AMITY UNIVERSITY
MADHYA PRADESH

CENTRE OF EXCELLENCE FOR ENVIRONMENTAL CONSERVATION & BIODIVERSITY

ACTIVITY REPORT

2024-2025

Amity University Madhya Pradesh, Maharajpura Gwalior

(M.P.) – 474005, India

Tel No. 91- 751 - 2496021, Fax No. 91-751- 2496023

E-mail:info@gwa.amity.edu

Website: www.amity.edu/Gwalior

Composition

Chairperson

- **Dr. Kuldip Dwivedi, Professor & HOD, Environmental Science**

Members

- **Dr. Swapnil Rai, Professor, Environmental Science**
- **Dr. Rwitabrata Mallick, Associate Professor, Environmental Science**
- **Dr. Nidhi Shukla, Assistant Professor, Environmental Science**
- **Dr. Abhishek Kumar Bhardwaj, Assistant Professor, Environmental Science**

Vision / Purpose

- The Centre is established to promote conservation and sustainable use of natural resources, aiming for a better environment and a better quality of life.
- It seeks to assess, preserve, and manage biodiversity and environmental health, contributing to long-term ecological sustainability.

Mission

- Conduct research in biodiversity analysis, ecosystem analysis, environmental pollution monitoring, environmental microbiology, bioremediation, and eco-friendly product development.
- Monitor environmental pollution, identify harmful synthetic compounds, and develop alternate remediation or eco-friendly techniques.
- Assess and conserve biodiversity — both flora and fauna — of the region/state.
- Promote sustainable use of natural resources.
- Undertake funded projects (from government agencies or industry) related to environmental sustainability and conservation.

Objectives

- Monitoring of Environmental Pollution and Development of Alternatives Measures.
- Identification and Investigations of Harmful Synthetic Compounds in Environment and Remedial Measures
- Assessment and Conservation of Biodiversity
- Eco-friendly Product Development
- Enhancing awareness through various activities

Focus area(s) for Research

- Biodiversity Analysis
- Ecosystem Analysis
- Environmental Pollution
- Environmental Microbiology
- Bioremediation
- Heavy Metal Pollution
- Environmental Nanotechnology

Projects:

- Bioaugmentation of Crude Oil Using Bacteria and Fungus Isolates from the Oil Spilled Contaminated Sites

  Funding Agency: Madhya Pradesh Council of Science and Technology (MPCST), Bhopal.

PI: Prof. (Dr.) Kuldip Dwivedi

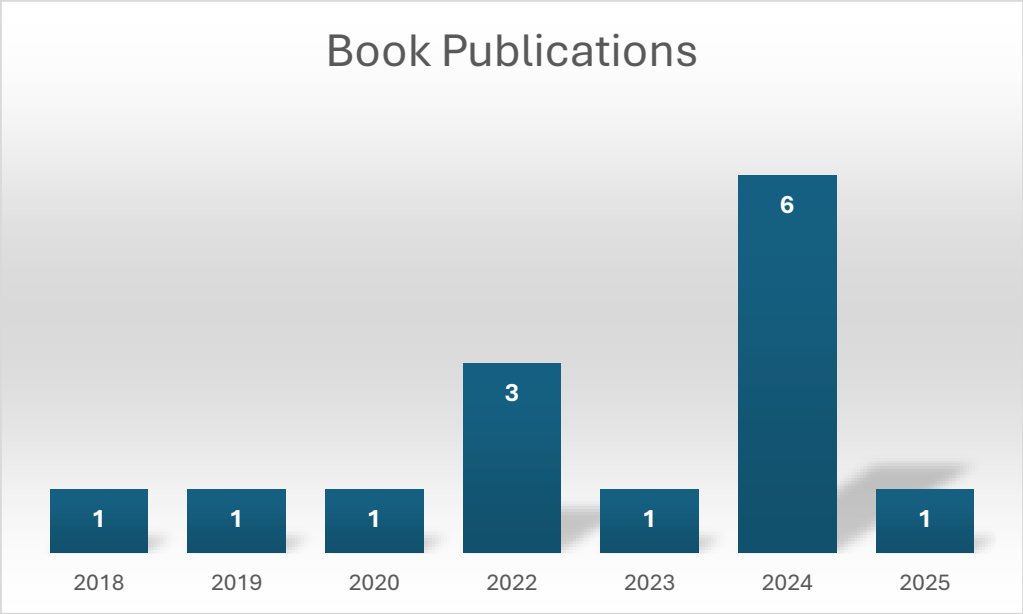
Amount: Rs. 7.10 Lakh

Publications

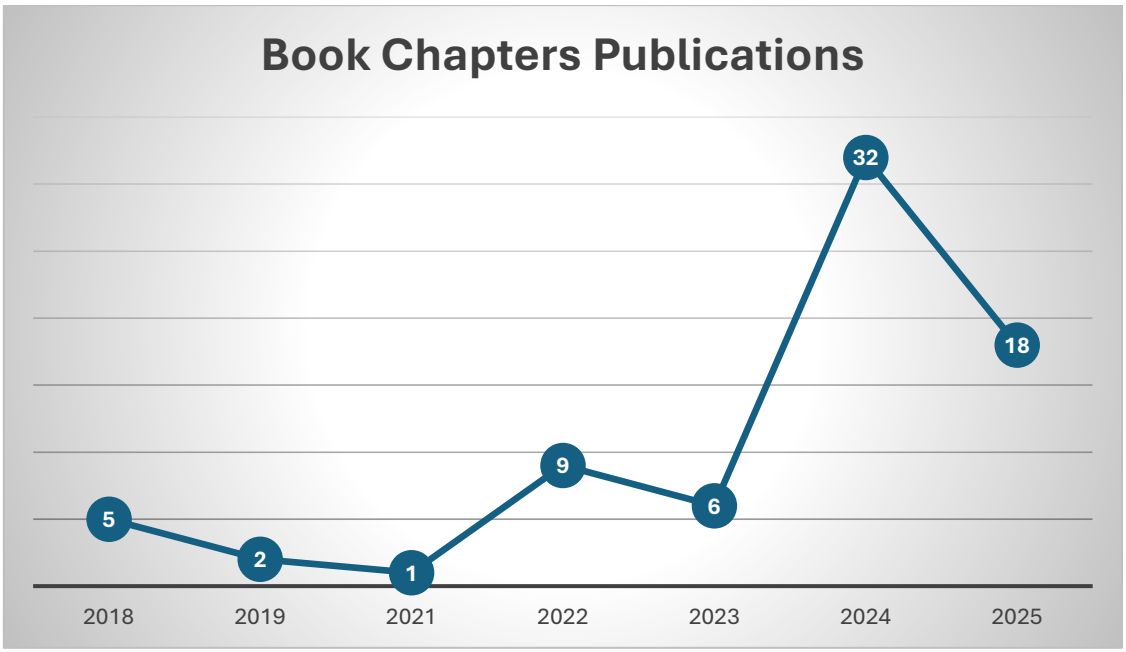
Type of Publication	SCI	Scopus	WOS	Other Indexed/Peer Reviewed
Research Paper	**3**	**23**	**4**	**17**
Books		**3**		**2**
Book Chapters		**18**		**4**

