching as a means of fostering mental well-being, cultural appreciation, and eco-tourism, contributing to sustainable livelihoods while reinforcing conservation values. Ethical bird watching practices, habitat-sensitive tourism, and community-based conservation models are emphasized to ensure minimal disturbance to wildlife.

Novel Materials for Sustainable Development

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Today, sustainable development has become a key point. However, there are certain critical challenges which include growing global energy demand, environmental pollution, resource depletion, and climate change. In order to meet these challenges it is necessary to develop novel advanced materials which are efficient, scalable, and environmentally benign. This talk will highlight the recent progress in novel functional materials designed to address these key issues through applications in photocatalysis, supercapacitor-based energy storage, environmental remediation, etc. Emphasis is given to materials composed of earth-abundant, low-toxicity, and recyclable elements, as well as green synthesis and processing strategies that minimize energy consumption and environmental impact. Photocatalysis is one of key step in environmental remediation. It involves bandgap tuning, defect engineering, and heterostructure design to enable enhanced solar energy utilization for pollutant degradation and clean fuel production. The materials with supercapacitor properties mainly include nanostructured and hybrid electrode materials which have high capacitance, rapid charge–discharge capability, and long-term cycling stability, contributing to reliable and sustainable energy storage solutions.

Metal–Organic Frameworks as Advanced Platforms for Environmental Sustainability

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Abstract

The accelerating environmental crisis, driven by industrial emissions, water contamination, and unsustainable energy consumption, calls for innovative materials that can simultaneously address remediation and resource recovery. Metal organic frameworks (MOFs), a class of crystalline porous materials constructed from metal ions or clusters and organic linkers, have emerged as highly tunable platforms with exceptional surface area, pore versatility, and chemical flexibility. In this talk, I will highlight recent advances in the design of MOFs for applications directly aligned with environmental sustainability, including, removal of organic pollutants and adsorption/sensing of toxic metal ions from wastewater. Emphasis will be placed on structure–property relationships that govern stability, selectivity, and renderability under realistic operating conditions, as well as on the integration of MOFs into functional membranes, composites, and device architectures. Case studies will be presented where MOF-based systems demonstrate improved performance compared to conventional materials, while also enabling circular approaches such as contaminant recovery and reuse. Finally, I will discuss current challenges such as large-scale synthesis, cost, and long-term environmental impact and outline future directions toward greener synthesis routes and application-oriented MOF design.

Keywords: MOFs; Wastewater; Toxic metal; Pollution

Effectiveness Of Different Synthetic Drugs & It's Sustainability

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The extensive use of synthetic chemical pesticides in conventional agriculture has led to serious concerns regarding environmental degradation, pesticide resistance, contamination of food products, and adverse impacts on human and animal health. These challenges have intensified the demand for safer, eco-friendly, and sustainable pest management strategies. In this context, natural biopesticides have emerged as a novel and promising avenue for organic and sustainable cultivation aimed at the development of healthy and high-quality agricultural products.

Natural biopesticides are derived from renewable biological sources such as plants, microorganisms, and naturally occurring bioactive compounds. Plant-based biopesticides, including essential oils, alkaloids, terpenoids, and phenolic compounds, exhibit strong insecticidal, antifungal, and antimicrobial properties. Microbial biopesticides based on bacteria, fungi, viruses, and protozoa offer species-specific pest control, thereby minimizing harm to beneficial organisms and maintaining ecological balance. Unlike synthetic pesticides, biopesticides are biodegradable, leave negligible residues, and reduce the risk of pest resistance due to their diverse modes of action.

The adoption of natural biopesticides plays a significant role in promoting sustainable agricultural practices by improving soil health, conserving biodiversity, and enhancing crop resilience against biotic stresses. Their integration into organic farming systems supports sustainable crop protection while maintaining productivity and improving the nutritional quality of agricultural produce. Moreover, the use of biopesticides aligns with global initiatives such as sustainable development goals (SDGs), integrated pest management (IPM), and climate-resilient agriculture.

This study emphasizes the potential of natural biopesticides as effective alternatives to chemical pesticides, highlighting their role in organic farming, environmental safety, and the development of healthy, residue-free agricultural products. The growing acceptance of biopesticides represents a crucial step toward sustainable agriculture, ensuring long-term food security, environmental protection, and human health.

Upgradation Of Technology for A Nation's Sustainable Development

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Abstract

Sustainable development has become a central objective for nations seeking to balance economic growth, social well-being, and environmental protection. In this context, the upgradation of technology plays a vital role in strengthening a nation's capacity to achieve long-term sustainability. This paper presents a conceptual discussion on how continuous technological upgradation across chemical science, physical science, life science, and computer technology contributes to sustainable national development.

Advancements in chemical science promote green chemistry practices, eco-friendly materials, and waste reduction, thereby minimizing environmental impact. Progress in physical science supports the development of renewable energy systems, energy-efficient technologies, and advanced materials essential for sustainable infrastructure. Technological advancements in life science improve healthcare delivery, agricultural productivity, food security, and public health outcomes, enhancing overall human well-being. Computer technology acts as a key enabler by integrating these scientific domains through artificial intelligence, data analytics, automation, and digital platforms, facilitating informed decision-making and efficient resource utilization.

The talk also discusses key challenges related to technology upgradation, such as high implementation costs, skill gaps, digital inequality, cybersecurity concerns, and environmental issues associated with electronic waste. It emphasizes the importance of ethical innovation, capacity building, inclusive access, and supportive policy frameworks to ensure that technological progress aligns with sustainability goals.

The talk concludes that a nation's sustainable development depends on the strategic and responsible upgradation of technology, supported by interdisciplinary collaboration and a long-term developmental vision.

Keywords: Advancements, Green Chemistry, Challenges, Resource Utilization.

Photocatalytic Water splitting for Green Hydrogen generation and Sustainable Energy Future

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Photocatalytic water splitting represents a sustainable and carbon-free approach for green hydrogen production by directly converting solar energy into chemical fuel. This technology offers a viable pathway to address global energy challenges while mitigating greenhouse gas emissions. Recent progress in photocatalyst development particularly semiconductor heterojunctions, nanostructured materials, and cocatalyst-modified systems has led to significant improvements in light harvesting, charge separation, and surface redox reactions. Advanced strategies such as bandgap engineering, defect regulation, and plasmonic enhancement have expanded solar absorption into the visible region and reduced charge recombination losses. Increasing emphasis on earth-abundant and metal-free photocatalysts further enhances economic feasibility and environmental sustainability. However, challenges remain in achieving high solar-to-hydrogen efficiency, long-term stability, and scalable system integration. Continued interdisciplinary research in materials science, photochemistry, and reactor engineering is essential to translate laboratory advances into practical technologies, enabling green hydrogen to play a central role in the transition toward a sustainable and low-carbon energy future.

Quantum Superposition An Interference Phenomena

Dr. Dinanath D. Patil

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Quantum Mechanics, one of the most profound and foundational theories of modern science, has transformed our understanding of matter, energy, and the fundamental laws governing the universe. This multidisciplinary student talk by DR. Dinanath D. Patil explores the core principles of quantum mechanics and highlights its expanding influence across diverse fields such as physics, chemistry, materials science, electronics, biology, and emerging quantum technologies.

The presentation introduces key quantum concepts including wave–particle duality, quantization of energy, uncertainty principle, and quantum superposition, presented in a simplified and conceptual manner suitable for students from varied academic backgrounds. Emphasis is placed on how these principles underpin real-world applications such as semiconductors, lasers, magnetic resonance imaging, nanotechnology, and quantum computing. The talk further discusses the role of quantum mechanics in chemical bonding, spectroscopy, molecular interactions, and its growing relevance in interdisciplinary research areas.

By bridging theoretical foundations with practical applications, this session aims to demonstrate how quantum mechanics serves as a unifying framework across scientific disciplines. The presentation encourages multidisciplinary thinking and highlights the importance of quantum concepts in shaping future innovations and research opportunities. Overall, this student talk seeks to inspire young researchers to appreciate the interdisciplinary nature of quantum mechanics and its critical role in advancing science and technology in the 21st century.

Purification of Wastewater by Charcoal Treatment and Dye Preparation Techniques

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Abstract

Water is essential for maintaining life on Earth, controlling the climate, and forming the land. Water quality is routinely evaluated using physical, chemical, and biological characteristics and has a substantial impact on human health and the health of the environment. Aquatic habitats have been severely contaminated by rapid industrialization and overuse of chemical pesticides and fertilizers in agriculture, which has led to a decline in water quality and a loss of aquatic biota. The frequency of waterborne illnesses has increased due to the usage of contaminated water, underscoring the necessity of routine water quality monitoring.

In the current study, factors including temperature, pH, turbidity, salinity, nitrates, and phosphates were analyzed in order to assess the water quality. Additionally, the assessment of aquatic macroinvertebrates was used as a biological indication of the health of aquatic ecosystems. Wastewater containing dyes was produced concurrently with the synthesis of dyes using regular tap water in both basic and acidic conditions. After that, the effluent was purified utilizing color preparation and charcoal treatment methods. Because of its large surface area and potent affinity for dye molecules and organic contaminants, activated charcoal was employed as an efficient adsorbent. Color, turbidity, and pollutant load were all significantly reduced as a result of the treatment procedure. This study shows that charcoal-based treatment is an easy, affordable, and eco-friendly way to purify dye-contaminated waste water.

Keywords: Aquatic biota, Water Borne Diseases, pH, Turbidity, Pesticides, Dye,
Charcoal

Exploring Quantum Computing Innovations in India's Technology Ecosystem

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Abstract

Quantum computing is rapidly transforming the global technological landscape by enabling computational capabilities far beyond classical systems. In recent years, India has taken decisive steps to establish itself as a key contributor to this emerging field through strategic policy initiatives, academic excellence, and growing industry participation. The launch of the National Quantum Mission (NQM) marks a significant milestone in India's efforts to develop indigenous quantum computing hardware, secure quantum communication, quantum sensing, and advanced materials research. This paper examines the evolution of quantum computing innovations within India's technology ecosystem by analyzing recent literature, government initiatives, and notable institutional and industrial developments. The study identifies key achievements, challenges, and opportunities, offering insights into India's preparedness for global competition in quantum technologies. The findings suggest that while India has made commendable progress in ecosystem building, sustained investment, infrastructure development, and talent cultivation are essential for long-term success.

Keywords: Quantum Computing, National Quantum Mission, India, Innovation Ecosystem, Quantum Technology, Emerging Technologies.

“Incidence and Impact of Pink Bollworm and Associated Diseases on Bt Cotton Cultivation in Nandurbar District, Maharashtra: An Agro-Ecological and Farmer-Based Field Study”

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Abstract

Genetically modified cotton (*Bt cotton*), engineered to express *Bacillus thuringiensis* (Bt) toxins for resistance against bollworms, has significantly influenced Indian agriculture since its introduction. Despite its initial success, recent observations indicate a resurgence of pest infestations and disease outbreaks, raising concerns about its long-term agronomic and ecological sustainability. The present study was conducted in the Nandurbar district of Maharashtra to assess the incidence, severity, and spatial distribution of pink bollworm (*Pectinophora gossypiella*) and associated diseases in Bt cotton fields. Field surveys were carried out across multiple villages, involving both Bt and non-Bt cotton growers. Data on pest and disease occurrence, visible symptoms, and farmer-reported intensity were systematically recorded and analyzed using statistical methods.

The findings revealed a high incidence of multiple pest and disease infestations in Bt cotton, with pink bollworm emerging as the most destructive pest, affecting more than 90% of surveyed fields. Other major issues included *Alternaria* leaf spot, mealybug (*Phenacoccus solenopsis*), aphids, and cotton leaf curl-like disease. Bacterial blight (*Xanthomonas campestris* pv. *malvacearum*) and *Ascochyta* blight were observed with moderate to low intensity. Spatial analysis indicated that certain talukas of the district were more severely affected, showing extensive pest and disease pressure.

These results demonstrate that Bt cotton has become increasingly vulnerable to pest resurgence and complex disease interactions, contradicting its initial claims of broad-spectrum pest resistance. The study highlights the urgent need for integrated pest management (IPM), crop diversification, and regular resistance monitoring to sustain cotton productivity and ensure farmer livelihood security.

Keywords: Bt cotton, *Pectinophora gossypiella*, Pink bollworm, *Alternaria* leaf spot, Bacterial blight, *Ascochyta* blight, Pest resistance, Nandurbar district, Maharashtra, Integrated pest management, Transgenic crops, Farmer field study

Can Cloud AI Systems Learn to Self-Optimize Research Workflows?

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Abstract

The rapid convergence of cloud computing and Agentic AI has birthed a new paradigm in scientific and industrial inquiry: the Self-Optimizing Research Workflow (SORW). Traditionally, research pipelines—spanning data ingestion, experimental design, and resource provisioning—have required intensive manual tuning. However, emerging "Agentic" architectures allow AI systems to not only execute these tasks but to autonomously monitor their own performance and refine their underlying logic in real-time. This abstract explores how cloud-native AI systems leverage Deep Reinforcement Learning (DRL) and Multi-Agent Orchestration to achieve three core competencies of self-optimization:

1. **Dynamic Resource Right-Sizing:** Using predictive analytics to scale computational hardware (CPUs/GPUs) based on live workload patterns, reducing "digital deadweight" and cost by up to 40%.
2. **Autonomous Process Evolution:** Integrating feedback loops where AI agents detect "model decay" or data drift, triggering automatic retraining or the selection of alternative algorithms without human intervention.
3. **Bridge of the Physical-Digital Divide:** The transition from ad-hoc automation to "Science Agents" that coordinate across physically distributed labs and instruments, reasoning about scientific goals rather than just following static rules.

Despite these advancements, significant barriers remain, including the "causal gap" in Large Language Models (LLMs)—where systems recognize patterns but lack the physical understanding required for high-stakes experiments—and the complexity of integrating heterogeneous vendor interfaces. We conclude that while cloud AI systems have successfully learned to self-optimize the computational layers of research, the next frontier lies in Autonomous Science, where AI develops a native understanding of physical constraints and experimental uncertainty.

Keywords: Agentic AI, Cloud Computing, Self-Optimizing Workflows, Reinforcement Learning, Multi-Agent Orchestration, Resource Allocation, Autonomous Science, MLOps.

Functional Nanocomposites: Synthesis, Characterization, and Emerging Applications in Energy and Environmental Sustainability

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Abstract

Functional nanocomposites have emerged as a rapidly growing class of advanced materials due to their exceptional physicochemical properties and multifunctional behavior. By integrating nanoscale components such as metal nanoparticles, metal oxides, carbon-based nanostructures, and polymers into a single framework, these hybrid materials exhibit enhanced surface area, improved charge transfer, superior mechanical stability, and high catalytic efficiency. In recent years, functional nanocomposites have gained significant attention for their promising applications in energy storage and conversion systems, including lithium-ion batteries, supercapacitors, fuel cells, and solar energy devices. Simultaneously, their role in environmental remediation has expanded through applications in water purification, photocatalytic degradation of pollutants, air purification, and sensing technologies. This review provides a comprehensive overview of recent progress in the synthesis strategies of functional nanocomposites, such as sol–gel, hydrothermal, co-precipitation, chemical vapor deposition, and green synthesis approaches. In addition, key characterization techniques including X-ray diffraction, electron microscopy, spectroscopy, and electrochemical analysis are discussed to correlate structure–property relationships. Finally, current challenges such as nanoparticle agglomeration, scalability, cost, and environmental safety are highlighted, along with future prospects for the development of sustainable, high-performance nanocomposites for clean energy and environmental applications.

Keywords: Functional nanocomposites, Nanomaterials, Synthesis strategies, Structural characterization, Metal oxide nanocomposites, Carbon-based nanocomposites

"Eco-Friendly Biogenic Synthesis of ZnO Nanoparticles: A Sustainable Approach toward Environmental Remediation and Biomedical Applications"

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Abstract

The integration of green chemistry with nanotechnology has paved the way for the sustainable production of metal oxide nanomaterials, overcoming the environmental and toxicity constraints of traditional synthetic routes. This study focuses on the biogenic green synthesis of Zinc Oxide nanoparticles (ZnO NPs) using a plant-mediated approach, where natural phytochemicals serve as both reducing and stabilizing agents.

The synthesized nanoparticles were subjected to comprehensive characterization to verify their structural and optical properties. UV-Visible spectroscopy confirmed the characteristic absorption blueshift, while X-ray Diffraction (XRD) revealed a high degree of crystallinity with a hexagonal wurtzite structure. Morphological analysis via Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) demonstrated the formation of nanoscale particles with high surface area, while Fourier Transform Infrared (FT-IR) spectroscopy identified the functional groups responsible for the biological capping of the NPs.

Furthermore, the study evaluated the multi-functional potential of the green-synthesized ZnO NPs. The nanoparticles exhibited significant antimicrobial activity against pathogenic bacterial strains, attributed to the generation of reactive oxygen species (ROS) and cell membrane disruption. The antioxidant assays (DPPH) indicated a strong free-radical scavenging capacity, enhanced by the presence of bioactive capping layers. Additionally, the ZnO NPs displayed remarkable photocatalytic activity in the degradation of synthetic organic dyes under light irradiation, highlighting their potential in environmental remediation. These findings suggest that green-synthesized ZnO NPs are versatile, eco-friendly candidates for applications in biomedicine, pharmacology, and wastewater treatment.

Keywords; Zinc Oxide (ZnO) Nanoparticles, Green Synthesis, Phytochemical Reduction, Antimicrobial Activity, Antioxidant Potential, Photocatalytic Degradation, Wastewater Treatment, Biogenic Nanotechnology.

A Survey on Applications of Artificial Intelligence in Daily Life

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Abstract

Artificial Intelligence (AI) has become an integral part of modern life, influencing various daily activities through intelligent systems and applications. This study presents a survey-based analysis of the applications and impact of Artificial Intelligence in everyday life. Data was collected using a structured Google Form questionnaire from participants belonging to different age groups. The survey focused on awareness of AI, frequency of usage, commonly used AI applications, perceived benefits, and opinions on the future importance of AI. The results indicate a high level of awareness and frequent use of AI-based applications, particularly among younger individuals. Recommendation systems, virtual assistants, and navigation tools were identified as the most commonly used applications. Most respondents agreed that AI makes daily life easier, with education emerging as the sector benefiting the most from AI. However, mixed opinions were observed regarding AI's potential to replace human jobs. The study concludes that AI plays a significant role in enhancing convenience and efficiency in daily life, while highlighting the importance of responsible and balanced adoption of AI technologies.

Keywords: Artificial Intelligence, AI Applications, Daily Life, Smart Technology, Automation, Survey Analysis

**Secondary Metabolite Profiling, In-vitro Antibacterial and
Antioxidant Activities of Endophytic Fungi Isolated from
Gymnosporia rothiana (Walp.) M.A. Lawson**

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Abstract

Endophytic fungi from medicinal plants are prolific producers of bioactive secondary metabolites with therapeutic potential. This study investigated the secondary metabolite composition, antibacterial activity, and antioxidant potential of endophytic fungi isolated from the leaves of medicinal plant *Gymnosporia rothiana*. A total nine endophytic fungi *Aspergillus terreus*, *Aspergillus niger*, *Eurotium cristatum*, *Fusarium solani*, *Curvularia lunata*, *Hypoxylon fragiforme*, *Scopulariopsis* sp, and *Colletotrichum viniferum* were isolated and identified. Qualitative metabolite screening of ethyl acetate (EtOAc) extracts of fungal isolates revealed the presence of terpenoids, glycosides, and flavonoids in most fungal extracts. Several isolates exhibited the Antibacterial activity against both Gram-positive (*Staphylococcus aureus*) and Gram-negative (*Escherichia coli*) bacteria. Antioxidant activity assessed by DPPH scavenging assays indicated strong free-radical scavenging capacity by selected isolates. The results of this study demonstrate that endophytic fungi associated with *Gymnosporia rothiana* represent promising sources of bioactive secondary metabolites with antibacterial and antioxidant potential.

Keywords: Secondary Metabolites, Fungal endophytes, antibacterial and antioxidants.

Ethnobotanical Perspectives on Edible Therapeutic Plants for Tribal Women's Disorders in Raigad, Maharashtra.

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Abstract

Tribal communities possess a rich heritage of ethnobotanical knowledge, particularly regarding edible plants used for women's health and nutrition. This study documents and analyzes edible therapeutic plants traditionally used by tribal women in Raigad district, Maharashtra. Through field surveys, semi-structured interviews, focus group discussions, and participatory rural appraisal, 40 edible plant species belonging to 32 families were recorded. These plants are used to manage menstrual disorders, reproductive health issues, anemia, pregnancy-related discomforts, postnatal care, and general well-being. Key species include *Moringa oleifera*, *Trigonella foenum-graecum*, *Aloe vera*, *Asparagus racemosus*, *Musa paradisiaca*, *Sesbania grandiflora*, *Boerhavia diffusa*, and various wild leafy vegetables. Findings highlight the nutritional and medicinal value of indigenous edible flora and underscore the need to preserve this traditional knowledge for future generations. The study contributes to ethnopharmacology, women's healthcare practices, and conservation of culturally important plant resources.

Keywords: Ethnobotany, Edible therapeutic plants, Tribal women's health, Women's disorders.