Research Papers

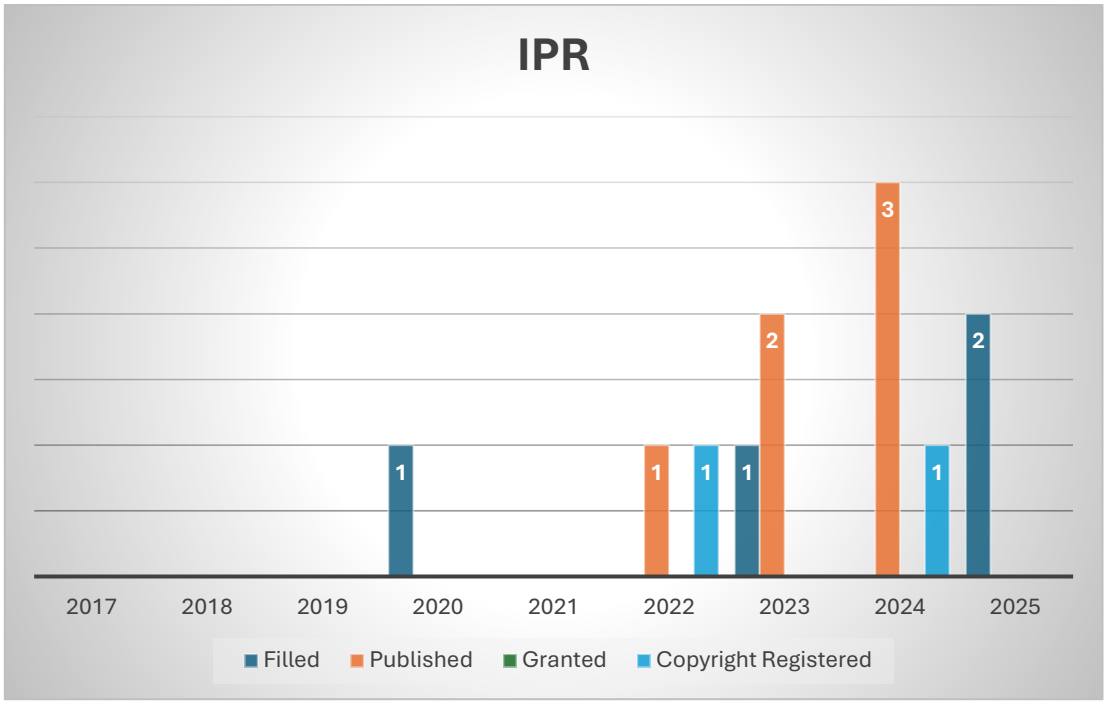
Book Published by Faculty members of COE



Book Chapters Published by Faculty members of COE



IPR (Patent/Copyrights)



Details of Patents Filed

Sr. No.	Institute	Name of Inventors	Title	National International	Application No.	Patent Filing Date	Status
1	**ASFDT & ASLS**	Dr. Shweta Singh, Mr. Vishal Kumar (Training Specialist) and Dr. Kuldip Dwivedi	Fiber Extraction from Washingtonia Palm Leaves	National	ACN1405	2-Jun-2025	Filed
2	**ASLS-EVS**	Shweta Singh, Vishal Kumar, Kuldip Dwivedi	Eco-Friendly Fiber Composition and Extraction Method for Textile Applications	National	202521067498	15-Jul-2025	Filed