Metal Complexes of Amino Acid Schiff Bases: A Brief Review

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Abstract

Schiff base ligands derived from amino acids and halo-substituted hydroxy aromatic aldehydes represent an important class of multifunctional chelating agents in coordination chemistry. In the present study, novel Schiff base ligands were synthesized through the condensation reaction of selected amino acids with halo-substituted hydroxy aromatic compounds such as chloro-, bromo-, and fluoro-salicylaldehyde derivatives. These ligands were subsequently complexed with transition metal ions including Cu(II), Ni(II), Co(II), and Zn(II) to yield stable metal complexes. The synthesized compounds were characterized using elemental analysis, FT-IR, UV-Visible, NMR, mass spectrometry, and thermal studies. Spectral data confirmed coordination of the ligands to metal centers through azomethine nitrogen and phenolic oxygen atoms, leading to predominantly octahedral geometries. The biological evaluation of these complexes revealed enhanced antimicrobial and antioxidant activities compared to the free ligands, which may be attributed to increased lipophilicity and chelation effects. Halo substitution on the aromatic ring significantly influenced the electronic properties and biological performance of the complexes. Overall, amino acid-based halo-substituted Schiff base metal complexes demonstrate promising potential in medicinal and bioinorganic applications, warranting further structural and pharmacological investigations.

Keywords: Schiff base ligands, Amino acid metal complexes, Halo-substituted hydroxy aromatics, Transition metal coordination compounds, Antimicrobial activity, Spectral characterization

Musli Pak Improves Spermatogenesis and Testicular Steroidogenic Activity in Parkes Strain Male Mice

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Abstract

Male infertility, characterized by reduced sperm count, poor sperm quality, and impaired testosterone production, is often influenced by stress, lifestyle, and psychological factors. There are chemically-derived medications available against male infertility; but these medications are known to induce certain side effects. On the other hand, Musli Pak is an Ayurvedic herbal medicine, mainly containing Safed Musli (*Chlorophytum borivillianum*) and other ingredients like clove, almond, Kaunch beej, etc. traditionally used to treat male infertility. However, scientific studies on its aphrodisiac and fertility-enhancing properties remain limited. In this study, male mice were divided into four groups: a cow-milk control group and Musli Pak-treated groups (50, 100, and 200 mg/kg BW) administered orally for 35 days. Spermatogenesis, steroidogenic potential, and reproductive tissue histology were evaluated. Musli Pak improved sperm parameters, increased testicular daily sperm production (TDSP), reduced abnormalities, and enhanced 3β - and 17β -hydroxysteroid dehydrogenase (HSD) expression. In conclusion, Musli Pak markedly improved reproductive organs in Parkes male mice. These results indicate the need for further *in situ* and clinical studies to evaluate Musli Pak as a treatment for male infertility.

Keywords: Musli Pak, aphrodisiac, spermatogenesis, TDSP, 3β & 17β -HSD, Parkes Strain mice

Classification and Elimination of Malware Using Intelligent Detection Techniques

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Abstract

The rapid growth of digital systems and networked infrastructures has significantly increased the complexity and frequency of malware attacks, posing serious threats to data security, system integrity, and user privacy. This research presents a comprehensive study on the classification of malware and effective techniques for its detection and elimination. The study analyzes various categories of malware, including viruses, worms, Trojans, ransomware, spyware, and rootkits, based on their behavior, propagation mechanisms, and impact on infected systems. Both static and dynamic analysis techniques are examined to identify distinguishing malware features such as opcode sequences, API call patterns, file system modifications, and network traffic behavior. The proposed approach integrates machine learning-based classification models to improve detection accuracy and reduce false positives. Algorithms such as decision trees, support vector machines, and ensemble classifiers are evaluated using benchmark malware datasets to assess their performance in terms of accuracy, precision, recall, and response time. Experimental results indicate that behavior-based and hybrid detection methods outperform traditional signature-based approaches, particularly in identifying zero-day and polymorphic malware. In addition to classification, the study explores malware elimination strategies, including sandboxing, real-time monitoring, automated quarantine, and system recovery mechanisms. The findings highlight the importance of adaptive and intelligent security frameworks capable of continuously learning from new threats. This research contributes to strengthening cybersecurity defenses by providing a structured malware taxonomy, efficient detection methodologies, and practical elimination techniques suitable for modern computing environments.

Keywords: Malware classification; Cybersecurity; Machine learning; Malware detection; Malware elimination; Static analysis; Dynamic analysis; Network security.

“Phytochemical and Therapeutic Significance of Medicinal Plants: A Review on Bioactive Compounds and Their Role in Human Health and Vector Control”

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Abstract

Medicinal plants have long been recognized as fundamental resources for maintaining and improving the health of individuals and communities. Their therapeutic potential arises from the presence of diverse bioactive compounds such as alkaloids, flavonoids, terpenoids, glycosides, tannins, and phenolics, which exert specific physiological effects on the human body. These secondary metabolites form the biochemical basis of plant-derived medicines and continue to serve as a primary source of pharmacologically active substances. In addition to their therapeutic applications, medicinal plants have emerged as promising eco-friendly alternatives for vector and pest control, particularly against disease-transmitting mosquitoes. The growing resistance to synthetic insecticides and increasing awareness of environmental safety have further renewed global interest in plant-based bioactives as sustainable mosquito repellents and larvicides.

This review highlights the multifaceted roles of medicinal plants in modern healthcare and disease prevention, emphasizing their phytochemical diversity, pharmacological importance, and potential application in integrated mosquito management. It also discusses recent research trends, utilization patterns, and the need for systematic exploration of herbal resources for the discovery of novel bioactive compounds. The integration of traditional knowledge with modern phytochemical and pharmacological validation offers a viable pathway toward developing safer, cost-effective, and sustainable alternatives for both human therapeutics and public health management.

Key words: Medicinal plants, Bioactive compounds, Phytochemicals, Herbal medicine, Mosquito control, Natural products, Phytotherapy, Public health, Secondary metabolites, Sustainable medicine

Use of bio - adsorbents for treatment of effluent generated in laboratory

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Abstract

Treatment of effluent generated in the routine analysis in laboratory is essential for environmental sustainability. This study explores the use of natural adsorbents to effectively remove azo dyes from the effluent generated in laboratory. It was found that the bio - adsorbents used improve water quality by reducing Chemical Oxygen Demand (COD) and enhancing other quality indicators highlighting their potential as greener alternatives to conventional treatment techniques. The study promotes adoption of eco-friendly wastewater management practices in line with sustainable development goals and encourages greener strategies in higher education institutions to reduce chemical waste.

Keywords: Bio – adsorbents, Effluent, COD, waste treatment.

Biodegradable food packing from natural polymer

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Abstract

The increasing use of synthetic plastic packaging has created serious environmental problems due to its non-biodegradable nature. This study focuses on the development of biodegradable food packaging material using banana peel, an agricultural waste rich in natural polymers such as starch, cellulose, and pectin. Banana peel was processed and converted into a film-forming solution with the addition of glycerol as a plasticizer. The prepared films were cast and dried under controlled laboratory conditions. The developed biodegradable films were evaluated for physical and mechanical properties including thickness, tensile strength, flexibility, moisture absorption, and biodegradability using soil burial test. The results indicated that banana peel-based films possess good flexibility, moderate tensile strength, and acceptable moisture absorption suitable for short-term food packaging applications. The soil burial test confirmed significant biodegradation within a few weeks, demonstrating the eco-friendly nature of the material.

The study highlights the potential of banana peel as a low-cost, sustainable alternative to conventional plastic packaging while simultaneously addressing agricultural waste management. This work contributes to the development of environmentally friendly packaging materials and supports sustainable practices in food packaging industries.

KEYWORDS: Biodegradable packaging; Banana peel; Natural polymer; Agricultural waste; Food packaging; Soil burial test; Sustainable materials

Synthesis and Characterization of 2,3-Diphenylquinoxaline Derivatives

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Abstract

2,3-Diphenylquinoxaline derivatives were synthesized via an efficient and straightforward condensation reaction between substituted o-phenylenediamines and benzil derivatives. The synthesis was carried out by refluxing equimolar amounts of o-phenylenediamine and benzil in ethanol as a solvent in the presence of a catalytic amount of glacial acetic acid. The reaction mixture was heated under reflux at 75–80 °C for 2–4 hours, resulting in the formation of quinoxaline derivatives through cyclocondensation followed by aromatization. The progress of the reaction was monitored by thin-layer chromatography (TLC). Upon completion, the reaction mixture was cooled to room temperature, and the solid product obtained was filtered, washed with cold ethanol, and recrystallized from ethanol to afford pure 2,3-diphenylquinoxaline derivatives in good to excellent yields. The simplicity of the reaction conditions, short reaction time, and high yields make this method an efficient approach for the synthesis of 2,3-diphenylquinoxaline derivatives, which are of significant interest due to their potential biological and pharmacological activities.

Keywords: 2,3-Diphenylquinoxaline, o-Phenylenediamine, Benzil, Cyclocondensation, Biological and Pharmacological Activities.

Development of *Rhizobium* based biofertilizer and evaluation of its influence on plant growth

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Abstract

The excessive use of chemical fertilizers has led to soil degradation, environmental pollution, and reduced microbial diversity. Biofertilizers offer an eco-friendly alternative by enhancing nutrient availability through biological processes. The present study focuses on the development of a *Rhizobium* based biofertilizer and the evaluation of its effect on plant growth parameters. *Rhizobium* was isolated, cultured, and formulated using a suitable carrier material. The biofertilizer was applied to leguminous plants under controlled conditions. Growth parameters such as plant height, number of leaves, root length, nodulation, and biomass were recorded and compared with untreated controls. The results demonstrated a significant improvement in plant growth and nitrogen fixation in biofertilizer treated plants. The study highlights the potential of *Rhizobium* based biofertilizers as sustainable inputs in modern agriculture.

Keywords: Biofertilizer, *Rhizobium*, Nitrogen fixation, Plant growth, Sustainable agriculture

Effect And Study of Bismuth Doping in Cobalt Nano ferrite.

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Abstract

Bismuth-doped cobalt nano ferrites were synthesized to investigate the effect of Bi³⁺ substitution on the structural, morphological, and magnetic properties. The nano ferrite sample was prepared using a Sol gel method. Structural analysis confirmed the formation of a single-phase cubic spinel structure, indicating the successful incorporation of bismuth ions into the cobalt ferrite lattice. The doping of bismuth was found to influence the crystallite growth, lattice distortion, and microstructural features of cobalt nano ferrites. Magnetic characterization revealed significant variations in magnetic behaviour due to bismuth incorporation. This study highlights the effect of Bi³⁺ doping on properties of cobalt nano ferrites. These results suggest that bismuth-doped cobalt nano ferrites are promising materials for applications in electronic, magnetic, and multifunctional device technologies.

Keywords: Cobalt Nano ferrites, Bismuth, Spinel Ferrite, Magnetic Property.

Enzyme Mimics as Sustainable Alternatives to Natural Enzymes in Green Catalysis

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Abstract

Catalytic systems that reduce environmental effect while maintaining high efficiency and selectivity are of great interest due to the quest of sustainable and green chemical processes. Although natural enzymes are among the most effective catalysts known, their practical use in large-scale and industrial chemical processes is frequently restricted by their high production costs, limited operational pH and temperature ranges, poor thermal and chemical stability, and challenges with recovery and reuse. To address these restrictions, enzyme mimics, often referred to as artificial enzymes or nanozymes, have emerged as promising sustainable alternatives. The search for sustainable and environmentally friendly chemical processes has led to a significant deal of interest in catalytic systems that minimize environmental impact while retaining high efficiency and selectivity. Although natural enzymes are among the most effective catalysts known, their practical use in large-scale and industrial chemical processes is frequently restricted by their high production costs, limited operational pH and temperature ranges, poor thermal and chemical stability, and challenges with recovery and reuse. To solve these limits, enzyme mimics, frequently referred to as artificial enzymes or nanozymes, have emerged as viable sustainable alternatives. Active-site modelling, electron transfer pathways, and substrate–catalyst interactions are highlighted in the important discussion of the mechanistic elements underlying enzyme-mimetic catalysis. Additionally, important uses of enzyme mimics in green catalysis are explored, such as ecologically friendly industrial processes, oxidation reactions, pollutant degradation, and sustainable organic transformations. Finally, current problems and future possibilities are outlined, highlighting the need for enhanced selectivity, reduced toxicity, and scalable synthesis to fully realize the potential of enzyme mimics as viable substitutes for natural enzymes in sustainable catalytic technologies.

Key Words: Enzymes, Enzyme mimics, sustainable, nanozymes, Artificial Enzymes.

AI-Driven Attack Detection System in Cyber Security

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Abstract

The rapid growth of digital technologies and widespread internet usage has led to a significant rise in cyber-attacks, posing serious threats to modern digital systems and networks. Traditional attack detection mechanisms mainly depend on predefined rules and signature-based techniques, which limits their effectiveness against new, complex, and evolving cyber threats. To overcome these limitations, AI-driven attack detection systems have emerged as an advanced and intelligent solution in the field of cyber security. These systems use artificial intelligence and machine learning techniques to analyze network traffic, system logs, and user behavior in order to detect malicious activities in real time. By learning patterns from historical data, AI-based systems can accurately identify both known and unknown attacks while reducing false alarms. This paper explores the role of AI-driven attack detection systems, focusing on their working principles, advantages, and challenges. It also discusses how emerging AI technologies enhance threat detection, prediction, and automated response, making cyber defense systems more adaptive, efficient, and reliable in today's dynamic threat landscape.

Keywords: Artificial Intelligence, Cyber Security, Attack Detection System, Machine Learning, Anomaly Detection, Network Security

Cyber Security in the Age of Cloud Computing

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Abstract

Rapid growth in the usage of cloud computing services has revolutionized the way in which organizations operate in regards to handling the way in which they store and even utilize the information that they hold. Despite the multiple advantages of undertaking business through the usage of cloud-based services, it has played a significant role in exposing many of the previously unknown security vulnerabilities that currently face many of the current data handling approaches. It becomes evident that, just like in every other situation in which cybersecurity issues play a role, not even the traditional security approaches that were previously used to combat such issues in these systems may prove sufficient in meeting the security requirements of an era that has seen an evolutionary sophistication in the types of attacks that circulate within this range. There is a significant need to understand and appreciate just why it may prove essential to employ techniques such as encryption, identity and access management, and even intrusion detection systems. There are even greater regulations and provisions that need consideration in this area. These factors are crucial in molding cloud security practices. Moreover, with the rising prominence of emerging technologies in cloud infrastructure, aspects like artificial intelligence and machine learning are coming into play to a greater extent in order to protect cloud infrastructure from possible risks and threats. Through various case studies based on recent trends in cybersecurity risks and attacks, this research suggests how dynamic cybersecurity in cloud computing has become and how various practices and mechanisms need to be developed to maintain cloud security in a complex world.

Keywords: Cyber Security, Cloud Computing, Data Privacy, Cyber Threats, Information Security

Thermal Pollution and Its Impacts on Human Health: A Review

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Abstract

Thermal pollution, primarily resulting from industrial effluents and power generation facilities, poses significant threats to both environmental integrity and human health. This review examines the major sources of thermal pollution, its ecological consequences, and emerging concerns related to human health. Power plants—particularly coal-fired and nuclear facilities—discharge heated water into natural water bodies, leading to alterations in aquatic species composition, elevated metabolic rates, and reduced dissolved oxygen levels essential for aquatic life. Urbanization, stormwater runoff, and deforestation further exacerbate thermal stress by increasing surface temperatures and accelerating the degradation of aquatic habitats. Climate change acts as an additional intensifying factor, compounding the impacts of thermal pollution on freshwater and marine ecosystems. Beyond ecological effects, this review highlights the relatively underexplored implications for human health, including contamination of water supplies and disruption of aquatic food resources. While existing research predominantly addresses environmental consequences, there is a growing need to understand indirect human health risks arising from compromised food chains and declining water quality. Mitigation measures such as cooling towers, green infrastructure, and riparian buffer restoration show promise in reducing thermal impacts. However, substantial knowledge gaps remain regarding the full extent of thermal pollution's influence on human health, underscoring the need for future interdisciplinary research.

Keywords: Thermal Pollution; Environmental Impact; Climate Change; Water Temperature , Alteration; Public Health; Ecological Balance

AI-Based Smart Education Systems

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Abstract

The rapid advancement of artificial intelligence (AI) is transforming the education sector by enabling personalized, adaptive, and intelligent learning experiences. Traditional teaching methods often fail to address the unique needs of individual learners, resulting in uneven learning outcomes and limited engagement. AI-based smart education systems provide a solution by analyzing student performance, learning behaviors, and preferences to deliver customized educational content. These systems integrate technologies such as machine learning, natural language processing, and data analytics to enhance teaching and learning processes. They can predict learning difficulties, suggest resources, provide real-time feedback, and automate administrative tasks. This paper explores the architecture, working principles, benefits, and challenges of AI-driven smart education systems. It also discusses how these systems are reshaping modern classrooms, improving learning efficiency, and supporting educators in delivering personalized education in a dynamic digital environment.

Keywords: Artificial Intelligence, Smart Education Systems, Personalized Learning, Machine Learning, Adaptive Learning, Educational Technology.

Post-harvest management of agricultural produce

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Abstract

The minimization of wastage of agricultural produce is the ultimate goal of post-harvest management. The post-harvest management has increasing population and shrinking agricultural land and other resources. Present situation is the main global challenge to ensure food security in a sustainable manner safe to mankind and environment. The production of agricultural crops have increased during the recent years, but the development and adoption of post harvest technology is lacking and resulting in huge post harvest losses. The factors which affect on post harvest during harvesting, storing, transporting, and marketing is microbial activity. The highly perishable crop like horticultural produce need much more attention and to ensure promotion of processing and value addition. The value chain for processing has become a important to improve the food safety and strengthen national food security. The value chain in post-harvest management of horticultural crops mainly comprise of pre-harvest factors, harvesting, market preparation (common storage, sorting, grading, packaging and on-farm storage), transportation, storage by-product waste management.

Keyword: Agricultural produce, economics, harvest ,Post-harvest management, quality, Post-harvest techniques in vegetables. Post-harvest management, processing of vegetables

Impact and awareness of artificial intelligence (AI) in daily life among the youth generation

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Abstract

Artificial Intelligence (AI) has emerged as a transformative technology that increasingly shapes the daily experiences of the youth generation. From social networking platforms and digital learning tools to virtual assistants and smart devices, AI-driven systems have become deeply embedded in routine activities. This study investigates both the level of awareness and the perceived impact of artificial intelligence among young individuals, with particular emphasis on its role in education, communication, entertainment, and decision-making processes. A structured survey methodology was adopted to collect data from students and young adults, enabling an assessment of their familiarity with AI concepts, frequency of usage, and overall attitudes toward AI-enabled applications. The findings indicate that while a significant proportion of youth actively engage with AI-based technologies on a daily basis, their understanding of the underlying mechanisms of AI remains limited. The results further demonstrate that most respondents view AI as a beneficial tool that enhances efficiency, supports personalized learning, and improves accessibility to information. However, the study also highlights notable concerns, including data privacy risks, excessive dependence on intelligent systems, and uncertainty regarding the future impact of AI on employment opportunities. These concerns reflect a gap between widespread usage and informed understanding. The study underscores the importance of promoting AI awareness and digital literacy among the youth generation to ensure responsible and ethical use of intelligent technologies. Enhancing education and awareness initiatives can empower young users to make informed decisions, maximize the advantages of AI, and effectively address the challenges associated with its growing presence in everyday life.

Keywords: Artificial Intelligence, AI Awareness, Youth, Daily Life, Technology Impact

Phytochemical evaluation of leaf of *Annona Muricata* Linn.

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Abstract

Annona muricata Linn., a member of the family Annonaceae, is a medicinally significant plant extensively employed in traditional systems of medicine. The present research was undertaken to investigate the phytochemical profile of the leaf material of *A. muricata* in order to establish dependable pharmacognostic parameters for its correct identification and quality evaluation. Preliminary phytochemical screening of the leaf extracts was carried out using standard qualitative procedures. The analysis revealed the presence of various bioactive constituents, including alkaloids, glycosides, tannins, terpenoids, reducing sugars, carbohydrates, saponins, flavonoids, and steroids. The detection of these phytochemicals highlights the therapeutic potential of *A. muricata* leaves and provides scientific validation for their traditional medicinal use.

Keywords: *Annona muricata* Linn, Annonaceae, alkaloids, glycosides, tannins

Effect of *Senna alata* Leaf Extracts on Dermatophytes Causing Ringworm in India

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Abstract

Medicinal plants have been an integral part of human healthcare since ancient times. They are realistic sources of bioactive compounds that possess therapeutic properties and have been traditionally used for the treatment of various diseases and infections. According to the World Health Organization (WHO), nearly 80% of the world's population still relies on traditional plant-based medicines for their main healthcare needs, especially in rural and tribal communities.

With thousands of species used in Ayurvedic, Siddha, Unani, and folk medicine, India is known as one of the world's hotspots for biodiversity. Numerous phytochemical groups, including alkaloids, flavonoids, tannins, terpenoids, and glycosides, are found in these plants. These compounds have pharmacological properties that include antibacterial, antifungal, anti-inflammatory, and antioxidant properties.