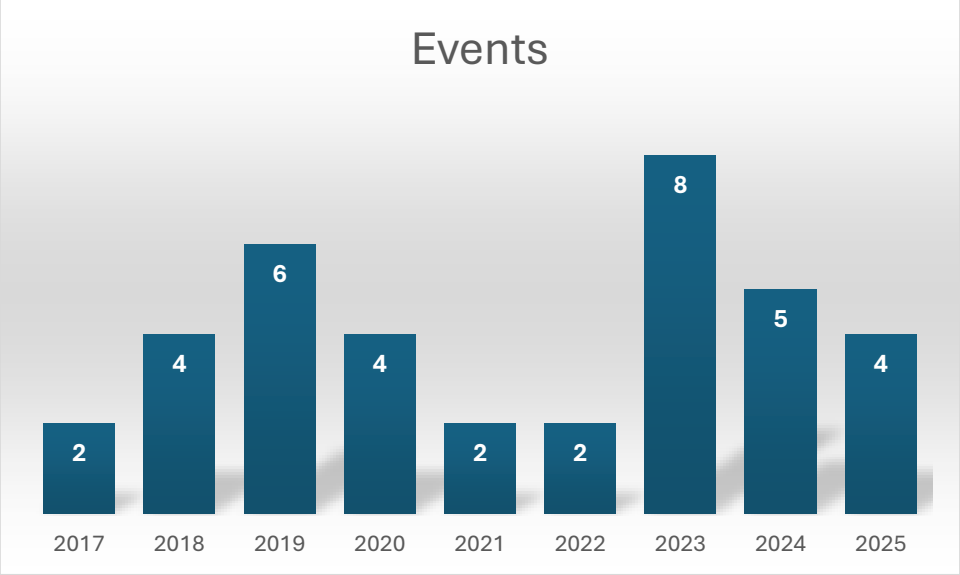
Details of Patents Published

Sr. No.	Institute	Name of Inventors	Title	National International	Application No.	Patent Filing Date	Patent Published Date
1	**ASET & EVS**	Dr. Mohan Kantharia, Dr. Pankaj Kumar Mishra, Dr. Snehal Chandrasekhar Jani, Dr. Swapnil Rai	Composition for Cement Mortar Using Nano Polymer Matrix and Method Thereof	National	202011053802	10-Dec-2020	21-Oct-2022
2	**ASLS -EVS**	Dr. Gurpreet Singh Matharou, Dr. Ranjit Kumar Saud, Dr.Sujith Kumar S G, Dr. Malvika Chaudhary, Mr. Dwarka, Dr. M. Vinay Kumar, Abhijeet Das, Menda Sreevani, Dr. Gourav Kumar Singh, **Dr. Swapnil Rai** & Mr.J Logeshwaran	Analysis Irrigation System for Real-Time Automation of Agricultural Environment System in India	National	202311080089	24-Nov-2023	29-Dec-2023

3	**ASLS -EVS**	**Dr. Abhishek Kumar Bhardwaj**, Dr. Kuldip Dwivedi, Dr. Amit Kumar Mishra, Kuldeep Singh, Dr. Deepak Motwani, Dr. Kapil Sharma, Dr. Uma Shankar Sharma (RJIT, Gwalior)	A Hybrid and Movable Cremation Furnace System Provided with Monitoring Unit	National	202211067899	25-Nov-2022	31-May-2024
4	**ASLS -EVS**	Dr. Nidhi Shukla	An Integrated Solution for Smart Agriculture Monitoring System	National	202411053627	14-Jul-2024	26-Jul-2024
5	**ASLS -EVS**	Dr. Ashish Sharma, Dr. Swapnil Rai, Dr. Rwitabrata Mallick, Dr. Amit Kumar Mishra, Dr. Pankaj Kumar Mishra, Dr. Devendra Kumar Mishra, Dr. Nasir Khan, Dr. Falit Goyal, Dr. Archana Sharma	An Augment Reality-Based System for Disabled and Elderly	National	202311042713	26-Jun-2023	27-Dec-2024

Name of Inventors	Title	National International	Patent Granted / Design No.	Patent Filing Date	Patent Granted Date	Type
Dr. Tarannum Vahid Attar, Mr. Manish Kumar Verma, **Dr. Rwitabrata Mallick**, Mr. Aditya Sharma, Dr. Chiranjeeva Rao Seela, Dr. Akanksha Pandey, Mr. Anant Kumar	Portable Biodiesel Reactor	National	397637-001	14-Oct-2023	23-Feb-2024	Indian Design Patent

Events /Activities Organized by Centre of Excellence



Name of the Activities	Number of Participants	Date of the Event
Centre of Excellence for Environmental Conservation & Biodiversity organized International Workshop on Technological Advancement in Renewable Energy: Current scenario, Future Perspectives & Challenges (IWTARE 2024)	200	18-22 March 2024

Centre of Excellence for Environmental Conservation & Biodiversity and Department of Environmental Science, Amity School of Life Science organized One Week Faculty Development Programme on Innovative Approaches in Environmental Research & Sustainability	200	1-7 August 2024
Centre of Excellence for Environmental Conservation & Biodiversity and Department of Environmental Science, Amity School of Life Science organized National Conference on Technological Innovations & Environmental Sustainability (NCTIES 2024)	250	14 November 2024
Centre of Excellence for Environmental Conservation and Biodiversity along with Department of Environmental Science, AUMP under Institution's Innovation Council, organized a Guest Lecture on Role of Youth in Environmental Conservation followed by Tree Plantation of Medicinal Plants at AUMP campus.	250	8th October 2024
COE organized lecture on "National Pollution Control Day" on 14th December under the mandate of Institute Innovation Council (IIC), an initiative of MOE, Govt of India.	120	14 December 2024
The Department of Environmental Science, Eco-Club AUMP, and the Centre of Excellence for Biodiversity & Environmental Conservation, in collaboration with the NSS of AUMP, celebrated World Environment Day 2025 with great enthusiasm.	100	5th June, 2025
International Conference on Sustainable Technologies for Viksit Bharat (ICSTVB 2025)	250	8-9 April 2025
Centre of Excellence for Environmental Conservation and Biodiversity along with Department of Environmental Science, organized a Poster Making Competition as part of the Wildlife Institute of India initiative, 'Amrit Dhara - A Festival of Rivers', under the aegis of the Ministry of Jal Shakti, Government of India.	100	27th February 2025

COE organized Wetland-Mitra Pledge & Lecture on the Significance of Wetland	120	20 January 2025

Outcomes of Events organized by Centre of Excellence

- **Collaborative Project Work with Department of Environmental Science and Engineering, Guru Jambheshwar University of Science and Technology, Hisar, Haryana.**

ANRF Project: Traditional Tribal Knowledge based Ethnobotanical Study in reference to Northwest India for Potential Bioactive Compounds to formulate Nanomaterials for Sustainable Health and Agriculture,
Project submitted with Dr. Santosh Bhukal.
Amount;14,292,460

- **Collaborative Publication with Universidade de Passo Fundo, Brazil.**

Published book: Sustainable Management of Agro-Food Waste
Fundamental Aspects and Practical Applications
1st Edition - November 29, 2024
Academic Press
Editors: Shalini Rai, Abhishek Kumar Bhardwaj, Luciane Colla
Language: English
Paperback ISBN: 9780443236792
eBook ISBN: 9780443236808

- Mr. Chitra Kumar, Ph.D. Scholar of the Department of Environmental Science, Amity University Madhya Pradesh, got an internship of 80 days under Prof. Dr. Ciro Abbud Righi at Escola Superior de Agricultura Luiz de Queiroz da Universidade de São Paulo – USP, Piracicaba, Brazil, with financial support of INR 1,10000/-, travel expenses, plus food & accommodation. He has got training on field data collection, forest inventory assessments, soil sampling, and analysis of physical and chemical soil properties.

OUTCOMES ACHIEVED

Research Paper Publications:

Next Materials

journal homepage: www.sciencedirect.com/journal/next-materials

Research article

Novel synthesis of algae-derived mesoporous magnetic nanomaterial for sustainable removal of Pb and Cr(VI) from synthetic and industrial wastewater

Rishi Mittal [a], Shyamalee Patar [b], Yadvinder Singh [c], Rachna Bhateria [d], Abhishek Kumar Bhardwaj [e], Santosh Bhukal [a,*]

[a] Department of Environmental Science and Engineering, Guru Jambheshwar University of Science and Technology, Hisar, Haryana 125001, India
[b] Department of Chemistry, Gauhati University, Guwahati, Assam 781014, India
[c] Department of Botany, Central University of Punjab, Bathinda, Punjab 151401, India
[d] Department of Environmental Science, Maharshi Dayanand University, Rohtak, Haryana 124001, India
[e] Department of Environmental Science, Amity School of Life Sciences, Amity University, Gwalior, Madhya Pradesh 474001, India

ARTICLE INFO

Keywords:
Green Synthesis
Oscillatoria
Adsorption
Magnetic Nanoparticles
Sustainable Development Goals

ABSTRACT

In this study, mesoporous iron oxide magnetic nanoparticle was fabricated using *Oscillatoria* sp. (OslONP) for the adsorption of Cr(VI) and Pb from aqueous solution and to treat industrial wastewater. The magnetic nanoparticle was characterized using different techniques like XRD, SEM, TEM, XPS, etc. BET analysis revealed their mesoporous nature with a pore diameter of 15.749 nm. From the experimental results the optimum conditions were found to be pH 4, 90 ppm and 50 ppm concentration of Pb and Cr(VI), 0.16 g/L and 0.17 g/L OslONP dosage for Pb and Cr(VI), respectively. The nanomaterial follows the Langmuir adsorption isotherm model better than the Freundlich isotherm model, with an adsorption efficiency of 108.343 mg/g for Cr(VI) and 316.456 mg/g for Pb. The synthesized magnetic adsorbent exhibits high stability and reusability without any considerable changes in the material up to seven cycles. The OslONP is applied to the industrial wastewater collected from a local industrial area in the Rohtak district of Haryana, India and analyzed using excitation-emission fluorescence spectroscopy. From the initial concentrations of 185.117 ppb and 7.122 ppb for Cr(VI) and Pb, the concentrations were reduced to 1.02 ppb and 0.931 ppb, respectively for Cr(VI) and Pb after the adsorptive treatment. The adsorptive treatment showed strong adsorption affinity and efficient purification with 99.45 % removal of Cr(VI) and 86.90 % removal of Pb, indicating high efficiency of the nanoparticle against industrial wastewater treatment. The results showed that OslONP can be effectively used as a low-cost adsorbent for the removal of heavy metals both from synthetic and industrial wastewater.

1. Introduction

Untreated industrial effluent such as dyes, heavy metals, emerging pollutants discharged into rivers affects the physicochemical properties of groundwater and soil [1]. In recent years, the global community has been confronted with a pressing environmental issue, the contamination of water sources by heavy metals [2], especially chromium and lead. Cr (VI), also known as hexavalent chromium, which is easily absorbed by the body, is a highly toxic and carcinogenic element that poses severe health risks to humans [3]. Lead (Pb) is also a highly toxic metal in water which causes severe health issues such as kidney failure, brain damage, effect on gastrointestinal tract, and neurotoxic effects in children [4]. The presence of such heavy metals contaminates the drinking water and is mainly caused by the battery, textile, food processing, electroplating, and automobile manufacturing industries [5]. Hence, it is crucial to remove such hazardous heavy metals from such highly polluted wastewater.

Numerous conventional technologies for the treatment of heavy metal-contaminated water include chemical precipitation, electrocoagulation, oxidation, chemical reduction, and others. But these techniques have some disadvantages, such as high energy consumption, toxicity, and high cost which limit their efficiency in the remediation of

* Corresponding author.
E-mail addresses: rishimittal1996@gmail.com (R. Mittal), shyamaleepatar123@gmail.com (S. Patar), yadbotany@gmail.com (Y. Singh), rachnabhateria@gmail.com (R. Bhateria), bhardwajak87@gmail.com (A.K. Bhardwaj), santoshesegju@gmail.com (S. Bhukal).

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Journal of MATERIALS RESEARCH

Article
DOI:10.1557/s43578-025-01696-3

NEXT-GENERATION NANOMATERIALS FOR BIOMEDICINE AND BIOMEDICAL ENGINEERING

FOCUS ISSUE

Facile synthesis of zinc oxide nanoparticles for skin care applications

Sharad Kumar Tripathi[1,b], Ajay Kumar Tiwari[2,a], Rajesh Kumar[3,a),b)], Abhishek Kumar Bhardwaj[4], Ram Raseele Awasthi[5], Anand Pandey[6], Afifa Qidwai[7], Anupam Dikshit[7]

[1] Department of Life Sciences, Arni University, Kangra, HP 176401, India
[2] Department of Physics, G H Raisoni International Skill Tech University, Pune, MH 411006, India
[3] P.G. Department of Botany, Mahatma Gandhi Govt. Arts College, Mahe, Puducherry 673311, India
[4] Department of Environmental Science, Amity School of Life Sciences, Amity University Madhya Pradesh, Gwalior, MP 474 005, India
[5] Faculty of Engineering and Technology, Khwaja Moinuddin Chishti Language University, Lucknow, UP 226013, India
[6] Department of Botany, AGCW College, Karaikal, Puducherry 609602, India
[7] Department of Botany, Biological Product Laboratory, University of Allahabad, Prayagraj, UP 211002, India
[a)] Address all correspondence to these authors. e-mails: drajayngbv@gmail.com; rajeshdubey.au@gmail.com
[b)] These authors have equally contributed to this work.