Great pick—*Senna alata* (syn. *Cassia alata*, "ringworm bush") is one of the most documented ethnomedicinal plants for dermatophytosis. A superficial fungal infection of the skin, hair, and nails, ringworm (dermatophytosis) is frequently brought on by *Trichophyton*, *Microsporum*, and *Epidermophyton* species. *Senna alata* (L.) Roxb., also referred to as the "ringworm bush," has long been used in tropical traditional medicine to treat fungal skin conditions.

Aqueous, methanol, and ethyl acetate solvents of increasing polarity were used to collect, authenticate, shade-dry, and extract fresh *S. alata* leaves. Using agar well diffusion and broth microdilution techniques, the extracts' antifungal efficacy against dermatophytes (*Trichophyton rubrum*, *T. mentagrophytes*, *Microsporum gypseum*, and *Epidermophyton floccosum*) was evaluated in vitro.

KEYWORDS - *Senna alata*, Evaluated, Extracts, antifungal, p

Sustainable Synthesis of Thiopyrimidones: a potential heterocycle

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Abstract

Six membered ring heterocyclic compounds exhibits an array of microbial activities. Fused Heterocycles were synthesized via. Nano catalysed route by using compound containing active methylene group, Aromatic aldehydes and Thiourea as a starting material. Zr-Ferrite Nano catalysts were used as potential green catalyst which yield of the reaction, decreases the reaction time and easy to separate. The Zr-Ferrite nano catalyst can be used for number of times without loss of any catalytic activity. All the reactions were monitored TLC. The synthesised compounds were then confirmed by IR spectra and Proton NMR.

Keywords: Catalysis, Cyclisation and Grinding.

Green Synthesis of fused Nitrogen and Oxygen Containing Heterocycles by using Zr-Ferrite

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Abstract

Fused heterocyclic compounds Nitrogen and oxygen exhibits an array of Antimicrobial activities. Heterocyclic derivatives were synthesized via. Green route by using active Methylene Compounds known as Meldrums acid, Aromatic aldehydes and Urea as a starting material. Nano catalysts were used as potential green catalyst which decreases the cost of reaction, reaction time and easy to separate. The nano catalyst can be used for number of times without loss of any catalytic activity. All the reactions were monitored by using Thin Layer Chromatography. The synthesised compounds were then confirmed by H¹ NMR and IR spectra.

Keywords: Sustainability, Multicomponent, Biginelli reaction.

Effect of Cobalt Doping on Various Properties of Lead Nano Ferrite

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Abstract:

Lead-based nanoferrites doped with cobalt ions were synthesized to investigate the influence of cobalt substitution on their structural, morphological, and electrical properties. The nanoferrite samples were prepared using a sol gel route followed by Calcination. Structural analysis carried out using X-ray diffraction indicates successful incorporation of cobalt ions into the lead ferrite. The variation in crystallite size and lattice parameters with cobalt doping suggests that the substitution of Co^{2+} ions significantly affect the crystal growth mechanism and internal lattice strain of lead nanoferrites. Morphological studies revealed well-defined and uniformly distributed nanoparticles. Electrical characterization demonstrated that cobalt doping modifies the charge transport behavior, leading to changes in electrical conductivity and resistivity. These findings suggest that cobalt-doped lead nanoferrites are promising candidates for applications in electronic, magnetic, and energy-related devices.

Keywords: Lead Ferrites, Cobalt, Spinel Ferrite, Sol gel Method, Electric Property

Study of Fertilizer Potential of *Pongamia pinnata* (Karanj) Flowers and Its Antimicrobial Activity

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Abstract

The present study evaluates the fertilizer potential of *Pongamia Pinnata* flowers as well as its antibacterial activity. The physico-chemical parameters of flowers are determined. The N-P-K value obtained for the flower is 2-3-1 which is satisfactory. The other macro-nutrients and micro-nutrients level is also satisfactory. The influence of powdered flowers on the yield and growth of the fenugreek plants were tested by plant assay method. It was seen that the yield is comparable to the commercial fertilizer and growth parameters such as shoot height and root height are better than the commercial fertilizer. The all results shows that the *Pongamia Pinnata* flowers have excellent fertilizer potential and can be effectively used as organic fertilizer.

In addition, the antimicrobial study of alcohol and water extract of flowers is carried out against common and plant pathogens. The alcohol extract showed the antimicrobial activity against both. It indicates that the flowers also have the antimicrobial activity.

Keywords: *Pongamia Pinnata* flowers, organic fertilizer, N-P-K, Plant assay, antimicrobial

Oxidative Desulphurisation of Model Oil Using Nanocrystalline Cobalt Ferrite as a Catalyst

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Abstracts

In this project, CoFe₂O₄ nanoparticles were synthesized by gel-combustion method and used as magnetically recoverable catalyst for oxidative desulphurization of model oil. The catalyst was characterized by XRD, TEM, BET technique and zeta potential measurement. The catalytic activity of as-synthesized Nano catalyst in the oxidative desulfurization of model oil was investigated. The catalyst showed high activity in the oxidative desulfurization of model oil. Due to its magnetic nature, it was readily recovered from reaction vessel using an external magnet and reused effectively in four times consecutively.

Keywords: Oxidative Desulphurization (ODS); Nanocrystalline Cobalt Ferrite; Magnetically Recoverable Catalyst; Gel-Combustion Method.

Zinc Oxide Nanopowders: Controlled Synthesis and Structural Characterization

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Abstract

Zinc oxide (ZnO) nanopowders have attracted significant scientific and technological interest owing to their wide band gap, high exciton binding energy, chemical stability, and diverse applications in optoelectronics, photocatalysis, sensors, and biomedical fields. In the present study, ZnO nanopowders were synthesized using a controlled chemical synthesis route with the aim of achieving phase purity, nanoscale crystallite size, and uniform morphology. The synthesized powders were characterized using X-ray diffraction (XRD), which confirmed the formation of a single-phase hexagonal wurtzite structure with high crystallinity. The average crystallite size was estimated using the Debye–Scherrer equation and found to be in the nanometer range. Surface morphology and particle distribution were examined by scanning electron microscopy (SEM), revealing nearly uniform nanosized particles with slight agglomeration. The results demonstrate that the adopted synthesis method is simple, cost-effective, and suitable for producing high-quality ZnO nanopowders for advanced functional applications.

Keywords: Zinc oxide nanoparticles; ZnO nanopowders; Chemical synthesis; X-ray diffraction; Nanomaterials; Structural characterization

Effect of microwave radiation power on morphology of ZnO nanoparticles

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Abstract

This study investigates the influence of microwave radiation power on the morphology of zinc oxide nanoparticles synthesized by a microwave-assisted route. Different microwave power levels were applied to control nucleation and growth during synthesis. The structural properties of the obtained ZnO nanoparticles were examined using X-ray diffraction. Morphological variations were analyzed through scanning and transmission electron microscopy. Results reveal a strong dependence of particle size and shape on microwave power intensity. Higher power led to rapid nucleation and finer particle formation. Lower power favored anisotropic growth and agglomeration. The crystallinity of ZnO improved with optimized microwave exposure. Surface area and defect density were also affected by radiation power. Optical characteristics showed changes in band gap values correlated with morphology. The method offers a fast and energy-efficient synthesis route. Controlled morphology enhances application potential in optoelectronics and catalysis.

Keywords: ZnO nanoparticles, microwave synthesis, morphology control.

Synthesis of Rifaximin

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Abstract

Rifaximin is a semisynthetic, non-systemic antibiotic derived from rifamycin SV, belonging to the rifamycin class of ansamycins. The synthesis proceeds through chemical modification of the rifamycin core rather than total synthesis. In general, rifaximin is prepared by conversion of rifamycin SV to a Schiff base derivative via condensation with an appropriate aminopyridine moiety. The process involves: Activation of rifamycin SV at the C-3 position of the naphthohydroquinone core. Condensation with 2-aminopyridine, forming an imine (Schiff base) linkage. Stabilization of the imine structure to yield rifaximin, which exists predominantly in a crystalline, poorly soluble polymorphic form responsible for its minimal gastrointestinal absorption. Purification and crystallization, yielding rifaximin as an orange-red crystalline solid.

Keywords: Rifaximin, Antibiotic, Rifamycin, polymorphic and Crystallization.

Study Of Optical Properties of ZNO Nanoparticles Using Solution Gel Synthesis

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Abstract

Zinc oxide nanoparticles were synthesized by the sol–gel technique to investigate their optical properties. The method provides good control over composition and particle uniformity. Structural characterization confirmed the formation of crystalline ZnO phase. UV–visible spectroscopy was used to analyze optical absorption behavior. A blue shift in absorption edge indicated quantum confinement effects. Band gap energy was calculated and found to vary with particle size. Photoluminescence studies revealed defect-related emission peaks. The presence of oxygen vacancies influenced luminescence intensity. Particle size distribution affected optical transparency. Surface states played a significant role in recombination processes. The synthesized ZnO exhibited promising optoelectronic behavior. These properties suggest suitability for sensors and photonic applications..

Keywords: ZnO nanoparticles, sol–gel method, optical properties.

Photoreduction of Hexavalent Chromium Cr (VI) to Trivalent Chromium Cr (III) Using Reduced Graphene Oxide (rGO)

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Abstract

The efficient removal of toxic hexavalent chromium (Cr (VI)) from wastewater remains a major environmental challenge due to its carcinogenicity and high solubility. This study investigates the photoreduction of Cr (VI) to the less toxic Cr (III) using reduced graphene oxide (r-GO) as an advanced photocatalytic material. Reduced graphene oxide was synthesized and characterized by XRD, Raman spectroscopy, FTIR, and UV-V is spectroscopy to confirm successful reduction and structural features conducive for photocatalysis. The r-GO demonstrated enhanced visible-light absorption and efficient charge transport, resulting in significant photocatalytic activity. Under visible-light irradiation, r-GO facilitated rapid electron transfer and suppressed electron-hole recombination, favoring the reduction of Cr (VI) to Cr (III) with high efficiency. The effects of key operational parameters — including pH, initial Cr (VI) concentration, catalyst loading, and irradiation time — were systematically evaluated to optimize reduction performance. The results indicate that r-GO is a promising metal-free photocatalyst for the environmental remediation of Cr (VI)-contaminated water, combining high reduction rates with facile recovery and reuse. This work highlights the potential of graphene-based materials in photocatalytic applications for heavy metal detoxification and sustainable water treatment technologies.

Keywords: Photoreduction, Hexavalent Chromium (Cr (VI)) reduction, Trivalent Chromium (Cr (III)), Reduced Graphene Oxide (r-GO), Photocatalysis, Visible Light Irradiation, Charge Carrier Separation, Wastewater Remediation, Graphene-based Nanomaterials.

Study of Green Synthesis of Antibacterial Agents Using Indian Medicinal Plant

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Abstract

The present work focuses on the green synthesis of antibacterial agents using extracts of Indian medicinal plants. Plant phytochemicals served as natural reducing and stabilizing agents. The synthesis process was simple, eco-friendly, and cost-effective. Formation of bioactive nanoparticles was confirmed by spectroscopic analysis. Particle morphology was studied using microscopic techniques. Antibacterial activity was evaluated against selected pathogenic strains. The synthesized agents exhibited significant inhibition zones. Enhanced activity was attributed to synergistic effects of plant compounds and nanoparticles. The method avoided toxic chemicals and high energy inputs. Stability of the bioagents was satisfactory over time. The study highlights sustainable synthesis for biomedical use. These materials show potential in antimicrobial coatings and drug formulations.

Keywords: green synthesis, medicinal plants, antibacterial activity.

Antioxidant Potential, Phenolic Composition and Phytochemical Profiling of Selected Karonda (*Carissa carandas* L.) Fruit Varieties

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Abstract

Background: Karonda (*Carissa carandas* L.) is a hardy, drought-tolerant and low-maintenance shrub well suited for cultivation in wastelands of India. Despite its adaptability and nutritional richness, karonda remains an underutilized fruit crop, primarily consumed in processed forms due to its astringency arising from high pectin content. **Objective:** The present investigation aimed to evaluate the antioxidant activity, total phenolic content, and phytochemical composition of selected promising karonda fruit varieties and to establish their potential as functional foods. **Methods:** Three table-purpose karonda collections, namely Konkan Bold, CHES K-II/7, and CHES K-V/8, were analyzed for total phenols, flavonoids, and anthocyanins. Antioxidant activity was assessed using DPPH radical scavenging assay and ferric reducing antioxidant power (FRAP). Individual phenolic acids, flavonoids, and anthocyanin components were identified and quantified using HPLC-MS analysis. Correlation analysis was performed between phytochemical content and antioxidant activity. **Results:** All three karonda collections were found to be moderate sources of phenolic compounds, flavonoids, and anthocyanins, exhibiting appreciable antioxidant activity. A positive correlation was observed between total phenolic and flavonoid contents and antioxidant capacity. Phytochemical profiling revealed the presence of major phenolic acids such as vanillic, protocatechuic, trans-cinnamic, ferulic, chlorogenic, 2,4-dihydroxybenzoic, syringic, and salicylic acids. Identified flavonoids included rutin, myricetin, and umbelliferone, while anthocyanins were mainly represented by cyanidin and pelargonidin glucosides. Among the studied collections, CHES K-V/8 and CHES K-II/7 exhibited superior phytochemical composition and antioxidant activity compared to Konkan Bold, along with desirable horticultural traits. **Conclusion:** The findings highlight karonda fruits as valuable sources of health-promoting polyphenols and antioxidants. Particularly, CHES K-V/8 and CHES K-II/7 show strong potential for release as improved varieties with functional food attributes, offering nutritional benefits while supporting sustainable cultivation in marginal and wasteland areas.

Sustainable Synthesis of Pyrimidones and Thiopyrimidones: a potential heterocycle

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Abstract

Six membered ring heterocyclic compounds exhibits an array of microbial activities. Fused Heterocycles were synthesized via. Nano catalysed route by using compound containing active methylene group, Aromatic aldehydes and Thiourea as a starting material. Zr-Ferrite Nano catalysts were used as potential green catalyst which yield of the reaction, decreases the reaction time and easy to separate. The Zr-Ferrite nano catalyst can be used for number of times without loss of any catalytic activity. All the reactions were monitored TLC. The synthesised compounds were then confirmed by IR spectra and Proton NMR.

Key words: Catalysis, Cyclisation and Grinding.

Plant Mediated Synthesis of Silver Nano Particles from Osmium Sanctum and their Antimicrobial Activity

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Abstract

Silver nanoparticles were synthesized using leaf extract of *Ocimum sanctum* as a reducing agent. The green synthesis approach eliminated the use of toxic chemicals. Formation of nanoparticles was confirmed by surface plasmon resonance spectra. Crystallinity was analyzed using X-ray diffraction techniques. Morphology and size distribution were examined through electron microscopy. The nanoparticles showed uniform spherical shapes. Antimicrobial activity was tested against bacterial and fungal strains. Significant growth inhibition was observed at low concentrations. Enhanced activity was due to high surface reactivity. The nanoparticles exhibited good stability in aqueous media. The method is rapid, economical, and environmentally benign. These particles are promising for biomedical and pharmaceutical applications.

Keywords: silver nanoparticles, *Ocimum sanctum*, antimicrobial activity

Nanoparticles in Modern Science: An Overview of Synthesis and Applications

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Abstract

Nanoparticles have emerged as a central focus of modern scientific research due to their unique physicochemical properties arising from their nanoscale dimensions. These materials exhibit enhanced surface area, tunable optical and electronic behavior, and remarkable catalytic activity, making them valuable across diverse fields. This review provides a comprehensive overview of nanoparticle synthesis methods and their wide-ranging applications. Conventional physical and chemical approaches, including sol-gel, precipitation, hydrothermal, and chemical reduction techniques, are discussed alongside green and sustainable synthesis strategies that employ biological and eco-friendly reagents. Emphasis is placed on how synthesis conditions influence particle size, morphology, stability, and functional performance. The review further highlights key characterization techniques used to elucidate structural, optical, and surface properties of nanoparticles. Applications of nanoparticles in catalysis, biomedical science, environmental remediation, energy conversion, and electronics are critically examined, with particular attention to recent advancements and practical challenges. Finally, current limitations, toxicity concerns, and future perspectives are outlined to provide insights into the responsible development and integration of nanoparticles in advanced technologies. This review aims to serve as a valuable reference for researchers and students seeking a concise yet thorough understanding of nanoparticles in modern science.

Keywords Nanoparticles, Synthesis, Applications, Catalysis, Green nanotechnology, Characterization, Biomedical applications

Study Of Heavy Metal Contamination in Rural Soil Sample of Roth Budruk

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Abstract

This study evaluates heavy metal contamination in rural soil samples collected from Roth Budruk region. Soil samples were analyzed using atomic absorption spectroscopy. Concentrations of lead, cadmium, chromium, and nickel were determined. Physicochemical parameters such as pH and organic content were measured. Metal distribution showed spatial variation across sampling sites. Certain metals exceeded permissible limits in agricultural zones. Pollution indices were calculated to assess contamination levels. Potential sources included fertilizers and vehicular emissions. Bioavailability of metals posed risks to crop safety. Correlation studies indicated interaction among metal species. The findings highlight environmental and health concerns. Regular monitoring is recommended for sustainable soil management.

Keywords: heavy metals, soil contamination, environmental monitoring

Sustainable Approaches to the Synthesis of Benzimidazole Derivatives: Advances in Green Chemistry

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Abstract

The continuous increase in the production and use of chemical substances has led to serious environmental concerns, as a large proportion of these materials are non-degradable and contribute significantly to pollution and ecological imbalance. Addressing these challenges requires preventive strategies that minimize hazards at their source rather than controlling their effects. In this context, green chemistry has emerged as an essential discipline focused on the development of chemical products and processes that reduce or eliminate the generation of toxic and hazardous substances. Heterocyclic compounds have gained considerable importance in recent years due to their diverse pharmacological activities, with benzimidazole standing out as a privileged heterocyclic scaffold in medicinal chemistry. Benzimidazole derivatives exhibit a wide range of biological properties, including analgesic, anti-inflammatory, antiulcer, antihypertensive, antibacterial, antiviral, antifungal, anticancer, and antihistaminic activities. Owing to their significant therapeutic relevance, the synthesis of benzimidazole analogues has attracted sustained interest among synthetic chemists. This review presents an overview of environmentally benign and sustainable methodologies for the synthesis of differently substituted benzimidazole derivatives, highlighting the advantages of green approaches over conventional methods. Emphasis is placed on greener alternatives that offer reduced reaction times, lower energy consumption, simpler experimental procedures, cost-effectiveness, and minimized environmental impact, thereby supporting the principles of sustainable chemistry.

A Study on The Role of Polymer-Based Hydrogels in Soil Moisture Retention for Improved Irrigation Efficiency

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Abstract

Polymer-based hydrogels were investigated for enhancing soil moisture retention capacity. Hydrogels were incorporated into sandy and loamy soils. Water absorption and swelling behavior were systematically evaluated. Moisture retention was monitored under controlled drying conditions. Treated soils showed prolonged water availability compared to untreated samples. Evaporation losses were significantly reduced. Root zone moisture remained stable for extended periods. Plant growth parameters improved in hydrogel-amended soils. The material exhibited good biodegradability and reusability. Irrigation frequency was reduced without affecting crop yield. The approach promotes water conservation in agriculture. Hydrogels offer a sustainable solution for efficient irrigation management.

Keywords: hydrogels, soil moisture retention, irrigation efficiency.

Nutritional Composition, Mineral Profile and Antioxidant Potential of Selected Leafy Vegetables from the Konkan Region of Maharashtra

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Abstract

Traditional leafy vegetables form an important component of the rural diet in the Konkan region of Maharashtra, particularly during the monsoon season, contributing significantly to nutritional security and health. The present investigation was undertaken to document and evaluate the nutritional, mineral, and phytochemical characteristics of four commonly consumed leafy vegetables traditionally used by rural communities of Ratnagiri district. The selected vegetables were analyzed for their proximate composition, mineral content, and antioxidant capacity using standard analytical procedures. The results revealed considerable variation in nutritional composition among the studied species. Moisture content was highest in *Chlorophytum tuberosum*, followed by *Commelina benghalensis*. Ash values, indicative of total mineral content, ranged between 2.3 and 14.3%. Notable protein levels were observed, with *Colocasia esculenta* showing the highest protein content. Carbohydrate and crude fiber contents were found to be appreciably high, particularly in *Chlorophytum tuberosum*. Lipid content remained low across all samples, enhancing their dietary value. Mineral analysis indicated substantial levels of calcium, phosphorus, and magnesium, with exceptionally high calcium and magnesium concentrations recorded in *Chlorophytum tuberosum* and *Smithia sensitiva*. Phytochemical evaluation revealed strong antioxidant activity, with methanolic and ethanolic extracts of *Smithia sensitiva* exhibiting the highest total antioxidant capacity. These findings highlight the nutritional richness and health-promoting potential of traditional leafy vegetables, supporting their inclusion in daily diets and their role in sustainable nutrition.