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Scientists are focused on creating skincare solutions to combat various factors like pollution, UV rays, and skin infections. In the present investigation, a wet chemical method was employed to synthesize the zinc oxide (ZnO) nanoparticles (NPs). The physicochemical properties of the synthesized material were studied, including X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), and ultraviolet–visible spectroscopy (UV–Vis) techniques. In addition to it, the synthesized material was tested against four pathogens: *Trichophyton mentagrophytes*, *Trichophyton rubrum*, *Microsporum gypseum*, and *Microsporum canis*. The minimal inhibitory concentrations (MICs) of the synthesized material against fungal pathogens were recorded as 0.711, 2.469, 0.786, and 1.789 mg/ml, respectively, which almost effectively suppressed over 80% of their growth. It's worth noting that the properties of nanomaterials can be tailored by adjusting their surface, shape, and size. These findings suggest that ZnO NPs hold promise as effective fungicidal compounds.

Abbreviations

NPs	Nanoparticles
XRD	X-ray diffraction
SEM	Scanning electron microscopy
TEM	Transmission electron microscopy
$ZnCl_2$	Zinc chloride
T. rubrum	*Trichophyton rubrum*
T. mentagrophytes	*Trichophyton mentagrophytes*
M. gypseum	*Microsporum gypseum*
M. conts	*Microsporum cants*
RPMI	Roswell Park Memorial Institute
CLSI	Clinical and Laboratory Standards Institute
SDB	Sabouraud dextrose broth
mg/ml	Milligrams/milliliter
eV	Electron volt
MTCC	Microbial type culture collection and gene bank
MIC	Minimum inhibitory concentration
OD	Optical density
DMSO	Dimethyl sulfoxide

Introduction

The limited research on antifungal agents and the increasing prevalence of antifungal-resistant diseases are creating difficulties in clinical treatments, posing serious threats to both humans and animals. Researchers have reported various lethal strains of fungi like *C. albicans*, *Aspergillus fumigatus*, *Cryptococcus neoformans*, etc. [1]. In general, skin infections are caused by different fungi, including dermatophytes, yeasts, and non-dermatophyte molds. Dermatophytes are a significant concern, as

Waste and Biomass Valorization
https://doi.org/10.1007/s12649-025-03419-5

REVIEW ARTICLE

Recent Advances in Valorizing Agricultural Waste: A Sustainable Approach

Abhishek K. Bhardwaj[1] · Birendra Thakur[1] · Sharad Kumar Tripathi[2] · Marat E. Turabayev[3] · Ali A. Aljulaih[3] · Tamara S. Kharlamova[4] · Sergei A. Kulinich[3,5]

Received: 24 June 2025 / Accepted: 18 November 2025

Abstract
Agricultural practices generate vast quantities of waste materials, including crop residues, husks, bagasse, and by-products from various agro-businesses. Proper management of this waste, guided by the principles of circular bioeconomy, is crucial for maximizing its potential. Scientists are actively exploring ways to transform agricultural waste into valuable products, thereby contributing to a more sustainable future. This review delves into a broad approach to developing valuable substances from agricultural waste. These applications encompass several sectors, including developing alternatives to wood, producing reusable utensils, establishing biorefineries, extracting and separating valuable compounds, and utilizing lignocellulosic residues into valuable products. Furthermore, processes like solid-state fermentation can be stimulated to produce industrial enzymes with applications in the food, pharmaceutical, and environmental sectors. New approaches also include the use of waste to create biofertilizers, closing the loop in the circular economy. In regard to agricultural effluents, the conversion of nutrients into useful biomass, such as microalgae, aligns with current concepts of waste valuation. This approach offers the potential for producing biofuels, animal feed, and nutraceuticals. This review on agrowaste valorization aligns with and contributes to the United Nations Sustainable Development Goal (SDG) 12 by promoting responsible consumption and production patterns. Through the exploration and development of alternative energy sources, conservation of natural resources, waste reduction, circular economy practices, and mitigation of greenhouse gas emissions and pollution, these strategies collectively support progress toward SDGs 7, 12, 13, and 15.

Keywords Agricultural waste · Circular bioeconomy · Bioprocess · Bioenergy · Sustainable efforts

Introduction

The sharply growing global population and increasing demand for agricultural products are leading to a significant escalation in agrowaste. Agricultural waste refers to the by-products generated in large quantities from various agricultural activities [1]. This waste includes a wide range of materials such as crop residues, animal by-products, agro-processing waste, and agro-scraps from households and industries, just to name some. For example, India is known to be the second-largest producer of agro-products, including vegetables, fruits, sugarcane, groundnut, wheat, rice, and cotton. And nearly 20% of the fruits and vegetables produced in it remain unutilized. As a result, India's agro-processing industries are reported to release 1.3 billion tons of waste, thus contributing to a total of around 2.5 billion tons of agricultural waste generated annually [2].