Keywords Traditional leafy vegetables; Nutritional analysis; Mineral composition; Antioxidant activity; Konkan region

Micro Wave Synthesis of Iron Oxide Nano Particles for Magnetic and Catalytic Applications

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Abstract

Iron oxide nanoparticles were synthesized using a microwave-assisted method for multifunctional applications. The technique enabled rapid heating and uniform nucleation. Phase formation was confirmed by X-ray diffraction analysis. Particle morphology was examined through electron microscopy. The nanoparticles exhibited narrow size distribution and high crystallinity. Magnetic properties were evaluated using vibrating sample magnetometry. Superparamagnetic behavior was observed at room temperature. Catalytic performance was tested in model degradation reactions. Enhanced activity resulted from high surface area and defect sites. Microwave synthesis reduced reaction time and energy consumption. The nanoparticles showed good stability and recyclability. These materials are suitable for magnetic separation and environmental catalysis.

Keywords: iron oxide nanoparticles, microwave synthesis, magnetic catalysis.

Comparative Phytochemical Profiling of Selected Traditional Medicinal Plant Leaf Extracts Using Different Solvents

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Abstract

Medicinal plants serve as valuable reservoirs of naturally occurring bioactive compounds that contribute significantly to traditional and modern therapeutic practices. The biological efficacy of these plants is largely attributed to their phytochemical constituents, making phytochemical investigation a vital step in natural product research. In the present study, a comparative qualitative phytochemical analysis was carried out on the leaf extracts of three traditionally important medicinal plants, namely *Cannabis sativa*, *Ricinus communis*, and *Bryophyllum pinnatum*.

Leaf extracts were prepared using a Soxhlet extraction technique with solvents of varying polarity, including petroleum ether, chloroform, acetone, and distilled water. The extracts were subjected to standard qualitative tests to detect the presence of key phytoconstituent groups such as reducing sugars, flavonoids, steroids, glycosides, polyphenols, tannins, terpenoids, and coumarins. The results indicated the presence of all tested phytochemical classes across the studied plant species, although their distribution varied depending on the solvent system employed. The aqueous extract of *C. sativa* showed the highest diversity of phytoconstituents, while acetone extracts of *R. communis* and chloroform extracts of *B. pinnatum* exhibited maximum phytochemical richness. These findings highlight the influence of solvent polarity on phytochemical extraction and support the therapeutic relevance of the selected plants as potential sources of bioactive compounds for plant-based drug development.

Keywords: Medicinal plants; Phytochemical screening; Solvent extraction; *Cannabis sativa*; *Bryophyllum pinnatum*

Optical and Electrical Properties of Lead Doped Cobalt Nanoferrite Prepared Using Sol-Gel Synthesis Method

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Abstract

Lead doped cobalt nanoferrites were synthesized using a simple sol-gel method and their structural, optical, and electrical properties were systematically studied. X-ray diffraction analysis confirmed the formation of a single-phase cubic spinel structure with high phase purity, as no secondary phases were detected and all diffraction peaks matched well with standard cobalt ferrite data. The crystallite size showed a noticeable dependence on lead substitution, initially increasing and then decreasing at higher dopant concentrations, indicating the influence of Pb²⁺ ions on crystal growth, while a slight variation in lattice parameter suggested successful incorporation of lead into the ferrite lattice. UV-Visible absorption studies revealed a clear absorption edge for all samples, with the optical band gap exhibiting a non-linear trend as a function of Pb²⁺ content due to changes in the electronic structure. AC conductivity measurements demonstrated that conductivity increases with frequency, attributed to electron hopping between ions at octahedral sites, whereas an overall decrease in conductivity with increasing lead concentration indicated that the electrical behavior of Co_{1-x}Pb_xFe₂O₄ nanoferrites is strongly governed by the level of Pb²⁺ substitution.

Keywords: Lead, Cobalt Nanoferrite, Structural Property, Optical Property.

**Fish market survey and Strategies of Nashik city, Maharashtra
(India)**

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Abstract

The study was carried out to find the status of fish availability of wholesale and Local fish market in Nashik City. Large number of Intermediaries are involved in various activities of fish selling and their distribution in city. We collected data in the month of July 2025 to December 2025 about Fishes availability and Selling Strategies in Wadalagaon, Gandhinagar, Lekhanagar, Phule Market (Bhadrakali) and Trimurti Chowk in Nashik City. This data was collected by the survey and questionnaires method. We observed total no. of 24 species of fish included the 11 fishes are freshwater, 9 species are marine water whereas 4 species are included in both marine and freshwater bodies.

Keywords: Survey, Nashik city, marine, freshwater bodies.

Microplastic Pollution Along the Konkan Coast of Maharashtra: Sources, Distribution, Ecological Impacts, and Management Challenges

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Abstract

The Konkan coast of Maharashtra represents one of India's most ecologically sensitive and socio-economically important coastal regions; however, it is increasingly threatened by the widespread presence of microplastics (MPs). This review critically synthesizes research findings published between recent years to evaluate the sources, spatial distribution, characteristics, and ecological consequences of microplastic pollution along the approximately 720-km Konkan coastline. Available studies indicate that urbanized and industrialized coastal stretches, particularly around Mumbai–Thane and Ratnagiri, act as major accumulation zones for microplastics, with polyethylene and polypropylene being the dominant polymer types. These particles occur mainly as secondary fragments, fibers, and films generated through the degradation of larger plastic debris, discarded fishing gear, and untreated municipal waste. Riverine inputs from major catchments such as the Vashishti and Savitri rivers, combined with seasonal tourism pressure and fishing activities, significantly contribute to the transport and redistribution of microplastics in coastal and nearshore environments. Evidence of microplastic ingestion in commercially important marine organisms, including Bombay duck and mackerel species, raises serious concerns regarding trophic transfer, chemical leaching, and potential risks to human health through seafood consumption. The review further highlights critical gaps in standardized monitoring, limited long-term datasets, and insufficient integration of local stakeholders in pollution management. Considering recent national environmental policy initiatives, this article emphasizes the need for region-specific monitoring frameworks, improved waste management infrastructure, and community-based conservation strategies to mitigate microplastic pollution and safeguard the ecological integrity of the Konkan coast.

Keywords: Microplastics; Konkan coast; Coastal pollution; Marine biodiversity; Polymer types; Bioaccumulation; Trophic transfer; Waste management; Maharashtra.

Synthesis and Characterization of Anthraquinone Derivatives

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Abstract

Anthraquinone derivatives constitute an important class of aromatic compounds due to their extensive applications in dyes, pharmaceuticals, and biologically active molecules. In the present study, a series of substituted anthraquinone derivatives were synthesized using anthraquinone as the parent nucleus. The synthesis was achieved through electrophilic substitution and condensation reactions involving appropriately substituted aromatic amines under controlled basic conditions. Potassium carbonate was employed as a base, and the reactions were carried out in organic solvents such as dimethylformamide (DMF). The progress of the reactions was monitored by thin-layer chromatography (TLC). The reaction mixtures were refluxed for a specific duration, followed by cooling and quenching in ice-cold water. The crude products were purified by recrystallization or column chromatography. The synthesized compounds were obtained in good yields and characterized by melting point determination. This work presents an efficient and straightforward synthetic route for the preparation of anthraquinone derivatives with potential industrial and pharmaceutical significance.

Keywords: Anthraquinone derivatives, Electrophilic substitution, Condensation reaction, Biologically active molecules, Dyes, Reflux method

Microwave-Assisted Green Synthesis of Novel Benzimidazole Derivatives: An Overview of Recent Advances

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Abstract

Benzimidazole derivatives constitute an important class of fused heterocyclic compounds owing to their remarkable synthetic versatility and wide spectrum of pharmacological activities. Structurally related to purines, the benzimidazole nucleus plays a crucial role in biological systems and forms an integral component of vitamin B₁₂. Compounds containing this scaffold exhibit diverse biological properties, including antimicrobial, antiviral, antidiabetic, anticancer, antifungal, antihelminthic, anti-HIV, antihistaminic, antiulcer, cardiogenic, antihypertensive, and neuroleptic activities, making them valuable targets in medicinal chemistry.

In recent years, microwave-assisted organic synthesis has emerged as an efficient and environmentally benign alternative to conventional heating methods for the preparation of benzimidazole derivatives. Microwave irradiation offers significant advantages such as reduced reaction time, improved yields, enhanced selectivity, lower energy consumption, and minimized use of hazardous solvents, thereby aligning well with the principles of green chemistry.

This review highlights recent developments in the microwave-assisted synthesis of benzimidazole derivatives, with particular emphasis on green and sustainable methodologies. Various reaction strategies, catalysts, solvent systems, and mechanistic aspects are discussed to illustrate the efficiency and versatility of microwave-induced reactions. The review aims to provide a comprehensive understanding of microwave-based approaches as powerful tools for the rapid and eco-friendly synthesis of novel benzimidazole derivatives with potential pharmaceutical applications.

Keywords: Benzimidazoles; Microwave-assisted synthesis; Green chemistry; Heterocyclic compounds; Medicinal chemistry

A review on applications of plant-based nanoparticles on cervical cancer

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Abstract

Cervical cancer continues to be a serious worldwide health burden, particularly in low- and middle-income countries with limited access to early detection and treatment. Conventional therapeutic approaches, including as chemotherapy and radiotherapy, are frequently associated with systemic toxicity, medication resistance, and decreased patient compliance. Plant-based nanoparticles have recently emerged as a promising option in cancer detection and therapy due to their biocompatibility, cost-effectiveness, and environmentally benign manufacturing. These nanoparticles are made from plant extracts high in bioactive phytochemicals, which act as reducing, stabilizing, and capping agents, removing the need for hazardous chemicals often utilized in conventional nanoparticle manufacturing. This study focuses on the use of plant-derived nanoparticles in cervical cancer treatment, emphasizing their roles in targeted drug administration, imaging, and direct anticancer activity. Various metallic and metal oxide nanoparticles, including silver, gold, zinc oxide, and iron oxide nanoparticles derived from medicinal plants, have been shown to have significant cytotoxic effects on cervical cancer cell lines, primarily through mechanisms such as apoptosis induction, reactive oxygen species generation, cell cycle arrest, and angiogenesis inhibition. Furthermore, plant-based nanoparticles boost drug loading capacity and therapeutic efficacy while limiting negative effects on normal cells. The review also addresses present obstacles, such as repeatability, scalability, and a lack of clinical validation, as well as future directions for translational research. Overall, plant-based nanoparticles are a sustainable and innovative platform that has the potential to significantly improve cervical cancer treatment outcomes and pave the path for safer nanomedicine-based therapeutics.

Key words: Cervical cancer, nanoparticles, SiHa cells, HeLa cells, Anticancer, HPV

Green Synthesis and Study of V₂O₅ Nanomaterials Prepared Using Mangroves Leaves

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Abstract

In the present work V₂O₅ nanomaterials were successfully synthesized using mangroves leaf extract through a microwave-assisted green synthesis method. The structural properties of the synthesized nanomaterial were systematically investigated. X-ray diffraction analysis confirmed the formation of single phase orthorhombic V₂O₅ with good crystallinity with moderate microstrain. Fourier Transform Infrared (FTIR) Spectroscopy confirmed the presence of V=O stretching vibration. The result demonstrates that mangrove leaf extract plays a crucial role in the green synthesis of nanomaterial.

Key words: Green Synthesis, Mangroves leaf extract, V₂O₅ nanoparticles, Microwave Synthesis, Structural Properties.

Cyclodextrin-Promoted One-Pot Aqueous Synthesis of Benzimidazo[2,1-b] Thiazoles

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Abstract

A green, efficient, and sustainable protocol has been developed for the one-pot synthesis of 2-aryl-3-methylbenzimidazo[2,1-b] thiazoles using cyclodextrin in water. The reaction proceeds smoothly through a multicomponent condensation of 2-mercaptobenzimidazole, substituted phenacyl bromides, and methylating agents in the presence of β -cyclodextrin as a supramolecular organocatalyst. The unique host-guest inclusion ability of cyclodextrin enhances the solubility of hydrophobic substrates in water, leading to improved reaction rates and excellent yields under mild conditions. The methodology offers several advantages, including the use of water as an eco-friendly solvent, avoidance of toxic reagents, operational simplicity, short reaction times, and broad substrate scope. The catalyst can be easily recovered and reused without significant loss of activity, further supporting the sustainability of the process. This environmentally benign approach provides an effective alternative for the synthesis of biologically important benzimidazo[2,1-b] thiazole derivatives and highlights the potential of cyclodextrins in green heterocyclic synthesis.

Keywords: Cyclodextrin catalysis; One-pot synthesis; Benzimidazo[2,1-b] thiazoles; Aqueous medium; Green chemistry; Supramolecular catalysis

Green-Synthesized Metal and Metal Oxide Nanoparticles for Photocatalytic Removal of Textile Dyes: Recent Developments and Future Perspectives

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Abstract

Rapid industrial growth has intensified environmental challenges, particularly those associated with wastewater generation and dye pollution. Among various industrial sectors, the textile industry is a major contributor to aquatic contamination due to the extensive use of synthetic dyes and large volumes of water during processing operations. A substantial fraction of these dyes is discharged into natural water bodies, leading to serious ecological and health concerns. Conventional dye removal techniques, including physical, chemical, and biological methods, often suffer from limitations such as high operational costs, incomplete degradation, secondary pollution, and complex waste disposal issues.

In recent years, photocatalytic degradation using nanoparticles has emerged as a promising and sustainable alternative for the treatment of dye-contaminated wastewater. Green synthesis of nanoparticles, employing plant extracts, microorganisms, and other bio-resources, offers an eco-friendly route that eliminates toxic chemicals and enhances material biocompatibility. This review highlights recent advancements in the green synthesis of metal and metal oxide nanoparticles such as Au, Ag, Pt, Pd, ZnO, CuO, α -Fe₂O₃, TiO₂, CeO₂, SnO₂, and NiO, with a focus on their photocatalytic efficiency under UV and visible light irradiation. Emphasis is placed on synthesis strategies, reaction mechanisms, degradation pathways, and factors influencing photocatalytic performance. The review also discusses current challenges and future prospects of green nanophotocatalysts for large-scale industrial wastewater treatment applications.

Keywords: Green synthesis; Photocatalysis; Metal and metal oxide nanoparticles; Textile dye degradation; Wastewater remediation

Mangrove Adaptations, Salinity Tolerance, and Phytochemical Potential: Ecological Significance and Conservation Challenges

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Abstract

Mangrove ecosystems are among the most productive and resilient coastal habitats, occupying intertidal zones characterized by high salinity, periodic tidal inundation, and oxygen-deficient soils. These salt-tolerant woody plants play a vital ecological and socio-economic role by stabilizing shorelines, supporting rich biodiversity, and sustaining coastal livelihoods. Mangroves are widely distributed in tropical and subtropical regions, with India supporting extensive forests along the eastern coast and fragmented patches along the western coastline, including Maharashtra. Among the mangrove flora, *Avicennia marina* is one of the most dominant and widely distributed species, exhibiting specialized adaptations such as pneumatophores for aerial respiration and leaf salt glands for salt excretion. Mangrove species employ diverse physiological mechanisms to tolerate salinity stress, including salt exclusion at the root level in *Rhizophora* and salt secretion through leaves in *Avicennia*. Salinity gradients strongly influence mangrove zonation, growth, seed germination, and seedling establishment, with optimal performance generally observed under low to moderate salinity. Excess salinity induces oxidative stress, reduces nutrient uptake, and suppresses early growth stages. A distinctive reproductive strategy, vivipary, allows propagules to germinate while attached to the parent plant, enhancing successful establishment in unstable coastal substrates. Beyond their ecological importance, mangroves possess significant phytochemical and medicinal potential; species such as *A. marina* are rich in flavonoids, phenolics, and terpenoids with proven antioxidant, antimicrobial, and anticancer properties. Despite their value, mangrove ecosystems are increasingly threatened by coastal development, aquaculture, industrialization, and pollution. This review emphasizes existing gaps in species-specific salinity tolerance, particularly during early developmental stages, and highlights the need for integrated physiological, molecular, and ecological approaches to strengthen conservation, restoration, and sustainable mangrove management under changing climatic conditions.

Keywords: Mangroves; *Avicennia marina*; Salinity tolerance; Vivipary; Coastal ecosystems; Phytochemicals; Restoration ecology; Maharashtra; Climate change.

Synthesis, Characterization and Biological Assessment of Novel Benzothiazole Derivatives via Green Chemistry

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Abstract

Benzothiazole derivatives represent a privileged class of heterocyclic compounds due to their structural diversity and wide spectrum of biological properties. In recent years, the development of environmentally sustainable synthetic methodologies for such scaffolds has gained significant attention. In the present investigation, a series of newer benzothiazole derivatives were synthesized employing a green and efficient microwave-assisted protocol using phenyliodonium bis(trifluoroacetate) (PIFA) as an oxidizing agent in ethanol. This approach offers advantages such as reduced reaction time, improved yields, and minimal environmental impact.

The synthesized compounds were thoroughly characterized by elemental analysis, FT-IR spectroscopy, ¹H and ¹³C NMR spectroscopy, and mass spectrometry to confirm their chemical structures. The purity of the compounds was verified using thin layer chromatography and high-performance liquid chromatography techniques. Furthermore, the biological potential of the synthesized derivatives was assessed through in vitro antimicrobial studies by determining their minimum inhibitory concentration (MIC) using the serial dilution method. Analgesic activity was evaluated in vivo employing the hot-plate model. The results revealed that several benzothiazole derivatives exhibited moderate to significant antimicrobial and analgesic activities, indicating their potential as promising lead molecules for further pharmaceutical development.

Keywords: Benzothiazole derivatives; Green synthesis; Microwave-assisted reaction; Antimicrobial activity; Analgesic evaluation

Phytochemical Profiling and Antioxidant Potential of Selected Wild Medicinal Plants from the Himalayan Region

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Abstract

Background: The Himalayan region is one of the richest reservoirs of medicinal plant biodiversity and has supported traditional healthcare systems for thousands of years. Indigenous communities in this region rely extensively on wild medicinal plants for primary healthcare, while these plants also serve as important raw materials for pharmaceutical, nutraceutical, and traditional medicine industries worldwide. **Methods:** Twenty medicinal plant species, including *Swertia bimaculata*, *Ficus neriifolia*, *Rubus treutleri*, *Periploca calophylla*, *Buddleja napaulensis*, *Habenaria edgeworthii*, *Pyracantha crenulata*, *Roscoea procera*, *Allium rubellum*, *Berberis chitria*, *Capsella bursa-pastoris*, *Artemisia maritima*, *Juniperus macropoda*, *Origanum vulgare*, *Valeriana jatamansi*, *Polygonatum verticillatum*, *Meconopsis aculeata*, and *Fragaria nubicola*, were analyzed. Different plant parts were examined for total polyphenols, flavonoids, alkaloids, saponins, and tannins using standard phytochemical assays. Antioxidant capacity was assessed employing DPPH radical scavenging and ferric reducing antioxidant power (FRAP) assays. High-performance liquid chromatography (HPLC) was used for rapid screening and identification of bioactive compounds in potent extracts. **Results:** The phytochemical screening revealed considerable variation in bioactive compound content among species as well as among different plant parts. Certain fractions exhibited significantly higher concentrations of polyphenols, flavonoids, alkaloids, saponins, and tannins, which corresponded to enhanced antioxidant activity. A strong association was observed between phytochemical content and antioxidant capacity as determined by DPPH and FRAP assays. HPLC analysis supported the presence of multiple antioxidant-related compounds, enabling efficient identification of bioactive constituents. **Conclusion:** The study demonstrates that Himalayan wild medicinal plants are valuable sources of natural antioxidants and phytochemicals with therapeutic potential. These findings provide scientific validation for the traditional use of these species and highlight the importance of their conservation and sustainable utilization for future pharmaceutical and functional food applications.

Keywords: Medicinal plants; Himalayan region; Antioxidant activity; Phytochemicals; HPLC

Sanitary Waste : Transforming a Problem into a Solution.

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Abstract

Turning Menstrual and Sanitary Waste from Liability to Asset Sanitary waste—specifically used menstrual pads, diapers, and other absorbent hygiene products—represents a rapidly growing, hazardous fraction of municipal solid waste (MSW) that poses severe health risks and environmental burdens. Dominated by non-biodegradable plastics and superabsorbent polymers, conventional disposal via landfills or open dumping leads to long-term pollution and clogged drainage systems. This study analyzes innovative, circular economy approaches that transform this hazardous liability into a sustainable asset. Key solutions include the implementation of decentralized, eco-friendly incinerators that minimize toxic emissions, the development of specialized, low-carbon, waste-to-energy conversion techniques, and the introduction of advanced, eco-friendly, biodegradable, or compostable sanitary products. Furthermore, it highlights community-driven initiatives, such as the "red dot" campaign, which segregates sanitary waste at the source for specialized treatment. By adopting these technologies and promoting public awareness, sanitary waste can be diverted from landfills to create valuable energy or compost, thus turning a public health threat into an environmentally friendly, sustainable, and economically viable solution.

Keywords: Sanitary Waste Management , Menstrual Hygiene Products , Eco-friendly Solutions.

Green Synthesis, Spectral Characterization and Antimicrobial Evaluation of Schiff's Base Derivatives of Substituted Benzothiazoles

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Abstract

The growing demand for sustainable and eco-friendly synthetic strategies has encouraged the application of green chemistry principles in heterocyclic chemistry. In the present study, a series of novel Schiff's bases derived from substituted 1,3-benzothiazole moieties were synthesized using an environmentally benign approach. The benzothiazole nucleus was efficiently constructed starting from 2,4-dimethylaniline, employing an industrial waste mixture of sodium chloride and sodium bromide as a green cyclization medium, thereby minimizing hazardous reagents and waste generation. Subsequent condensation reactions led to the formation of structurally diverse Schiff's bases under mild reaction conditions. The synthesized compounds were systematically characterized using spectroscopic techniques such as FT-IR, ¹H and ¹³C NMR, and mass spectrometry, confirming their structural integrity and purity. Furthermore, the biological potential of the prepared derivatives was evaluated through antimicrobial screening against selected bacterial and fungal strains. Several compounds exhibited promising biological activity, highlighting the significance of benzothiazole-based Schiff's bases as potential bioactive scaffolds. This work demonstrates an effective integration of green synthetic methodology with medicinal chemistry, offering an environmentally sustainable route for the development of biologically active heterocyclic compounds.

Keywords: Green synthetic methodology; Benzothiazole scaffold; Schiff's base derivatives; Industrial waste utilization; Spectral characterization; Antimicrobial activity

“Green Synthesis and Characterization of Nanoparticles Using *Rhynchospora wightiana* (Nees) Steud.”

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Abstract

The family Cyperaceae is one of the largest monocotyledonous families, exhibiting considerable morphological diversity and ecological adaptability. *Rhynchospora wightiana* (Nees) Steud., a taxonomically complex sedge species, possesses notable phytochemical potential, though its role in green nanotechnology remains poorly explored. This study investigates the phytochemical profile of *R. wightiana* and its application in the green synthesis of silver nanoparticles (AgNPs) using leaf extracts. Qualitative and quantitative phytochemical analyses of aqueous and methanolic extracts revealed the presence of bioactive secondary metabolites, including alkaloids, phenolics, flavonoids, tannins, terpenoids, and saponins, with extraction efficiency influenced by solvent polarity. Green synthesis of AgNPs was successfully achieved using the aqueous leaf extract. Nanoparticle formation was confirmed by UV–Visible spectroscopy, showing a characteristic surface plasmon resonance peak at 440–450 nm. Fourier Transform Infrared (FTIR) analysis identified functional groups responsible for the reduction and stabilization of AgNPs. The combined phytochemical and spectroscopic results demonstrate the potential of *R. wightiana* as a sustainable biological resource for eco-friendly nanoparticle synthesis, supporting its future application in biomedical and environmental fields.

Keywords: *Rhynchospora wightiana*; Green synthesis; Metal nanoparticles; Plant-mediated synthesis; UV–Visible spectroscopy; FTIR

Green Fabrication of Cadmium Sulfide Nanoparticles Using *Hibiscus rosa-sinensis* Leaf Extract for Photocatalytic Dye Degradation

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Abstract

The development of environmentally benign nanomaterials has gained increasing attention for applications in pollution control. In the present work, cadmium sulfide nanoparticles (CdS NPs) were synthesized through a green and sustainable route utilizing *Hibiscus rosa-sinensis* leaf extract as a natural reducing and stabilizing agent. This plant-mediated approach aligns with green chemistry principles by reducing the use of hazardous chemicals and minimizing waste generation.

The formation and physicochemical properties of the synthesized CdS nanoparticles were confirmed using Fourier transform infrared (FTIR) spectroscopy, X-ray diffraction (XRD) analysis, and scanning electron microscopy (SEM). The photocatalytic performance of the CdS nanoparticles was evaluated by monitoring the degradation of methylene blue dye under natural sunlight irradiation. The results demonstrated efficient and rapid dye degradation, indicating strong photocatalytic activity of the biosynthesized nanoparticles. The study highlights the potential of green-synthesized CdS nanoparticles as effective photocatalysts for the treatment of dye-contaminated wastewater generated from textile, paper, leather, and plastic industries.

Keywords: Cadmium sulfide nanoparticles; Green synthesis; *Hibiscus rosa-sinensis* extract; Photocatalytic degradation; Wastewater treatment

Analytical Study on Quality of Drinking Water in Pen Taluka, District Raigad (Maharashtra-India)

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Abstract

Water has another name "Jiwan" meaning life. This factor has crucial role in all the biological process. Clean and pure water is essential for healthy life. On the contrary, contaminated water can be harmful for the health. Presence of different minerals in adequate concentration in drinking water is essential for different metabolic processes. Various studies were carried out previously concerning the potability of drinking water. Various waste disposal systems can contaminate the drinking water resources like river, lakes, ponds and wells. The contaminants can be biological and non-biological. Drinking water is the root cause of many of the diseases. Hence, it is important to study the quality check parameters of the drinking water. We carried out the studies related to the non-biological parameters of water. The present article provides a comprehensive review of the existing literature from 2003 to 2025 concerning the quality of drinking water in Pen Taluka, Raigad District. In addition, the study assesses the current physico-chemical characteristics of drinking water, including parameters such as colour, pH, total hardness (TH), chlorides, calcium, magnesium, and other relevant constituents. The objective of the study is to examine long-term variations in drinking water quality and to evaluate their potential implications for public health in Pen Taluka.

Keywords: Drinking water quality; Physico-chemical parameters; Pen Taluka; Public health; Temporal variation.

Cyber Security Awareness Among Internet Users

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Abstract

The increasing use of the internet has made cyber security awareness essential for users. This study examines the level of awareness, online behavior, and security practices among internet users through a Google Form survey of 40 respondents. The results show that most participants access the internet daily, mainly via mobile phones. Although many users are aware of cyber threats, knowledge about specific risks such as phishing and identity theft remains limited.

The study also found risky practices, including password reuse, failure to verify website links, and low usage of antivirus software. A notable number of respondents have experienced cybercrime, indicating existing security gaps. However, most participants agreed that cyber security awareness programs are necessary.

Overall, the research highlights the need for better education and training to improve safe online behavior and reduce cyber risks, ultimately promoting a more secure digital environment.

Keywords: Cyber Security, Awareness, Internet Users, Cyber Threats, Online Safety

A Review of Imidazole Derivatives: Synthesis, Pharmacological Applications, and Future Perspectives

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Abstract:

Imidazole derivatives are a versatile class of heterocyclic compounds with significant importance in medicinal chemistry due to their diverse pharmacological activities, including antimicrobial, anticancer, anti-inflammatory, antiviral, and enzyme inhibitory effects. This review provides a comprehensive overview of recent synthetic strategies for imidazole derivatives, encompassing classical and modern approaches such as condensation reactions, cyclization, multicomponent reactions, and green chemistry methodologies. Emphasis is placed on the structure–activity relationships (SAR), highlighting how specific substitutions and functional group modifications influence biological activity. The pharmacological potential of these compounds is discussed in the context of current therapeutic applications, along with challenges such as bioavailability, toxicity, and drug resistance. Finally, the review explores future perspectives, including opportunities for targeted drug design, nanocarrier-based delivery systems, and environmentally sustainable synthesis routes, underlining the ongoing relevance of imidazole derivatives in drug discovery and development.

Keywords: Imidazole derivatives, Heterocyclic compounds, Synthetic methodologies, Medicinal chemistry, Pharmacological activities, Antimicrobial agents, Anticancer agents, Antifungal activity, Anti-inflammatory agents, Structure–activity relationship (SAR)

Photoreduction of Hexavalent Chromium Cr (VI) to Trivalent Chromium Cr (III) Using Reduced Graphene Oxide (rGO)

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Abstract

The efficient removal of toxic hexavalent chromium (Cr (VI)) from wastewater remains a major environmental challenge due to its carcinogenicity and high solubility. This study investigates the photoreduction of Cr (VI) to the less toxic Cr (III) using reduced graphene oxide (r-GO) as an advanced photocatalytic material. Reduced graphene oxide was synthesized and characterized by XRD, Raman spectroscopy, FTIR, and UV-V is spectroscopy to confirm successful reduction and structural features conducive for photocatalysis. The r-GO demonstrated enhanced visible-light absorption and efficient charge transport, resulting in significant photocatalytic activity. Under visible-light irradiation, r-GO facilitated rapid electron transfer and suppressed electron-hole recombination, favoring the reduction of Cr (VI) to Cr (III) with high efficiency. The effects of key operational parameters — including pH, initial Cr (VI) concentration, catalyst loading, and irradiation time — were systematically evaluated to optimize reduction performance. The results indicate that r-GO is a promising metal-free photocatalyst for the environmental remediation of Cr (VI)-contaminated water, combining high reduction rates with facile recovery and reuse. This work highlights the potential of graphene-based materials in photocatalytic applications for heavy metal detoxification and sustainable water treatment technologies.

Keywords: Photoreduction, Hexavalent Chromium (Cr (VI)) reduction, Trivalent Chromium (Cr (III)), Reduced Graphene Oxide (r-GO), Photocatalysis, Visible Light

Irradiation, Charge Carrier Separation, Wastewater Remediation, Graphene-based Nanomaterials

An In-Depth Investigation of the Green Synthesis of Benzimidazole Derivatives

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Abstract

Heterocyclic compounds play a vital role in medicinal and pharmaceutical chemistry due to their diverse biological activities and structural versatility. Among them, benzimidazole derivatives have attracted significant attention because of their close structural resemblance to naturally occurring nucleotides, such as the adenine base of DNA, and their presence in biologically important molecules like vitamin B₁₂. Benzimidazole-based compounds are widely used as key intermediates in drug discovery and therapeutic applications. The present study focuses on the green synthesis of benzimidazole derivatives using transition metal-based nanoparticles as efficient and eco-friendly catalysts. The approach emphasizes mild reaction conditions, improved yields, reduced reaction time, and minimal environmental impact. The synthesized benzimidazole derivatives demonstrate the potential advantages of nanocatalysis in sustainable organic synthesis. This work highlights the importance of green chemistry principles in the development of environmentally benign and economically viable synthetic routes for biologically active heterocyclic compounds. Benzimidazole and its derivatives constitute an important class of nitrogen-containing heterocyclic compounds that have been extensively explored in medicinal chemistry. Structurally, benzimidazole consists of a fused benzene and imidazole ring system, which imparts unique chemical and biological properties. Due to its resemblance to naturally occurring purine bases, benzimidazole readily interacts with biological systems, making it a valuable scaffold in drug design and pharmaceutical research.

Evaluation of Antioxidant Potential and Antibacterial Activity of Tuber Extracts of *Amorphophallus konkanensis* and *Amorphophallus bulbifer* (Araceae)

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Abstract

Background: Tubers of *Amorphophallus* species are traditionally used in herbal remedies; however, scientific evidence supporting their antioxidant and antibacterial properties remains limited, particularly for *Amorphophallus konkanensis*. Objective: The present study aimed to investigate the antioxidant activity, antibacterial potential, and phenolic composition of tuber extracts of *Amorphophallus konkanensis* (AKT) and *Amorphophallus bulbifer* (ABT). Methods: Tubers were extracted using ethanol, acetone, and aqueous solvents. Antioxidant activity was assessed using ferric reducing antioxidant power (FRAP), DPPH radical scavenging, hydroxyl (OH•) radical scavenging, and nitric oxide (NO•) scavenging assays. Total phenolic content (TPC) was determined using the Folin–Ciocalteu method. Antibacterial activity of different extracts was evaluated against selected Gram-positive and Gram-negative bacterial strains using the agar diffusion method. High-performance liquid chromatography (HPLC) was employed to identify major phenolic compounds present in the active extracts. Results: Among the tested solvents, acetone extracts of both AKT and ABT showed the highest total phenolic content, measuring 29.37 ± 0.83 and 20.62 ± 1.04 mg GAE/g, respectively. Acetone extracts also demonstrated superior antioxidant activity with strong reducing power and high radical scavenging efficiency in FRAP, DPPH, hydroxyl, and nitric oxide assays. HPLC analysis revealed the presence of key phenolic compounds, including tannic acid, gallic acid, quercetin, p-coumaric acid, and catechin. Furthermore, acetone extracts of both species exhibited significant antibacterial activity against all tested Gram-positive and Gram-negative bacterial strains. Conclusion: The findings suggest that tubers of *Amorphophallus konkanensis* and *Amorphophallus bulbifer* are rich sources of bioactive phenolic compounds with notable antioxidant and antibacterial properties. These results provide scientific validation for their traditional medicinal use and highlight their potential applications in nutraceuticals, functional foods, and natural therapeutic formulations.

A one-pot three component green synthesis of 1-Aminoalkyl-2-naphthols using grindstone chemistry.

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Abstract

A simple, efficient, and environmentally benign one-pot three-component protocol for the synthesis of 1-aminoalkyl-2-naphthols has been developed using grindstone chemistry. The reaction involves the condensation of 2-naphthol, aromatic aldehydes, and amines under solvent-free conditions at ambient temperature. Mechanical grinding promotes rapid reaction rates, affording the desired products in excellent yields with high purity and minimal work-up. This green methodology eliminates the need for hazardous solvents, harsh catalysts, and elevated temperatures, thereby reducing waste generation and energy consumption. The operational simplicity, broad substrate scope, and eco-friendly nature of this protocol make it a sustainable alternative to conventional synthetic methods for biologically and pharmaceutically important aminoalkyl naphthol derivatives.

Keywords: Green synthesis; Grindstone chemistry; One-pot multicomponent reaction; 1-Aminoalkyl-2-naphthols; Solvent-free synthesis; Eco-friendly methodology

Green synthesis of nanoparticles and its potential application

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Abstract

Green synthesis of nanoparticles has emerged as an eco-friendly and sustainable alternative to conventional physical and chemical methods of nanoparticle production. This approach utilizes biological entities such as plant extracts, microorganisms, and biomolecules as reducing and stabilizing agents, eliminating the need for toxic chemicals and high-energy processes. Green-synthesized nanoparticles exhibit unique physicochemical properties, including high surface area, enhanced reactivity, and improved biocompatibility. These nanoparticles have attracted significant attention due to their wide range of potential applications in biomedical fields (such as antimicrobial agents, drug delivery, and cancer therapy), environmental remediation (water purification and pollutant degradation), agriculture (nano-fertilizers and pest control), food packaging, and energy systems. Despite challenges related to scalability, reproducibility, and precise control over particle size and morphology, green synthesis offers a promising pathway toward sustainable nanotechnology. Continued research and standardization are essential to fully realize its industrial and commercial potential.

Keywords: Green synthesis; Nanoparticles; Sustainable nanotechnology; Plant-mediated synthesis; Biomedical applications; Environmental remediation.

Invisible Threats in Visible Networks: A Study of Contemporary Cyber Attacks

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Abstract

In today's digitally connected environment, computer networks have become increasingly visible, accessible, and essential for communication, commerce, and data exchange. At the same time, cyber threats targeting these networks have grown more sophisticated and often operate invisibly, making detection and prevention difficult. This study critically examines contemporary cyber-attacks that exploit technical vulnerabilities, human behavior, and misconfigured infrastructures to compromise systems silently. The paper reviews recent trends in cyber threats such as phishing, ransomware, distributed denial-of-service (DDoS) attacks, zero-day exploits, and insider threats, focusing on their mechanisms, impact, and evolving nature. Findings from recent studies indicate that traditional security measures are often insufficient against modern, stealth-based attacks, resulting in data breaches, service disruption, and financial losses. The study also analyzes existing detection and prevention strategies, highlighting limitations in conventional security models. Emphasis is placed on the need for proactive security approaches, continuous monitoring, threat intelligence, and user awareness programs to effectively mitigate invisible cyber threats. The paper concludes by underscoring the importance of adaptive and layered security frameworks to safeguard visible networks from emerging cyber risks.

Keywords: Cyber Attacks; Network Security; Malware; Phishing; Ransomware; Cyber Threats; Information Security.

From Data to Diagnosis: The Rise of Intelligent Care Systems in Modern Medicine

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Abstract

The rapid growth of digital healthcare systems has led to the increasing adoption of artificial intelligence (AI) for medical diagnosis and clinical decision-making. This review critically examines recent advancements in intelligent care systems that transform large volumes of medical data into accurate and timely diagnostic insights. The study synthesizes research findings published between 2023 and 2025, focusing on AI applications in clinical diagnostics, predictive analytics, personalized treatment planning, and decision support systems. Available studies indicate that machine learning and deep learning models significantly enhance diagnostic accuracy in areas such as medical imaging, disease risk prediction, and early detection of complex conditions. These systems demonstrate strong potential in improving clinical efficiency, reducing diagnostic errors, and supporting healthcare professionals in data-intensive environments. However, challenges related to data quality, algorithmic bias, ethical concerns, transparency, and integration into existing clinical workflows remain significant barriers to widespread adoption. Evidence from recent implementations highlights the importance of explainable AI, clinician involvement, and robust data governance frameworks to ensure safe and equitable use. The review emphasizes the need for standardized evaluation methods, continuous monitoring, and interdisciplinary collaboration to enable sustainable and responsible deployment of intelligent care systems in modern medicine.

Keywords: Artificial Intelligence; Intelligent Care Systems; Medical Diagnosis; Machine Learning; Predictive Analytics; Clinical Decision Support; Healthcare Technology.

Photocatalytic Study of Copper Ferrite (CuFe₂O₄) Nanoparticles Synthesized By Sol–Gel Auto-Combustion Method

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Abstract

The increasing discharge of dye-containing wastewater from textile, paper, leather, and chemical industries has become a major environmental concern due to the toxic, non-biodegradable, and persistent nature of synthetic dyes. Photocatalysis has emerged as an effective and eco-friendly technique for the degradation of such organic pollutants under light irradiation. In the present study, copper ferrite (CuFe₂O₄) nanoparticles were synthesized using the sol–gel auto-combustion method and evaluated for their photocatalytic performance toward the degradation of methylene blue and rhodamine B dyes under visible light illumination. The structural and morphological properties of the synthesized nanoparticles were characterized using techniques such as X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and transmission electron microscopy (TEM). Photocatalytic studies were carried out to differentiate between dark adsorption and true photocatalytic degradation. The influence of solution pH, mild temperature variation, and the role of hydrogen peroxide on degradation efficiency were systematically investigated. The degradation kinetics followed a pseudo-first-order reaction model, indicating efficient photocatalytic behavior. The results demonstrate that CuFe₂O₄ nanoparticles exhibit significant visible-light-driven photocatalytic activity, highlighting their potential application in sustainable wastewater treatment and environmental remediation.

Keywords: Copper ferrite; CuFe₂O₄ nanoparticles; Photocatalysis; Visible light; Dye degradation; Methylene blue; Rhodamine B; Wastewater treatment.

Study of effect of Ashwagandha extracts on lead-induced toxicity in *Labeo rohita*

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Abstract

The current investigation studied the extract of Ashwagandha as remedies for lead (Pb) induced toxicity in *Labeo rohita* fish. Lead poses significant risks to aquatic life and human health even at low levels. Acute toxicity tests were conducted to determine the appropriate doses of Pb and the plant extracts. The 96-hour LC₅₀ for Pb was determined to be 3.78 mg/L, while the aqueous extracts of Ashwagandha exhibited LC₅₀ values of 352.19 mg/L. Sub-acute chronic exposure experiments were then performed on adult rohu exposed to Pb (0.37 mg/L) and treated with Ashwagandha extract (3.52 mg/L). The results indicated that the extracts exhibited positive effects on antioxidant enzymes such as superoxide dismutase (SOD), catalase (CAT), and glutathione S-transferase (GST) in various tissues. Histological analyses revealed improvements in tissue structures, with Ashwagandha extracts mitigating Pb-induced damage in the liver, kidney, gills, and muscles of the fish. Overall, the findings underscored the potential of Ashwagandha extracts as effective remedies against Pb toxicity in fish. Further experimental validations, particularly focusing on these plant extracts, are recommended to comprehensively understand and utilize their protective properties in addressing heavy metal toxicity in aquatic ecosystems.

Keywords: Adaptogenic plant, Ashwagandha, biomarkers, SOD, GST.

Healing Herbs of the Western Ghats Foothills: An Ethnomedicinal Study of

Akole Tahsil of Ahilyanagar District (MS)-India

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Abstract

The Western Ghats foothills of Maharashtra are an important centre of plant diversity and traditional ethnomedicinal practices. The present study documents the diversity and ethnomedicinal uses of herbaceous plant species in Akole tahsil of Ahilyanagar district, Maharashtra, India. Field surveys were conducted across selected villages and adjoining forest areas during different seasons. Ethnomedicinal information was collected through semi-structured interviews with local tribal communities, traditional healers, and knowledgeable elders. Plant specimens were collected, taxonomically identified using standard floras, and authenticated through herbarium consultation. A total of 45 different species from 21 different families were recorded. These species are traditionally used to treat various ailments, including gastrointestinal disorders, skin diseases, respiratory infections, fever, diabetes, wounds, and inflammatory conditions. Leaves were the most frequently utilized plant part (42%), followed by roots (20%), whole plants(14%), Flower, Fruits (8% each) and seeds(6%). The common modes of preparation included decoctions, pastes, powders, and infusions, administered either orally or topically. The findings indicate a strong dependence of local communities on herbaceous medicinal plants for primary healthcare. However, traditional ethnomedicinal knowledge is gradually declining due to socio-economic changes and habitat degradation. The documentation provided in this study serves as baseline ethnobotanical data and may support biodiversity conservation strategies and future phytochemical and pharmacological investigations of medicinal plants from the Western Ghats foothills.