✉ Sergei A. Kulinich
skulinich@tokai-u.jp

1 Department of Environmental Science, Amity School of Life Sciences, Amity University, Gwalior 474005, MP, India

2 Department of Life Sciences, Arni University, Kangra 176401, HP, India

3 Department of Mechanical Engineering, Tokai University, Hiratsuka 259-1292, Kanagawa, Japan

4 Department of Physical and Colloid Chemistry, Tomsk State University, Tomsk 634050, Russia

5 Research Institute of Science and Technology, Tokai University, Hiratsuka 259-1292, Kanagawa, Japan

Published online: 05 December 2025

scientific reports

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OPEN

Green synthesis of TiO_2 nanoparticles using Kinnow peel extracts and their antioxidant properties

Ajay Kumar Tiwari[1], Abhimanyu Kumar Singh[2✉], Saket Jha[3], Sharad Kumar Tripathi[4], Ram Raseele Awasthi[5], Sheo K. Mishra[6], Rudra Prakash Ojha[7], Abhishek Kumar Bhardwaj[8] & Anupam Dikshit[9]

The green synthesis of nanomaterials has drawn researchers from all over the world over the past few decades in a huge surge of interest. The aim of this research was to use Kinnow peel extract to synthesize titanium dioxide (TiO_2) nanoparticles (NPs) in an environmentally friendly and efficient manner. This method seeks to improve antioxidant qualities while using fewer hazardous chemicals in the production of NPs. Using ultraviolet visible (UV–Vis) spectroscopy, the formation of crystalline TiO_2 NPs was first verified by a distinctive absorbance peak at 235 nm. Further characterization was performed using X–ray diffraction (XRD), field emission–scanning electron microscopy (FE-SEM), energy–dispersive X–ray spectroscopy (EDX), transmission electron microscopy (TEM), and Fourier transform infrared (FT–IR) spectroscopy. The antioxidant potentials of the green-synthesized TiO_2 NPs were evaluated using DPPH and FRAP assays. The results demonstrated potent free radical scavenging activity, comparable to ascorbic acid, a well-known standard antioxidant. These findings suggest that TiO_2 NPs possess effective antioxidant properties and highlighting Kinnow peel extract as an eco-friendly sustainable and alternative to conventional synthesis routes. Moreover, the study indicate that the green-synthesized TiO_2 NPs could serve a promising candidate to replace the conventional antioxidant drugs, such as ascorbic acid.

Keywords Kinnow peel extract, Green synthesis, TiO_2 NPs, DPPH, Antioxidant

Nanoparticles (NPs) are defined as materials with at least one dimension in the nanoscale range of 1–100 nm. Their extremely high surface–to–volume ratio imparts distinctive physical, chemical, and biological characteristics, which are often more effective than those of their bulk materials[1]. Because of these unique features, NPs are considered highly versatile and have been investigated for a variety of applications. Significant research has been carried out on their use in biotechnology, solar cell technology, microbiology, and pharmaceutical development[2–4]. Their distinct physicochemical properties allow for precise molecular-level interactions, while their electrical properties enhance conductivity and sensing capabilities. Moreover, their mechanical strengthening supports the development of a light weight yet robust material[5–7]. The integration of NPs into scientific and medical fields continues to drive innovation, underscoring their indispensable role in modern research and industry. However, chemically synthesized NPs are often deemed unsuitable for pharmaceutical and nutraceutical applications due to their high toxicity, raising serious concerns about human health. This has

[1]Department of Physics, G. H. Raisoni International Skill Tech University, Pune 411006, India. [2]Department of Physics, Shyama Prasad Mukherjee Government Degree College, University of Allahabad, Prayagraj 211013, India. [3]Department of Surgery, University of Illinois at Chicago (UIC), Chicago, IL 60612, USA. [4]Department of Life Sciences, Arni University, Kangra 176401, India. [5]Faculty of Engineering and Technology, Khwaja Moinuddin Chishti Language University, Lucknow 226013, India. [6]Nanoscale Engineering and Sustainable Technology (NEST) Laboratory, Department of Physics, Indira Gandhi National Tribal University, Amarkantak 484886, India. [7]Department of Biochemistry, University of Lucknow, Lucknow 226007, India. [8]Department of Environmental Sciences, Amity School of Life Sciences, Amity University Madhya Pradesh, Gwalior 474005, India. [9]Biological Product Laboratory, Department of Botany, University of Allahabad, Prayagraj 211002, India. ✉email: abhimanyu.kr.singh@gmail.com

Environmental Science and Pollution Research
https://doi.org/10.1007/s11356-025-37000-3

REVIEW ARTICLE

Comprehensive review on acid dye treatment and sustainability: engineering approaches, AI and ML integration

Kalpana Singh[1] · Shashank Sharma[2] · Shalini Pathak[3] · Sankalp Raghuvanshi[4,5] · Mohini Singh[6] · Pankaj Mittal[7] · Manglam Soni[3]

Received: 8 April 2025 / Accepted: 16 September 2025

Abstract
The extensive use of acid dyes, particularly in the textile industry, raises serious environmental concerns due to their toxicity and persistence in wastewater. This review explores various treatment methods, including chemical, biological, physical, and advanced oxidation processes (AOPs), highlighting their mechanisms, applications, and effectiveness. It also evaluates integrated approaches and real-world case studies in the field. Additionally, the study assessed the performance of feedforward neural networks (FFNN) and recurrent neural networks (RNN) in predicting acid dye removal, finding both models to be equally effective. This review identifies research gaps, emphasizes the integration of experimental and AI-based modeling methods, and outlines future directions for improving dye-remediation strategies.