Key words: Tribes, Ethnomedicinal, herbaceous diversity, Akole, Ahilyanagar

Comparative Evaluation of Polyphenol Oxidase from Two Wild Mushrooms, *Microporus xanthopus* and *Polyporus arcularius*

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Abstract

Crude enzyme extracts were obtained from *Polyporus arcularius* and *Microporus xanthopus*. Partial purification of polyphenol oxidase (PPO) from both mushroom species was carried out using the three-phase partitioning technique. Among the substrates tested, catechol and pyrogallol showed the highest affinity, exhibiting maximum enzymatic activity. The enzymes displayed optimal activity at relatively low substrate concentrations, specifically 5 mM pyrogallol and 10 mM catechol in both mushrooms. Among natural inhibitors, sweet lime and orange extracts from citrus fruits, as well as black-eyed pea extracts from vegetables, demonstrated strong inhibitory effects on PPO activity. In addition, sodium metabisulphite and ascorbic acid effectively suppressed enzyme activity in both mushroom species.

Keywords: *Microporus xanthopus*, *Polyporus arcularius*, Polyphenol oxidases, TPP.

Green Synthesis of Copper Oxide Nanoparticle Using *Murraya Koenigii* Leaves (Curry Leaves) Extract for Photodegradation of Methyl Red

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Abstract

In this study, copper nanoparticles (Cu NPs) will be synthesized by using *Murraya koenigii* leaf extract as a natural solvent which will be safe for the environment. *Murraya koenigii* leaf extract has been found to decrease copper ions without the need for a stabilizer or surfactant agent, making it an easy, economical, and environmentally friendly way to prepare Cu NPs. A color shift in the reaction mixture was noticed upon the combination of plant extract with the copper sulphate solution, indicating the creation of nanoparticles. Using UV-Vis spectra, FESEM images and XRD spectrum the particles were characterized. UV-vis data shows that Cu NPs generated using this green synthesis approach remain stable even after a month, confirming their stability. Metallic Cu nanoparticles are less expensive than conventional heterogeneous catalysts. The characterization results of biosynthesized Cu NPs show that the particles are crystalline and cubical in shape, with an average size few nanometer and are very stable. This study has the potential to have a significant impact in a few years on the industrial synthesis of metallic nanoparticles. Because of its outstanding qualities, we suspected that the use of green-produced Cu NPs will result in the biomedical applications. Cu NPs exhibit cytotoxicity and anticancer characteristics in numerous applications

Purification of Water Effluent Using Manganese Ferrite (MnFe₂O₄) Synthesized By Using Orange Juice As A Fuel By Sol-Gel Method

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Abstract

The present research focuses on the green synthesis of MnFe₂O₄ nanoparticles using orange juice as a natural fuel via the sol–gel method, followed by their application in the purification of contaminated water effluent. The synthesized nanoparticles will be characterized using techniques such as X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM) confirm their crystal structure, functional groups, morphology, and particle size. The study aims to evaluate the adsorption and catalytic degradation efficiency, kinetics, and reusability of MnFe₂O₄ nanoparticles in wastewater treatment. The magnetic nature of MnFe₂O₄ allows easy separation and recovery of the catalyst after treatment, enhancing its practical applicability. Expected outcomes include high pollutant removal efficiency, fast reaction kinetics, excellent recyclability, and reduced environmental impact. This work demonstrates a sustainable, cost-effective, and environmentally benign approach for water effluent purification, highlighting the potential of greensynthesized MnFe₂O₄ nanoparticles as an efficient material for advanced wastewater treatment applications

Synthesis of Zinc Chromite (ZnCrO₄) Nanoparticles and Its Application in Wastewater Treatment

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Abstract

The rapid growth of industrialization has resulted in the discharge of large amounts of wastewater containing toxic organic pollutants, dyes, and heavy metals. Nanotechnology offers effective solutions for wastewater treatment due to the unique physicochemical properties of nanoparticles. Zinc chromite (ZnCrO₄) nanoparticles have attracted attention because of their high surface area, chemical stability, catalytic

activity, and adsorption efficiency. This project focuses on the synthesis of zinc chromite nanoparticles using a chemical method and their application in wastewater treatment. The prepared nanoparticles are characterized and their efficiency in removing pollutants from wastewater is discussed. The study highlights the potential of ZnCrO₄ nanoparticles as an effective material for environmental remediation.

Synthesis of Nickel Ferrite (NiFe₂O₄) Nanoparticles by Sol-Gel Method and Their Application in Waste Water Treatment

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Abstract

Nickel ferrite (NiFe₂O₄) nanoparticles were synthesized using the sol-gel method and explored for their application in wastewater treatment. The sol-gel technique provides a simple and cost-effective route for obtaining nanoparticles with controlled size and high purity. The synthesized NiFe₂O₄ nanoparticles were characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM/TEM), UV-Visible spectroscopy. XRD results confirmed the formation of a cubic spinel structure with nanoscale crystallite size, while morphological studies revealed nearly spherical and uniformly distributed particles. The photocatalytic activity of NiFe₂O₄ nanoparticles was evaluated using a model organic dye solution under light irradiation. The effects of pH, catalyst dosage, and initial dye concentration on degradation efficiency were investigated. The results showed significant dye removal efficiency, highlighting the potential of NiFe₂O₄ nanoparticles as an effective, reusable, and environmentally friendly photocatalyst for wastewater treatment applications.

Study of marine Biology in the alibag region of Maharashtra

Omkar saware

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Abstract

Marine biology deals with the scientific study of marine organisms and their interactions within the marine environment. Coastal and nearshore ecosystems such as estuaries, mangroves, intertidal zones, and shallow waters are among the most productive ecosystems and play a vital role in maintaining ecological balance and supporting fisheries and coastal livelihoods. India, with a long coastline of about 7,516 km, hosts a wide diversity of marine habitats, particularly along the west coast, which is influenced strongly by seasonal monsoon cycles.

The Alibag region of Raigad district, Maharashtra, forms an ecologically significant coastal zone characterized by sandy beaches, rocky shores, estuarine environments, and shallow nearshore waters. These habitats support a rich diversity of marine organisms including phytoplankton, zooplankton, molluscs, crustaceans, echinoderms, fishes, and marine algae. The region is known for its productive fisheries and biodiversity, which are essential for sustaining local fishing communities.

The present study focuses on understanding the marine biological diversity of the Alibag region through a review of available literature and secondary data. Emphasis is given to the importance of coastal ecosystems in maintaining marine productivity and supporting fisheries. The study highlights the ecological significance of the Alibag coast and stresses the need for sustainable management and conservation of marine resources in this region.

**Taurine-Catalysed Green Synthesis of Bioactive Schiff Bases in Aqueous
Medium**

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Abstract

Schiff bases are an important class of compounds with wide applications in medicinal and coordination chemistry. In the present study, an environmentally benign protocol for the synthesis of Schiff base derivatives has been developed using aminoethanesulfonic acid (taurine) as a bio-organic catalyst in aqueous medium. Various aromatic aldehydes readily condensed with substituted aromatic amines under mild conditions to produce the corresponding imine derivatives in good to excellent yields. The method avoids the use of hazardous organic solvents and strong mineral acids, thereby offering a safer and more sustainable alternative to conventional procedures. The reaction proceeds smoothly with simple experimental handling, and the products are conveniently isolated by filtration and washing without requiring complex purification steps. This approach demonstrates the effectiveness of taurine as a green catalyst for efficient Schiff base synthesis.

Keywords Schiff bases; Taurine catalyst; Aminoethanesulfonic acid; Green synthesis; Aqueous medium; Bio-organic catalyst; Imine formation; condensation reaction

A study of electronic and magnetic properties of Solid- State Materials

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Abstract

The electronic and magnetic properties of solid-state materials play a crucial role in determining their functionality and potential technological applications. This study presents a comprehensive investigation of the electronic structure and magnetic behavior of selected solid-state materials using theoretical modeling and experimental characterization techniques. Electronic properties such as band structure, density of states, and charge carrier behavior are analyzed to understand conductivity and semiconducting behavior. Magnetic properties, including magnetization, magnetic susceptibility, and exchange interactions, are examined to identify ferromagnetic, antiferromagnetic, or paramagnetic characteristics. The correlation between electronic structure and magnetic ordering is discussed in detail, highlighting the influence of crystal structure, electron correlation, and external parameters such as temperature and magnetic field. The results provide valuable insights into the fundamental physics governing solid-state materials and contribute to the development of advanced materials for applications in electronics, spintronics, and energy technologies.

Microplastic Contamination In Coastal Water Or Sand

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Abstract

Microplastic pollution has become a significant environmental issue due to its widespread distribution and persistence in marine ecosystems. Coastal areas serve as major sinks for plastic debris originating from land-based human activities such as urbanization, tourism, fishing, and improper waste management. The present study reviews and assesses microplastic contamination in coastal water and beach sand, with particular reference to the Uran beach coastal area of Maharashtra, India. This study compiles and analyzes published scientific literature on the occurrence, distribution, types, and environmental impacts of microplastics in coastal environments. The reviewed studies indicate that microplastics are abundantly present in both coastal water and beach sand, with fibers and fragments being the most dominant forms. Commonly identified polymer types include polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), and polyvinyl chloride (PVC). The methodologies discussed include sample collection, pretreatment, density separation, visual identification, and polymer characterization using Fourier Transform Infrared (FTIR) analysis. Results from various studies show a higher accumulation of microplastics in beach sand compared to coastal water. Microplastics act as carriers of toxic pollutants and pathogenic microorganisms, posing serious ecological risks to marine organisms through ingestion and bioaccumulation. The study highlights the need for standardized monitoring methods, long-term studies, and effective management strategies to reduce microplastic pollution and protect coastal ecosystems.

Bridging Curriculum and Practice: A Document-Based Gap Analysis of Green Chemistry in Undergraduate Chemistry Practicals across Navi Mumbai Colleges

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Abstract

Green chemistry has become an essential component of contemporary chemical education due to its emphasis on environmental protection and sustainable practices. Despite its inclusion in university curricula, the extent to which green chemistry principles are meaningfully applied in undergraduate laboratory teaching remains uncertain. This study conducts a document-based gap analysis to examine the level of integration of green chemistry within undergraduate chemistry practicals across selected colleges in Navi Mumbai. Given that a significant proportion of students in these institutions are first-generation learners, effective laboratory implementation becomes particularly important. The study systematically analyzes institutional documents, including laboratory manuals, Standard Operating Procedures (SOPs), NAAC Self-Study Reports (SSR) and IQAC records, to assess whether curriculum intentions are translated into laboratory practice. The twelve principles of green chemistry are used as an evaluative framework to examine alignment between curriculum objectives, laboratory procedures and institutional commitment. The findings indicate a pronounced gap between theoretical acknowledgement and practical execution, especially in areas such as waste minimization, selection of safer solvents, energy-efficient experimentation and pollution prevention measures. Although sustainability is frequently referenced in institutional documentation, consistent and operational laboratory-level practices are largely absent. The study proposes feasible and cost-effective strategies to strengthen the implementation of green chemistry in undergraduate laboratories by addressing identified gaps. By relying on documentary evidence rather than perception-based inputs, the study offers a practical model for curriculum–laboratory alignment and supports institutional planning aligned with sustainable development goals. The findings underscore the need for curriculum restructuring, faculty capacity-building and stronger policy enforcement to ensure that green chemistry is embedded as a routine laboratory practice rather than remaining a conceptual aspiration.

Keywords: Green Chemistry Education, Curriculum–Practice Gap, Undergraduate Laboratories, Sustainable Chemistry, NAAC, IQAC

“A Review on the Biochemical and Medicinal Significance of *Costus igneus*”

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Abstract

The Insulin Plant *Costus igneus* is a highly valued medicinal herb recognized for its potent anti-diabetic properties. Commonly referred to as “Natural Insulin,” the plant has gained significance due to its ability to help regulate blood glucose levels. Its leaves contain bioactive compounds such as corosolic acid, diterpenoids, flavonoids, and antioxidants, which contribute to improved glucose metabolism and enhanced insulin sensitivity. Traditionally used in Ayurveda and herbal medicine, *Costus igneus* has been employed as a natural remedy for managing Type 2 diabetes, reducing hyperglycemia, and supporting overall metabolic health. Regular consumption of its leaves is believed to lower blood sugar levels, reduce oxidative stress, and improve pancreatic function.

The present study explores the phytochemical composition, medicinal applications, and therapeutic potential of the Insulin Plant, with a focus on its role in diabetes management. By analyzing available scientific literature, the project aims to highlight the plant’s effectiveness as a natural, accessible alternative for metabolic disorders. This research contributes to understanding the importance of traditional medicinal plants in modern healthcare and encourages further scientific validation for clinical use.

Keywords: Diterpenoides, flavonoids and *costus igneus*

Microwave Mediated One Step Synthesis of 2,4,5-Triaryle-1H- Imidazole Derivatives Using Co-Cu Mixed Oxide as Catalyst

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Abstract

In this study, a catalyst composite of Co-Cu was prepared from chloride containing precursor of Co (II) & Cu (II) metals using milky latex of *Euphorbia neriifolia* plant following green principals of synthesis. The catalyst composite was characterized using XRD, EDAX, SEM, HR-TEM, FTIR, XPS and TOF-MS. Crystalline of the mixed oxide composite was confirmed from analysis with distorted octahedral nature. Chemical charge of mixed phase of Co-Cu based on XPS revealed Co²⁺ and Cu²⁺ oxidation state. This material was used for synthesizing 2,4,5-triaryle-1H-imidazole (TIMDZOL) derivatives. Analysis of reaction conditions revealed that EtOH:PEG at 8:2 ratio under microwave condition showed better yield with less time and better reusability of the Co-Cu catalyst.

Keywords: Co-Cu, *Euphorbia neriifolia*, imidazole, TIMDZOL, Microwave, Octahedral, XPS

Green Synthesis of Benzimidazole Derivatives using Ionic Liquids

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Uran

Abstract

An environmentally benign and efficient protocol for the synthesis of benzimidazole derivatives has been developed via the condensation of *o*-phenylenediamine with orthoesters using the ionic liquid 1-butylimidazolium bisulfate [*Hbim*][*HSO*₄] as a catalyst in water. The present study emphasizes a comparative evaluation of conventional heating, ultrasound irradiation, and microwave-assisted methods. Among these, ultrasound and microwave techniques significantly reduced reaction time and enhanced product yields. The reactions proceed smoothly under mild conditions, offering good to moderate yields with a simple and clean work-up procedure. The antibacterial activity of the synthesized compound was evaluated *in vitro* against both Gram-positive and Gram-negative bacterial strains at varying concentrations and compared with the standard antibiotic ciprofloxacin. The results demonstrate that this green synthetic strategy is efficient, sustainable, and applicable for the preparation of biologically relevant benzimidazole derivatives.

Keywords: Benzimidazoles; Ionic liquid; Green synthesis; Microwave irradiation; Ultrasound; Antibacterial activity

CADET-Phish: A Cost-Aware Continual Adversarial Framework for Robust Phishing Email Detection under Concept Drift

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Abstract

Research into phishing email detection has benefited substantially from advances in deep learning and language models, with reported accuracies often exceeding 98% on benchmark datasets. However, these results largely reflect static evaluation conditions. In operational environments, phishing campaigns evolve rapidly; attackers increasingly leverage AI to generate linguistically sophisticated content, introducing both adversarial perturbations and concept drift. Consequently, existing systems still exhibit three persistent weaknesses: limited robustness to adversarial rephrasing, brittle performance under distributional shifts, and prohibitive costs when naïvely integrating large language models (LLMs) into the detection pipeline.

To address these gaps, this paper proposes CADET-Phish, a cost-aware continual adversarial framework for phishing email detection. CADET-Phish combines four key components: (i) an efficient deep learning base classifier for high-throughput filtering, (ii) an adaptive drift and uncertainty monitor, (iii) an LLM-assisted semantic analyser invoked only on selected borderline and drift-suspect samples, and (iv) an adversarial augmentation module that generates realistic phishing paraphrases to harden the detector against evolving attacks. Concept drift is managed using streaming drift detectors and confidence trends, while adversarial robustness is improved through iterative training on constrained, LLM generated paraphrases and structural perturbations inspired by realistic evasion strategies.

The framework is designed to be implementable with publicly available datasets and open-source tooling, enabling empirical evaluation of robustness, drift adaptation, and cost-performance trade-offs. We outline experimental scenarios to compare CADET-Phish against conventional deep learning baselines and pure LLM classifiers, emphasizing operationally relevant metrics such as false positives on benign emails, robustness to AI-generated phishing, and LLM invocation cost.

Dye Degradation using Green Synthesised Silver Nanoparticles from *Stachytarpheta jamaicensis*

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Abstract

This study focuses on the green synthesis of silver nanoparticles (AgNPs) using leaf extract from *Stachytarpheta jamaicensis*, a plant known for its medicinal properties. The synthesis process was confirmed through a colour change and characterised using UV-visible spectroscopy, SEM-EDX, FT-IR, and XRD techniques. The synthesized AgNPs exhibited a characteristic absorption peak at 440 nm, indicating successful nanoparticle formation. Optimization studies were conducted to determine the effects of time, temperature, plant extract concentration, and silver nitrate concentration on nanoparticle synthesis.

The synthesized AgNPs demonstrated significant potential in various applications. They enhanced seed germination rates and seedling growth at lower concentrations, while higher concentrations exhibited toxicity. The AgNPs also showed excellent photocatalytic activity, effectively degrading crystal violet and methylene blue dyes under sunlight. Optimization of parameters such as temperature, light exposure, and nanoparticle concentration revealed the most efficient conditions for dye degradation.

Overall, the green synthesis of AgNPs using *Stachytarpheta jamaicensis* leaf extract offers a sustainable and eco-friendly approach to nanoparticle production. The synthesized nanoparticles exhibit diverse applications, including dye degradation and seed germination, highlighting their potential in environmental and biomedical fields.

Synergetic effects of pharmaceutical drugs on *Tilapia*

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Abstract

Pharmaceutical residues are ubiquitous in the environment and have been measured globally on every continent. Pharmaceuticals present a particular concern for aquatic animals, with the discharge of human, veterinary, and livestock wastewater effluents being a primary source of contamination.

Drug Synergism is an interaction between two or more drugs that causes the total effect of the drugs to be greater than the sum of the individual effects of each drug. A synergistic effect can be beneficial or harmful. When certain drugs are used together, they can have a synergetic effects, meaning that their combined action is more potent or pronounced than when used individually. While this can sometimes be beneficial for therapeutic purposes, it is important to be aware of the potential risk and side effects that can arise from using synergetic drugs. Some of the negative effects of synergetic drugs include:

1. Increased risk of adverse reactions: Combining drugs with similar mechanisms of action or overlapping side effects can increase the risk of experiencing adverse reactions. For example, combining two medications that both have the potential to cause drowsiness can result in increased sedation or impairment.
2. Enhanced toxicity: Synergetic drugs may lead to an increase in the concentration of particular drugs or its metabolites in the body. This can potentially increase the risk of toxic effects or overdose, particularly if the drug has a narrow therapeutic index.
3. Heightened side effects: Some drugs can have side effects that become more severe when combined. For instance combining two medication that can cause gastrointestinal irritation may lead to an increased risk of stomach ulcer or gastrointestinal bleeding.
4. Drug interaction: Synergetic drugs can interact with each other altering their pharmacokinetics (absorption, distribution, metabolism and excretion) or pharmacodynamics (effects on the body). These interactions can lead to unpredictable effects, including reduced efficacy or increased toxicity.

Keywords: Drugs, Pharmacokinetics, Pharmacodynamics, Pharmaceuticals, Synergetic, Toxicity

Restoration of *Jaskhar* wetland and Its Importance as a Feeding Habitat for Birds: A Case Study

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Abstract

Wetlands are among the most threatened ecosystems due to rapid urbanization, industrial expansion and land reclamation. The present study documents the ecological restoration of *Jaskhar* wetland, a small freshwater wetland located near the Jawaharlal Nehru Port Authority (JNPA), Uran, Maharashtra, and evaluates its importance as a feeding and resting habitat for birds. Prior to restoration, the lake was neglected and showed signs of eutrophication and habitat degradation. Recently, conservation measures including desilting, protection from dumping, development of peripheral pathways, landscaping and controlled human access were implemented, resulting in visible ecological improvement. Field observations were carried out to assess habitat conditions and avifaunal utilization of the restored lake. The lake presently supports a variety of resident and migratory bird species, particularly waders and waterfowl, indicating improved food availability and habitat suitability. The study highlights that even small restored wetlands can function as critical refuges for birds in landscapes where natural wetlands have largely disappeared due to port development and infrastructure expansion. The *Jaskhar* wetland restoration demonstrates the positive ecological outcomes of localized conservation efforts and underscores the need for protection and scientific monitoring of remaining urban and peri-urban wetlands for sustaining avifaunal diversity.