Keywords Acid dye · Wastewater treatment · Engineering approaches · Chemical methods · Biological methods · Physical methods · Advanced oxidation processes · Feedforward neural network (FFNN) and recurrent neural network (RNN) · Environmental impact

Introduction

In recent years, the dye industry has rapidly developed. According to the US "Color Index", commodity dyes have reached tens of thousands. Approximately 60,000 tons of dyes are discharged into the environment in the form of waste each year worldwide, with 80% of these being azo dyes. The environmental impact of acid dye pollution extends beyond its immediate effects on water bodies. Dye residues can pose a significant threat to human health, as some of these compounds are carcinogenic and mutagenic, potentially affecting the well-being of communities living near polluted water sources (Lade et al. 2012). Conventional physicochemical wastewater treatment methods, such as electrocoagulation, adsorption, and membrane filtration, have had limited success in removing dyes from textile effluents. These methods often struggle to address the high

Responsible Editor: Tito Roberto Cadaval Jr

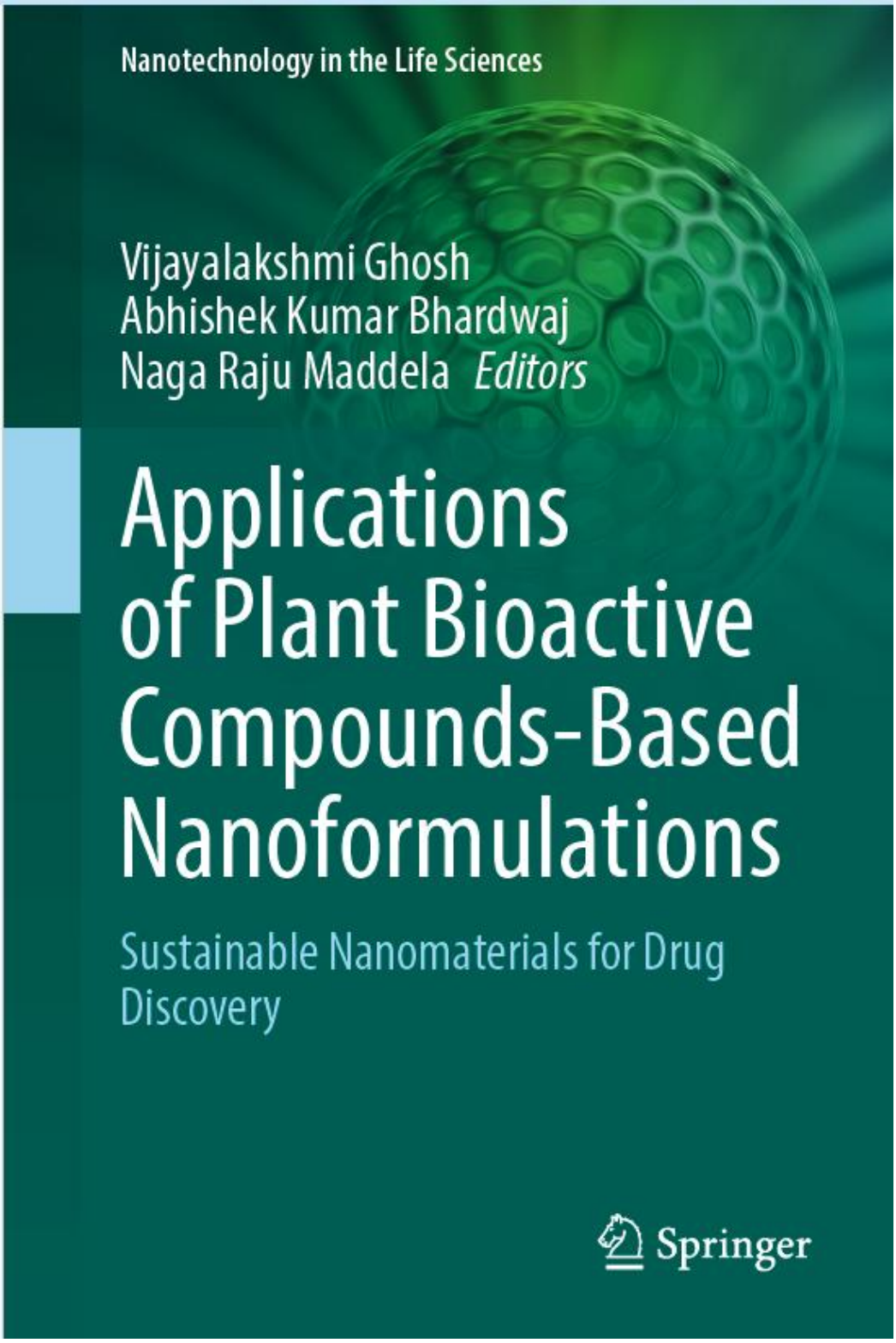
✉ Shashank Sharma
shashank.enviro@gmail.com

[1] Lloyd Institute of Management and Technology, Greater Noida, India

[2] Department of Chemistry & Biochemistry, School of Basic Sciences & Research, Sharda University, Greater Noida, India

[3] Amity Institute of Biotechnology, Amity University Madhya Pradesh, Gwalior, India

Book Publications


Nanotechnology in the Life Sciences
Vijayalakshmi Ghosh
Abhishek Kumar Bhardwaj
Naga Raju Maddela Editors
Applications of Plant Bioactive Compounds-Based Nanoformulations
Sustainable Nanomaterials for Drug Discovery
Springer

Chapter 1
Outlook of the Potential of Medicinal Plant and Scope of Nanoformulation

Swati Rajput, Teeka Ram Sahu, Abhishek Kumar Bhardwaj, and Vijayalakshmi Ghosh

1.1 Introduction

An essential component of human existence on Earth is nature. Human survival is entirely dependent on the natural world. One of the vast components of nature is plants. Phytochemicals obtained from these plants have been used to enhance human health since the distant past. They have been adopted extensively to address multiple ailments. Since they form an integral part of the environment, the demand for medicinal plants is increasing every day. They also improve the general health of the ecosystem. Plants have historically served a variety of purposes, ranging from providing basic necessities to playing a central part in traditional medicine for treating a variety of maladies, laying the groundwork for understanding their therapeutic value (Rabizadeh et al. 2022). The Ayurveda gives reference to the significance of these therapeutic qualities. The Indian medical system has been using therapeutic medicinal plants for the past 5000 years. It includes herbal remedies and diets to prevent and treat mental and physical health issues. Humanity looks to herbal remedies to treat and avoid illnesses. Consumer preference for herbal remedies is frequently motivated by a belief that they are safer than synthetic alternatives, as well as purported benefits in treating various disorders and increasing long-term well-being (Salem et al. 2021). Currently, half of the natural compounds used in pharmaceuticals have some sort of plant origin. Pharmaceutical medications, which may