Keywords:

Wetland restoration; Avifaunal diversity; Migratory birds; Urban wetland; Habitat conservation; *Jaskhar* wetland; Case study; Bird feeding habitat; JNPA region

Assessment of Carbon Sequestration Potential of Trees in and Around College Campus

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Abstract

Trees play a vital role in mitigating climate change by sequestering atmospheric carbon dioxide and storing it as biomass. The present study aims to assess the carbon sequestration potential of trees in and around a college campus, highlighting their contribution to local carbon storage and environmental sustainability. A field survey was conducted to record tree species, girth at breast height (GBH), and height. Above-ground and below-ground biomass were estimated using standard allometric equations, and carbon stock was calculated by applying a carbon conversion factor. The total carbon sequestered and corresponding carbon dioxide equivalent were computed for the study area. The results revealed significant variation in carbon storage among tree species, largely influenced by their size and density. Large, mature trees contributed disproportionately to the total carbon stock compared to smaller individuals. The findings emphasize the importance of conserving existing trees and promoting plantation of native and fast-growing species within campus premises. This study provides baseline data for carbon budgeting at the institutional level and supports the role of educational campuses as important green sinks for carbon sequestration and climate change mitigation.

Keywords: Carbon sequestration; Tree biomass; Carbon stock; Allometric equations; College campus; Climate change mitigation; Urban green spaces; Tree diversity

Assessment of water temperature and pH profile sea-to-shore

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Abstract

Water temperature and pH are vital physicochemical parameters that influence the structure, functioning, and productivity of coastal and nearshore ecosystems. Variations in these parameters affect metabolic processes, growth, reproduction, and distribution of aquatic organisms. Coastal waters, especially shoreline zones, are highly dynamic and are often influenced by tidal action, freshwater input, atmospheric conditions, and increasing anthropogenic activities, leading to spatial differences in water quality.

The present study aims to assess the surface water temperature and pH profile along a shore-to-sea gradient at Pirwadi sea shore, Uran. Surface water samples will be collected from selected stations at the shoreline, 50 m, and 200 m offshore. Measurements of temperature and pH will be carried out *in situ* using standard instruments, with triplicate observations to ensure accuracy and reliability. The collected data will be analysed using basic statistical methods to evaluate spatial variation and trends across the sampling stations.

The study is expected to reveal noticeable differences in water temperature and pH between shoreline and nearshore zones, reflecting the influence of land-based activities and natural coastal processes. The findings will provide baseline information on coastal water quality and contribute to environmental monitoring, fisheries assessment, and coastal ecosystem management.

Ant community composition of Male Village, Pune, Maharashtra

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Abstract

The study was conducted to investigate the diversity of ants of Male Village, Pune, Maharashtra, from 2017 to 2018. This region is close to the North Western ghat. Order Hymenoptera consists of social insects like ants, bees and wasps. Ants are placed in a single family, Formicidae. Ants are deeply associated with terrestrial ecosystems. They serve numerous important functions as soil engineers, predators and nutrient recyclers. Ant studies are fragmented in Maharashtra. The Mulashi region is poorly studied for ant diversity. Ants are collected by different methods, such as an all-out search method, pitfall traps, and leaf litter. In the present study, the ants were collected from the study area using an all-out search method. Ant diversity from the five subfamilies, viz. Dolichoderinae, Formicinae, Myrmicinae, Ponerinae, and Pseudomyrmicinae were documented during the study. In terms of species diversity, the subfamily Myrmicinae (10 species) was the most speciose, followed by Formicinae (7 species), Ponerinae (5 species), Pseudomyrmicinae (1 species), and Dolichoderinae (1 species), respectively. A total of 24 ant species, belonging to 17 genera, were reported from the present study area. Generalist tramp species such as *Monomorium pharaonis* and *Tapinoma melanocephalum* were reported in the study area, along with some specialist species.

Keywords: Ants, Hymenoptera, Formicidae, Subfamily, All-out search method.

"Assessment of Water Parameters in Navghar pond, Uran, District- Raigad, Navi Mumbai"

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Abstract

The present study investigates the physico-chemical characteristics of Navghar Pond situated in Uran, District-Raigad, Navi Mumbai, with the objective of evaluating its water quality status and identifying potential sources of contamination. Systematic water sampling was conducted seasonally from selected locations within the pond to assess temporal and spatial variations. Key water quality parameters, including temperature, pH, electrical conductivity, turbidity, total dissolved solids, dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, total alkalinity, total hardness, chlorides, nitrates, and phosphates, were analysed following standard protocols prescribed by APHA. The generated data were statistically interpreted and compared with national and international water quality standards to determine the suitability of the pond water for domestic, agricultural, and ecological purposes. The results revealed significant seasonal fluctuations in several parameters, reflecting the influence of anthropogenic activities, surface runoff, and surrounding land-use practices. Elevated nutrient concentrations and organic load observed during certain seasons indicate emerging eutrophication trends and moderate pollution stress within the pond ecosystem. The study highlights the necessity for regular monitoring, effective pollution control measures, and sustainable management strategies to safeguard the ecological health of Navghar Pond. The findings provide valuable baseline data for long-term limnological assessment and support informed decision-making for freshwater resource conservation in rapidly urbanizing regions.

Keywords:

Water quality assessment; Physico-chemical parameters; Freshwater Pond; Eutrophication; Anthropogenic impact; Navghar Pond; Navi Mumbai.

Inhibiting Side Reactions with Functional Carbon Allotrope Coatings for an Efficient Zinc Anode in Aqueous Zinc-Ion Batteries

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Abstract:

Zinc (Zn) anodes in aqueous zinc ion batteries (AZIBs) face significant challenges, including dendrite growth, passivation, corrosion, and hydrogen evolution, which limit their electrochemical performance^[1,2]. To address these issues, our research work focused on the use of Graphene (G), Graphene Oxide (GO), and reduced Graphene Oxide (rGO) sheets as protective functional layer coatings on the Zn anodes, which were coated through a scalable spray-painting technique. The protective layer-coated Zn anode showed enhanced electrochemical performance by suppressing dendrite growth and minimizing irreversible reactions at the electrode/electrolyte interface. The G@Zn, rGO@Zn, and GO@Zn anodes demonstrated stable capacity retention after 35 cycles, with capacity losses of 2.0%, 5.1%, and 10.0%, respectively, than 14.7% for Zn anodes. Ex-situ X-ray diffraction and ATR-FTIR analyses revealed that the functional layer suppresses the formation of inactive and insoluble side reactions and their products on the Zn anode. The spray-painted G, GO, and rGO Zn anodes at room temperature offers economical and scalable approach to resolve the issue. Thus, our current research work provides the simple and scalable anode processing approach for stable and enhanced electrochemical performance of AZIB.

Synthesis and Characterization of Mixed Ligand Cerium Complexes and Study Of Their Antibacterial Activity

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Abstract

The various mixed ligand complexes of cerium (III) metal are synthesized by using primary ligand 2-Hydroxybenzaldehydeoxime and the compounds 2-amino propanoic acid, pyrrolidine-2-carboxylic acid, 2-amino-3-methylpentanoic acid, 2-Amino-3-phenylpropionic acid as secondary ligand. The characterization of the complexes has been performed by different techniques. The complexes are brown in colour and stable. The complexes are formed in the ratio of 1:2:1. Electrical conductance studies specify their non-electrolytic nature. FTIR spectra indicates that the Cerium(III) metal ion is bonded to primary ligand and secondary ligand through N- and O- donor atoms while intra ligand and LCMT transitions are substantiated by electronic absorption spectra of the complexes. The TG-DTA study of complexes reveal the presence of coordinated water molecules, metal ion and primary as well as secondary ligands in the synthesized cerium complexes. Antibacterial activity of all the complexes studied against selective microorganisms *S. typhi*, *P. aeruginosa*, *S. aureus*, *C. diphtheriae* by Tube dilution and Agar cup methods exposes that the complexes have moderate activity against the chosen microorganism strains.

Keywords : Ligand, Complex, Characterization, antibacterial activity.

Questionnaire Surveys: Local fisherfolk perceptions of Fish stock Changes

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Abstract

Coastal fishing communities along the Maharashtra coast depend heavily on small-scale fisheries for livelihood, food security, and socio-cultural identity. Gavhan village, located in Uran Taluka of Navi Mumbai, represents a dynamic socio-ecological system that has undergone significant environmental and economic changes due to rapid coastal industrialization and port-led development. Expansion of the Jawaharlal Nehru Port Trust, land reclamation, dredging activities, increased maritime traffic, and coastal pollution have altered estuarine habitats and traditional fishing grounds. Local fishers have reported noticeable changes in fish abundance, species composition, catch size, and seasonal predictability over recent decades. This study aims to systematically document fishers' perceptions of fish stock changes and identify the environmental and anthropogenic drivers influencing these changes using a structured questionnaire survey. By integrating traditional ecological knowledge with scientific perspectives, the research captures qualitative insights into long-term ecological variability that may not be fully reflected in conventional stock assessment data. The study further examines the adaptive strategies adopted by fishers in response to declining resources and environmental stressors. The findings are expected to contribute valuable baseline information for understanding fisheries dynamics in data-poor estuarine systems and to support participatory and co-management approaches for sustainable fisheries governance in the Uran coastal region of Maharashtra.

Analysing the possibility of asexual reproduction and evaluating the growth under Mycorrhizal effect of *Chamaecostus cuspidatus* a medicinal plant.

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Abstract

India as a developing country where primary healthcare is commonly carried out with the help of traditional knowledge. *Chamaecostus cuspidatus* known by synonyms as *Costus igneus* Nak and *Costus pictus* D. Don. It is a medicinal herb which is traditionally well known for its medicinal uses and health benefits over prevention and treatment of multiple health problems, the herb is a perennial plant which spreads upright with growth of range of 2-2.5 feet approximately. The herb has tremendous medicinal as well as health benefiting properties. Majorly known for its anti-diabetic effect moreover the herb is also used in food and in treatment of fever, cough, cut burning sensation, vomiting, jaundice, diarrhea etc.

The herb is commonly propagated with the help of seeds, stem cutting and rhizome, where in rhizome is used in commercial propagation. Stem cutting is an alternate method practiced in propagation of the herb and it takes approximately 120 days to propagate, micropropagation is carried out in-vitro with the help of culture media section of nodal part for shoot propagation. Therefore, looking towards the complications in regular propagation and micropropagation method, a simplified artificial method was carried out as it also explores the horticultural aspect of the aimed subject. Where the stem was primarily subjected to evaluate the vegetative propagation also followed by estimating the effect of mycorrhiza (AMF) as a natural source showing symbiotic association.

Keywords :- *Chamaecostus cuspidatus*, Mycorrhiza, Arbuscular Mycorrhizal Fungi (AMF), Artificial method of propagation, Micropropagation, Horticulture.

Marine algal diversity along the Murud Tahasil Coastline

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Abstract

Marine algae play a vital role in coastal ecosystems by supporting primary productivity, maintaining ecological balance, and contributing to marine biodiversity. The marine algal species were collected and documented from 11 locations in the winter month of 2025. Total 11 locations viz. Murud, Vihour, Donde Tarf Nandgaon, Revdanda, Bhandarwada Murud, Turumbadi, Barashiv, Rajapuri Dongri, and Karle, representing diverse coastal habitats within the region. Among the 19 recorded marine algal forms, 5 belong to Rhodophyta, 7 to Chlorophyta, and 7 to Phaeophyceae. The documented species reflect the richness and variability of the marine algal flora along the Murud taluka coastline. This study provides baseline data on the occurrence of species in this region. Such baseline inventories are essential for long-term ecological monitoring and for assessing potential changes in algal diversity arising from environmental variation, coastal activities, or anthropogenic influences. Additionally, the documented species may serve as valuable biological resources for future studies related to ecological functioning, conservation planning, and sustainable utilization. Overall, this work contributes to strengthening the understanding of marine algal diversity along the Maharashtra coast and highlights the importance of continued documentation of coastal bioresources.

Keywords: Marine algal diversity, Coastal ecosystems, Rhodophyta, Chlorophyta, Phaeophyceae.

Green Synthesis of Benzimidazole Derivatise Using iron catalyst by Sonication approach

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Abstract

Green synthesis has emerged as an essential strategy in modern organic chemistry to minimize environmental impact while enhancing reaction efficiency. Benzimidazole derivatives are an important class of heterocyclic compounds exhibiting a wide range of biological and pharmaceutical activities, including antimicrobial, anticancer, antiviral, and anti-inflammatory properties. Conventional methods for benzimidazole synthesis often involve harsh reaction conditions, toxic solvents, expensive catalysts, and prolonged reaction times, which are not aligned with the principles of green chemistry. This overview highlights recent advances in the green synthesis of benzimidazole derivatives using iron-based catalysts combined with a sonication (ultrasound-assisted) approach. Iron, being earth-abundant, non-toxic, inexpensive, and environmentally benign, serves as an efficient green catalyst promoting high yields and selectivity. The application of ultrasound irradiation further enhances reaction rates through acoustic cavitation, leading to improved mass transfer, reduced energy consumption, and shorter reaction times under mild conditions. The synergistic effect of iron catalysis and sonication enables solvent-free or aqueous reaction systems, excellent atom economy, and minimal waste generation. This review emphasizes the alignment of these methodologies with the core principles of green chemistry and discusses their potential applications in sustainable pharmaceutical synthesis. Overall, iron-catalyzed ultrasound-assisted protocols offer a promising, eco-friendly alternative for the efficient synthesis of benzimidazole derivatives.

Mudskipper: As Biological indicator of Pollution at Coastal Waters

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ABSTRACT

Mudskippers are important for biological and ecological studies and recognized as potential bio indicator in environmental monitoring and assessments of coastal waters and intertidal system. Mudskipper are very much sensitive to ambient environment so this potential would be beneficial for new researches on this species specially in detecting pollution levels in coastal water ecosystems. Regular discharge of pollutant have negative effect on flora and fauna of coastal ecosystem especially mangrove ecosystem and mudflats.

Abundance and distribution of mudskippers on land as well as in coastal waters could be considered as a direct indicator of habitat health. Protecting and improving the state of coastal waters and mangrove forests ecosystems which are the natural habitat for mudskippers, mudskipper populations can be protected. Controlling garbage, untreated waste waters, pollutants, nutrients directly into the coastal waters will definitely help in protecting mudskippers. The review contains an update on our knowledge of mudskipper species and its related research fields in special reference to their potential use as an ecological indicator in coastal waters. The study was conducted in November-January 2024, with 2 observation creek coast, the data results shows that distribution of species and individuals were slightly different in each community. The contents of this review will lead to new researches, methodologies, discussions and efforts to overcome the global problem of coastal water pollution and degradation of coastal ecosystems.

Determination of thermodynamic parameters of transition metal complexes prepared from histidine derivative in ethanol-water system

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Abstract

The Determination of stability constant of the complexes formed by derivative of histidine, 2-[(4-Hydroxy-3-methoxy-benzylidene)-amino]-3-(1H-indol-3-yl)-proponic acid (HMBAlA)[1]. Its complexes are formed with transition metal ions chlorides and nitrates Zr (II), Nb (III), Mo (III), Pb (II) at the temperatures 298K, 303K, 308K, 313K [2] at constant ionic strength 0.1 M of KNO₃ in 50% ethanol-water mixture [3] by adopting pH metric technique has been studied by Calvin - Bejrrum method method. The thermodynamic parameters ΔG , ΔH and ΔS were calculated from values of stability constant at different temperatures. The formations of metal complexes were found to be spontaneous and exothermic nature [4] Key word: - Potentiometry, amino acid- histidine derivative, Stability constant of metal complexes, ionic strength, thermodynamic parameters.

Solute-Solvent Intercations of D(+)-Raffinose Pentahydrate In Aqueous Sodium Saccharin At $T = 298.15$ K.

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Abstract

Using a volumetric approach, solute-solvent interactions were investigated in terms of temperature and different concentrations. The densities of D-(+)-raffinose pentahydrate in H₂O and in aqueous sodium saccharin with molality, $m = (0.05, 0.15, \text{ and } 0.3) \text{ mol} \cdot \text{kg}^{-1}$ were determined at $T = 298.15$ K. The apparent molar volumes (V_ϕ), partial molar volumes (V_ϕ^0), and Masson's coefficient (S_v) were evaluated by means of experimental density (ρ) values. The data was further analyzed in terms of transfer characteristics ($\Delta_{trS}V_\phi^0$), apparent specific volumes (ASV), and volumetric interaction coefficients (V_{AB}, V_{ABB} using McMillan–Mayer theory). The significant interactions between the hydrophilic group of solutes (D-(+)-raffinose pentahydrate) and the Na⁺ ion of co-solute (saccharin sodium at varied concentrations have been reported. Studied saccharide was found to have a sweet taste in mixed aqueous sodium saccharin.

Keywords: D(+)-Raffinose pentahydrate, Density, Sodium saccharin, Partial molar volume, Apparent specific volume.

Oxazole-Based Heterocycles: Evolution of Synthetic Strategies and Emerging Roles in Medicinal Chemistry**Pritam Avinash Shete^{1*}***^{1*}Research Scholar, Gokhale Education Society H.P.T. Arts and R.Y.K. Science College, Nashik.***Abstract**

The oxazole nucleus, characterised by its unique 1,3-heteroatomic arrangement, continues to serve as a pivotal structural determinant in the architecture of modern pharmacophores. This review provides a high-level critical appraisal of the oxazole scaffold, documenting the profound evolution from classical cyclodehydration protocols such as the Robinson-Gabriel and Fischer syntheses toward contemporary, atom-economical catalytic paradigms. We specifically examine the recent integration of transition-metal-mediated C-H functionalization, visible-light-driven photoredox cycles, and multicomponent assembly techniques, which have revolutionised the regioselective construction of these heterocycles. Moving beyond synthetic utility, the discussion shifts to the expanding roles of oxazoles in medicinal chemistry. We highlight their strategic utility as bioisosteres, capable of fine-tuning metabolic stability and modulating the physicochemical properties of drug candidates. Emphasis is placed on their broad-spectrum pharmacological profiles, ranging from potent antimicrobial and anti-inflammatory activities to sophisticated roles as tubulin polymerisation inhibitors and kinase modulators in oncology. This review bridges the gap between innovative synthetic methodologies and detailed structure-activity relationship (SAR) analyses, providing a framework for the rational design of future clinical candidates. Ultimately, the work underscores the enduring relevance of the oxazole core as it adapts to meet the rigorous demands of precision drug discovery and the therapeutic challenges of the post-genomic era.

Keywords: Oxazole synthesis, Medicinal chemistry, C-H functionalization, Structure-activity relationship (SAR), Bioisosterism

Musli Pak Improves Sperm Production and Testicular Steroidogenic Activity in Parkes Strain Male Mice

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Abstract:

Male infertility, characterized by reduced sperm count, poor sperm quality, and impaired testosterone production, is often influenced by stress, lifestyle, and psychological factors. There are chemically-derived medications available against male infertility; but these medications are known to induce certain side effects. On the other hand, Musli Pak is an Ayurvedic herbal medicine, mainly containing Safed Musli (*Chlorophytum borivilianum*) and other ingredients like clove, almond, Kaunch beej, etc. traditionally used to treat male infertility. However, scientific studies on its aphrodisiac and fertility-enhancing properties remain limited. In this study, male mice were divided into four groups: a cow-milk control group and Musli Pak-treated groups (50, 100, and 200 mg/kg BW) administered orally for 35 days. Spermatogenesis, steroidogenic potential, and reproductive tissue histology were evaluated. Musli Pak improved sperm parameters, increased testicular daily sperm production (TDSP), reduced abnormalities, and enhanced 3 β - and 17 β -hydroxysteroid dehydrogenase (HSD) expression. In conclusion, Musli Pak markedly improved reproductive organs in Parkes male mice. These results indicate the need for further in situ and clinical studies to evaluate Musli Pak as a treatment for male infertility.

Keywords: Musli Pak, Sperm functions, 3 β & 17 β -HSD

Assessment of Carbon Sequestration Potential of Trees in and around College Campus

Shreya Patil

Veer Wajekar Arts, Science And Commerce College Phunde

Abstract:

Coastal and intertidal ecosystems support a rich diversity of benthic organisms, among which crabs and shellfish play a vital ecological role in nutrient cycling, food-web dynamics, and shoreline stabilization. The present study aims to assess the abundance and seasonal distribution of crabs and shellfish along the intertidal region of the west coast of India, with special reference to seasonal variations influenced by environmental factors. Monthly field surveys were conducted over different seasons to record species composition, abundance, and distribution patterns of crabs and shellfish. The study also examined the influence of abiotic parameters such as temperature, salinity, sediment texture, tidal regime, and food availability on their distribution. Results indicated significant seasonal fluctuations in abundance, with higher diversity and density observed during post-monsoon and winter seasons, likely due to favorable environmental conditions and post-monsoon recruitment. The findings highlight the strong influence of monsoonal patterns on coastal benthic communities. This study contributes to a better understanding of the ecological dynamics of crabs and shellfish and provides baseline information useful for biodiversity conservation, ecosystem health assessment, and sustainable coastal resource management.

Optimization of media for the growth of *Serratia marcescens* for pigment production

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Abstract:

Optimizing media is not about making bacteria stronger- it is about making their biology visible, consistent and interpretable for whatever questions you are trying to answer. Prodigiosin is a natural, water-insoluble, bright red pigment primarily produced by the bacterium *Serratia marcescens* as a secondary metabolite. Prodigiosin produced by *Serratia* is a promising drug due to its reported characteristics of having antibacterial activity, anticancer potential (it induces apoptosis in some tumor cells) antifungal effects and immunosuppressive properties like T-cell inhibition. Because of this it is been explored in Drug discovery, cancer research and immunology. *Serratia* is mainly used in medicine, research, biotechnology, agriculture and advanced material studies, with strong potential.

Serratia is a genus of Gram negative, rod shaped bacteria, commonly found in soil, water and the human gut. It is known for causing the infections especially in hospital settings, often linked to antibiotic resistance and forming red pigment. *Serratia marcescens*, are considered as opportunistic pathogens. They only cause serious infections in immunocompromised patients. The bacteria produce pigment for their defensive protection and for the improved survival in their environment. As organism is potent in pigment production, the wheat flour as a substrate is used for standardization of media. The study emphasize that the Gluten Agar media supplemented with wheat flour giving positive result, which would shows best results. Which would enhance the higher production of pigment yield.

Keywords: *Serratia marcescens*, prodigiosin, media optimization, wheat flour, gluten

Socio economic survey of various agrochemicals leading to pollution of Bhima River water

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Abstract

This study presents an Environmental Impact Assessment of the Bhima River flowing through Khed Tahsil of Pune District with a focus on its water quality and associated socio-economic implications. Ten strategically selected sampling stations viz. Wada, Chas, Saygaon, Padali, Kolpewadi, Donde, ETP Plant, HRM College, Retawadi, and Sangamwadi. The investigation evaluates the influence of anthropogenic activities i.e. particularly agricultural intensification, domestic sewage discharge, industrial effluents, and altered hydrological regimes on the ecological health of the river. Ten strategically selected sampling stations along the Bhima River were monitored to assess spatial variation in human pressures.

A socio-economic survey was conducted using structured questionnaires among residents and farming communities to document the extent of agrochemical usage and domestic practices affecting to river pollution. The survey revealed widespread reliance on insecticides, pesticides, sulfur-based compounds, phosphate fertilizers, and other agrochemicals, alongside untreated sewage disposal and industrial effluent release. Respondents highlighted both the economic necessity of these inputs and the growing awareness of their adverse impacts on water quality, aquatic biodiversity, and public health. The findings provide baseline evidence of how livelihood practices and agricultural intensification are directly linked to the deterioration of the Bhima River ecosystem.

The study underscores the need for integrated river basin management, improved sewage treatment infrastructure, sustainable agricultural practices, and community participation to restore and conserve the Bhima River ecosystem while safeguarding local livelihoods.

Keywords: Bhima River; Water quality assessment; socioeconomic parameters; Biological indicators; Aquatic; River pollution.

Synthetic Approaches of Benzimidazole Derivatives: A Comprehensive Review

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Abstract

Benzimidazole represents a privileged heterocyclic scaffold that has attracted significant attention in medicinal chemistry due to its wide range of therapeutic applications. Structural modification of the benzimidazole nucleus has led to the development of several clinically important drugs, including albendazole, pantoprazole, astemizole, telmisartan, thiabendazole, and benomyl. In view of the broad pharmacological potential of this moiety, continuous efforts are being made to design and develop novel, efficient, and sustainable synthetic methodologies for benzimidazole derivatives. The present review focuses exclusively on recent advances in the synthesis of benzimidazole derivatives, with particular emphasis on environmentally benign and green chemistry-oriented approaches. A comprehensive literature survey was conducted using scientific databases such as ScienceDirect, Semantic Scholar, Scopus, PubMed, and Google Scholar. The collected studies reveal that benzimidazoles can be synthesized efficiently using green solvents, recyclable catalysts, solvent-free conditions, and alternative energy sources, resulting in improved yields and reduced reaction times. Various starting materials, including *o*-phenylenediamines, 2-nitroanilines, anilines, *o*-anilinic amidines, and *o*-aminoaryl ketones, have been successfully employed for benzimidazole construction. This review aims to provide valuable insights and practical guidance for researchers engaged in the eco-friendly and convenient synthesis of benzimidazole-based compounds.

Keywords: Benzimidazole; Green synthesis; *o*-Phenylenediamines; Aromatic aldehydes; Eco-friendly methodologies; Heterocyclic chemistry

Phytochemical Chemical Activity of the Euphorbiaceous Family Plants from Kokan Region

Namdev B Pawar

Associate Professor and Head Department of Botany Veer Wajekar ASC College
Phunde

Abstract

Medicinal plants of the family *Euphorbiaceae* are well known for their rich phytochemical diversity and therapeutic potential. The Konkan region of Maharashtra harbors several rare and underexplored Euphorbiaceous plant species that are traditionally used in folk medicine. In view of the increasing demand for plant-based pharmaceuticals and the emergence of new diseases, the present study was undertaken to qualitatively analyze the phytochemical constituents present in the leaf extracts of selected rare Euphorbiaceae medicinal plants from the Konkan area. Fresh leaves were collected from their natural habitats, thoroughly washed, shade-dried, and powdered. Ethanolic extracts were prepared using Soxhlet extraction. Standard qualitative phytochemical screening methods were employed to detect the presence of alkaloids, flavonoids, steroids, tannins, saponins, and terpenoids. The results revealed the presence of alkaloids, steroids, tannins, and saponins in all the studied plant species, indicating their potential medicinal value. Flavonoids were present in most species, while terpenoids were absent. The study highlights the pharmacological significance of rare Euphorbiaceae plants from the Konkan region and emphasizes the need for their conservation and further phytochemical and pharmacological investigations.

Keywords : Medicinal plant, pharmacological

Shoreline litter (Marine debris) survey in Panvel Creek, Navi Mumbai, Maharashtra

Nalanda Waghmare

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Abstract

Marine debris, particularly shoreline litter, has emerged as a major environmental concern affecting coastal and estuarine ecosystems worldwide. Rapid urbanization, population growth, and inadequate waste management have significantly increased the input of solid waste into marine environments, especially in developing countries like India. Panvel Creek, a tidal creek in Navi Mumbai, Maharashtra, is highly influenced by anthropogenic activities such as domestic waste disposal, fishing operations, industrial growth, and urban runoff, making it vulnerable to shoreline litter accumulation. The present study aims to conduct a systematic shoreline litter (marine debris) survey along selected stretches of Panvel Creek to assess the abundance, composition, and spatial distribution of debris. Standardized transect-based survey methods will be employed to quantify litter density and classify debris into major material categories, with particular emphasis on plastic waste. The study will also evaluate the influence of human activities, tidal action, and mangrove ecosystems on litter accumulation and retention. The expected outcomes include the generation of baseline data on shoreline litter in Panvel Creek, identification of dominant debris types and pollution hotspots, and insight into the primary sources of marine debris. The findings will contribute to improved understanding of land-based pollution pathways and provide scientific support for local environmental management, conservation planning, and public awareness initiatives aimed at reducing marine pollution in the Panvel Creek region.

Assessment of Microplastic Contamination in Shore Sand of Uran Coast, Maharashtra, India

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I/C Principal and Head Department of Zoology Veer Wajekar ASC College Phunde

Abstract

Microplastic pollution has emerged as a critical environmental issue affecting coastal ecosystems worldwide. Shore sand serves as a major sink for microplastics and reflects inputs from both terrestrial and marine sources. The present study evaluates the occurrence, abundance, and characteristics of microplastics in shore sand from the Uran coast, a rapidly developing coastal region along the Maharashtra shoreline, India. Sand samples were collected from selected intertidal zones using standardized sampling protocols. The samples were subjected to drying, sieving, and density separation followed by visual sorting under a stereomicroscope to isolate suspected microplastic particles. The extracted particles were categorized according to size, shape (fibres, fragments, films, and pellets), and colour. Selected particles were further confirmed using spectroscopic techniques for polymer identification where applicable.

The results indicate a widespread distribution of microplastics in shore sand, with fibres representing the most dominant category, followed by fragments and films. The predominance of fibres suggests substantial anthropogenic inputs, likely originating from fishing activities, domestic wastewater, urban runoff, and tourism-related activities. The findings demonstrate that the Uran coastal environment is significantly impacted by microplastic contamination. This study provides baseline data for the region and underscores the urgent need for regular monitoring programs, improved waste management practices, and public awareness initiatives to reduce plastic inputs into coastal ecosystems.

Diversity and Nitrogen Fixing Potential of Heterocystous Cyanobacteria from Chhatrapati Sambhajinagar, Maharashtra, India

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Abstract

Cyanobacteria (blue-green algae) are ecologically important microorganisms capable of fixing atmospheric nitrogen, leads to enhancing soil fertility. This study deals with exploration of potential nitrogen fixing cyanobacteria from various habitats of Chhatrapati Sambhajinagar, Maharashtra, India. A total of 70 cyanobacterial isolates were collected, identified and cultured in aseptic condition. Total nitrogen content was estimated using Kjeldahl method. Among the 70 isolates considerable variation (Minimum and maximum) in the nitrogen content was observed. The nitrogen percentage (N%) ranged from low 0.02% to high 1.99% values, with certain isolates demonstrating notably higher N%, suggesting their potential as biofertilizers. taxonomically all the members belongs to order *Nostocales*, with representation from families Nostocaceae (*Aliinostoc*, *Anabaena*, *Aphanizomenon*, *Desmonostoc*, *Nostoc*), Cyndrospermaceae (*Cylindrospermum*), Rivulariaceae (*Calothrix*), and Scytonemataceae (*Scytonema*, *Scytonematopsis*, *Tolypothrix*).

Keywords: Cyanobacteria, Nostocales, Heterocystous, Soil fertility, Cyano-diversity

Chemical Reduction of 9,10-Anthraquinone: A Route to Anthracene

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Abstract

Anthracene and anthracene derivatives have been extensively studied over the years because of their interesting photophysical, photochemical, and biological properties. They are currently the subject of research in several areas, which investigate their use in the biological field and their application in OLEDs, OFETs, polymeric materials, solar cells, and many other organic materials. Their synthesis remains challenging, but some important preparative methods have been reported, especially in the last decade. This review presents an update of the recent strategies that have been employed to prepare anthracene derivatives. It encompasses papers published over the last twelve years (2008–2020) and focuses on direct and indirect methods to construct anthracene and anthraquinone frameworks.

The preparation of anthracene from 9,10-anthraquinone involves a catalytic reduction process, where the quinone is reduced to anthracene through the use of reducing agents. A common method is the catalytic hydrogenation or the use of metal-based reducing agents like iron (Fe) or zinc (Zn) in the presence of an acid. In this reaction, 9,10-anthraquinone undergoes reduction of its carbonyl groups to form the corresponding hydrocarbon, anthracene. The process requires careful control of temperature and reaction time to ensure complete reduction and the formation of pure anthracene. This transformation is often carried out in a solvent like ethanol or another appropriate medium to aid in the dissolution and proper reaction of the reactants. The product is then isolated, typically by recrystallization, to obtain anthracene in high purity.

The preparation of anthracene from 9,10-anthraquinone typically involves a reduction reaction. The reduction of 9,10-anthraquinone to anthracene is commonly achieved through catalytic hydrogenation or chemical reducing agents like zinc or sodium in the presence of an alcohol.

Keyword: Reduction, Anthracene, 9,10-anthraquinone, Zinc, Iron, OLEDs, OFETs, polymeric materials, solar cells

Formulation Of The Immunity Booster Chocolates By Using Moringa (Moringa Oleifera) Leaf Powder.

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(Empowered Autonomous), New Panvel.

ABSTRACT: Moringa (*Moringa oleifera*) belongs to the family Moringaceae. *M. oleifera* is an excellent source of beneficial compounds for the human diet, such as proteins, vitamins, and phytonutrients such as polyphenols, carotenoids and tocopherols. It is rich in minerals like calcium, potassium, zinc, magnesium, iron and copper. Adding Moringa powder to chocolate provides an easy way to enhance its nutritional value while keeping it enjoyable. Successfully formulated the chocolates with different quantity of Moringa leaf powder. The acceptability scores were calculated based on a number of sensory factors, including color, flavor, texture, appearance, and overall acceptance using nine-point hedonic scale. Sensory evaluation indicated that the 10g formulation offered the best balance of flavour, texture, colour, and overall acceptance, making it the most suitable concentration for Moringa-enriched chocolates. Physiochemical analysis was done for Moringa chocolate to check the amount of protein, fat, energy, Fiber, and carbohydrates which indicates the presence of different biomolecules present in Moringa chocolate.

Keywords: Moringa, Immunity, Chocolate

Responses of dendritic organs of a catfish *Clarias batrachus* following long term exposure of arsenic salt: A biomarker-based study

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Abstract

Dendritic organs of *Clarias batrachus* are the important accessory respiratory organs adopted for aerial respiration when the fish are under aquatic stress. Dendritic organs are modified gills and remain present on 2nd and 4th gill arches. Being present on gills and suprabranchial chamber, dendritic organs always remain direct touch with external water hence analysed. Live and healthy male and female *C. batrachus* (length 15 ± 1 cm and weight 45 ± 5 g) belonging to single population were exposed to 1 ppm sublethal concentration (1/10th of LC 50 for 96h) of sodium arsenate heptahydrate ($\text{Na}_2\text{HAsO}_4 \cdot 7\text{H}_2\text{O}$) for 90 days. The fish were cold anaesthetized and dendritic organs were isolated and analysed histopathologically and histochemically after different periods of exposure of arsenic stress. Following exposure, blood capillaries of the secondary lamellae of dendritic organs showed extensive congestion followed by wear and tear. The ladder like arrangement of blood channels and supporting pillar cells gets dismantled and haemorrhages regularly took place in the dendritic organs. The density of red blood cells in subepithelial blood vessels of dendritic organs decreased. The staining property and density and area occupancy of mucous cells showed extensive periodic fluctuation showing more affinity for acidic glycoproteins containing sulphate and carboxylic groups. The density and area occupancy of mucous cells however decreased significantly ($p \leq 0.05$; $p \leq 0.01$) at all stages of exposures of arsenic salt.

Key words. Catfish, Arsenic Histopathology, Histochemistry, Dendritic organs

Ethnozoology to Ethnopharmacology: Animal-Derived Remedies in Tribal Healthcare of Nashik, Maharashtra

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Abstract

Traditional zotherapy practices provide an untapped source of pharmacologically active compounds. This study explored the medicinal use of animals among tribal communities of Nashik, Maharashtra. Data were collected from 78 traditional healers using interviews and questionnaires. A total of 27 species were identified for treating 49 ailments, with mammals being most frequently used. Informant Consensus Factor (ICF) and Fidelity Level (FL) revealed high reliability for remedies treating joint pain, asthma, cough, fractures, and cataracts. These findings highlight the potential of ethnozoological knowledge for new pharmaceutical leads and emphasize the need for systematic pharmacological validation and conservation of bioresources

Comparative assessment of vermicompost produced by using cow dung and buffalo dung in dry arid and tribal area of Maharashtra's Palghar District

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2- Karmaveer Bhaurao Patil Mahavidyalaya, Pandharpur, District Solapur 413 304

Abstract

Vermicompost is the great alternative for the chemical fertilizers, on one hand it assures sustained nutrient supply to the crops and on other hand it avoids risk of side effects of chemical fertilizers that otherwise would appear profoundly. During present investigation vermicompost is produced by using economically important suitable species of earthworm i.e. *Eudrilus eugeniae*. Two vermibeds are used, in one vermibed buffalo dung is used while in another vermibed cow dung is used as a source of food for earthworms. Observations of three consecutive sets of both vermibeds are recorded and are presented in this article. Nutrients including nitrogen, phosphorus and potassium are found to be slightly greater in vermicompost produced by using cow dung. While micronutrients like magnesium, iron, zinc, boron, copper, sulphur are also found to be slightly greater in vermicompost produced by using cow dung. Results are discussed with recent literature.

Keywords: Vermicompost, Cow dung, Buffalo dung, Nutrients

“Design and Synthesis of a Triazine–Coumarin Thiazole Schiff Base for Selective Colorimetric Detection of Al (III) Ions”

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Abstract

In the present study, a novel colorimetric probe based on a triazine–Coumarin Thiazole Schiff base ligand (SBL) was successfully designed and synthesized through a simple condensation reaction. The integration of a triazine framework with a Coumarin Thiazole chromophore provides strong metal coordination capability along with an enhanced optical response arising from intramolecular charge transfer (ICT), enabling selective recognition of Al³⁺ ions. UV–Visible absorption studies carried out in ethanol demonstrated excellent selectivity toward Al³⁺, accompanied by an immediate visible color change and a significant bathochromic shift of 54 nm, resulting in the appearance of a new absorption band at 570 nm.

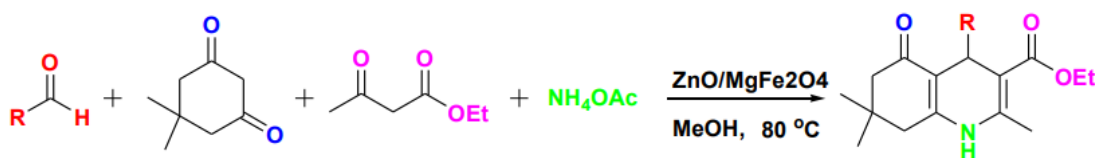
Titration experiments performed with increasing concentrations of Al³⁺ ions (0–100 equivalents) exhibited a distinct isosbestic point at 570 nm, indicating clean and well-defined complex formation between the ligand and the metal ion. The binding constant was determined to be $2.91 \times 10^4 \text{ M}^{-1}$, confirming strong interaction and high binding affinity of the probe toward Al³⁺ ions. Furthermore, Job’s plot analysis revealed a 1:1 binding stoichiometry between the ligand and Al³⁺.

The sensing mechanism is attributed to coordination-induced electronic redistribution within the triazine–Coumarin Thiazole framework, leading to pronounced spectral changes. Overall, the developed probe acts as an efficient, selective, and switchable colorimetric chemosensor for Al³⁺ detection, demonstrating promising potential for environmental monitoring and analytical applications.

“ZnO/MgFe₂O₄ as an Efficient and Reusable Catalyst for the Synthesis of Biologically Active 1,4-Dihydropyridines”**Dipak R. Tope**Department of Chemistry, RNC Arts, JDB Commerce and NSC Science College,
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Abstract:

A simple and efficient one-pot synthetic protocol has been developed for the preparation of 1,4-dihydropyridine derivatives using a reusable ZnO/MgFe₂O₄ solid catalyst. The synthesis involves a multicomponent condensation reaction of dimedone, ethyl acetoacetate, various aldehydes, and ammonium acetate in methanol as the reaction medium at room temperature. The developed methodology proceeds smoothly under mild reaction conditions, affording the desired 1,4-dihydropyridine derivatives in excellent yields of up to 94%. This protocol offers several significant advantages, including operational simplicity, mild reaction conditions, short reaction time, and high product purity with excellent yields. The heterogeneous ZnO/MgFe₂O₄ catalyst can be easily separated from the reaction mixture and reused multiple times without significant loss of catalytic activity, demonstrating its stability and practical applicability. Furthermore, the recyclability of the catalyst and the use of mild reaction conditions make this method environmentally benign and suitable for sustainable organic synthesis.

**Synthesis of 1,4-Dihydropyridine derivatives using ZnO/MgFe₂O₄ catalyst**

Keywords: Multicomponent reaction, 1,4-dihydropyridine, ZnO/MgFe₂O₄, Recyclable catalyst

To study structural, elastic & magnetic properties of green synthesized zinc ferrite using lemon juice as reducing agent

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Abstract

Nanocrystalline zinc ferrite is green synthesized using lemon juice as reducing agent. XRD confirmed single phase spinel structure of nanocrystalline zinc ferrite with crystalline size of 42 nm with lattice parameter 8.44°A . FTIR confirmed tetrahedral & octahedral groups present in the synthesized material. SEM analysis indicates polycrystalline, agglomerated structure of synthesized zinc ferrite. Saturation magnetization, coercivity are determined using VSM technique. Calculated elastic properties shows its ductile nature of the zinc ferrite.

Effect Of Organic Fertilizer On Soil Health Of Rahata Tehsil.

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Impact of organic fertilizer on soil health in agricultural fields with particular emphasis on its contribution to sustainable farming practices. The primary aim of the study was to assess variations in soil quality resulting from the application of organic manure. To achieve this, soil samples were systematically collected from selected farmlands both prior to and following organic fertilizer application and were evaluated using standard soil testing procedures.

The findings revealed a noticeable enhancement in soil health after the use of organic fertilizer. Post-application analysis showed that the soil condition became more stable and suitable for crop cultivation, indicating improved nutrient availability and increased biological activity. These improvements demonstrate better soil fertility, enhanced structure, and overall soil functionality.

The study concludes that organic fertilizer application significantly supports soil health maintenance and is a key factor in advancing sustainable agricultural systems. Continuous and regular use of organic manure can help sustain long-term soil productivity while also promoting environmental conservation.

Keywords: Healthy growth, Soil analysis.