S. Rajput (✉) · T. R. Sahu · V. Ghosh
Department of Biotechnology, Rungta International Skills University, Bhilai, CG, India

Department of Biotechnology, GD Rungta College of Science and Technology, Bhilai, CG, India

A. K. Bhardwaj
Department of Environmental Science, Amity School of Life Sciences, Amity University, Gwalior, MP, India

V. Ghosh et al. (eds.), *Applications of Plant Bioactive Compounds-Based Nanoformulations*, Nanotechnology in the Life Sciences,
https://doi.org/10.1007/978-3-032-13086-0_1

Nanoparticles in Public Health: Applications, Risks, and Future Directions

[2]Sonal Singh, [1]Gauri Kukreja, [1]Mansi Sharma, [1]Maahi Rastogi, [2*]Kuldip Dwivedi

[1]Amity Institute of Biotechnology [2, 2]Department of Environmental Science, Amity School of Life Science, Amity University Madhya Pradesh, Gwalior-474005 kdwivedi@gwa.amity.edu*

Abstract

Nanoparticles (NPs) are particles with diameters between 1-100 nanometres. They have several uses due to their unique physical and chemical properties, particularly in public health systems. This study demonstrates how nanoparticles can improve cancer treatment, drug delivery, gene therapy, and diagnostics, potentially revolutionizing medical practices. For example, by increasing bioavailability and reducing side effects, NPs improve targeted medication delivery and enable more successful therapy. When used with imaging methods like MRI and PET, they allow for accurate disease monitoring and diagnosis in diagnostics. The capacity of nanoparticles to carry therapeutic genes directly to target cells makes gene therapy a potential remedy for inherited problems. Furthermore, the ease with which tumor cells can be precisely eliminated when used in cancer treatment demonstrates the multimodal therapeutic potential of NPs. Despite their apparent advantages, a careful analysis of nanoparticle safety profiles is necessary due to their possible toxicity. Studies reveal that when NPs are ingested, breathed, or come into touch with the skin, they can cause immunological reactions and damage to organs. In order to balance innovation and safety in the use of nanotechnology in healthcare, this study explores the uses of nanoparticles in public health, tackles safety concerns, and categorizes them according to their composition and structure. The

CHAPTER

15

Role of gut microbiota, probiotics and prebiotics in diabetes

Manglam Soni[a,b] *and Kuldip Dwivedi*[b]

[a]Amity Institute of Biotechnology, Amity University, Gwalior, Madhya Pradesh, India [b]Department of Environmental Science, Amity School of Life Sciences, Amity University, Gwalior, Madhya Pradesh, India

15.1 Introduction

The father of medication Hippocrates once said that "all diseases begin in the gut." It emphasizes on the crucial role of the gut and diet in homoeostatic functions of the human body (Tamburini et al., 2016). The Human microbiome is a collection of various microbes like bacteria, fungi, viruses, etc. Human microbiomes have huge complexity than the human genome, human tissues, and biofluids. They reside in anatomical sites of human tissues and organs like skin, uterus, intestine, etc. Research proves that the human body have essential microbiota which is just one-third of the species of gut microbes, while two-third of the species can vary as per the host individuals (Qin et al., 2010). The individual host is influenced by various factors which are either intrinsic or extrinsic. While intrinsic factors include pH, antimicrobial properties, and mucus; extrinsic factors include medication and diet of host (Faith et al., 2015; Goodrich et al., 2014; Tamburini et al., 2016). The human gut microbiota plays a vital function in maintaining the physiology of the host. The disturbance in microbiota can end up in several metabolic disorders like obesity, diabetes (I and II), cancer, etc. (Fig. 15.1). Numerous studies has confirmed that human's microbiota has the potential to hamper the pathogenesis of immune diseases, especially the autoimmune disease in which system is unable to differentiate its own protein from other foreign proteins, and attack itself (Dedrick et al., 2020).

15.2 Development of type I diabetes

Diabetes is a chronic disease which is either caused by hereditary or acquired shortage in the manufacturing of insulin by the pancreases or the inability of the body to make satisfactory use of insulin produced, it affects the lifestyle and requires management of patient's dietary

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BIO-BASED FOOD PACKAGING POLYMERS

MANGLAM SONI, KULDIP DWIVEDI*, SURENDRA SINGH PARIHAR AND DEEP CHAKRABORTY

Introduction

For the food industry, food packaging is more important as producing a variety of foods of different favorable, different textures, different types of food like ready to eat, preserving food, etc. here the crucial role come of packaging, packaging increasing the life span of the product, protect food from post contamination, and it protects the foodstuff while during marketing. Thus Packaging makes an important fact the or in marketing and acceptability of the product. (Youssef *et al*., 2019) It has been reported that food most of the time packed in plastic polymers materials which are available at quite a cheaper rate, thus it also conserves foodstuffs, but the largest drawback of plastic is they are non-degradable and affects the environment, soil fertility by producing toxins in soil or lands, it also a big threat to marine life animals. (Mangaraj *et al*., 2009) The biggest importance of packaging is to preserve the food from microbes, environmental damage, spoilage, heat, insect, etc. thus it decreases the life span of the product. (Yam *et al*., 2012) The foodborne pathogens result in food poising and the death of human beings, hospitalization of people. In the United States (2008), the cost of foodborne illness is approximately $ 150 billion a year in longevity and urgent

* Corresponding author

Wastewater Management and Urban Water Sustainability

Manglam Soni, Sonal Singh, Shashank Gupta, Kuldip Dwivedi, and Nidhi Shukla

Abstract The rapid expansion of urban areas has intensified the challenges associated with water resource management, particularly its role in the context of wastewater management, which is vital for achieving urban water sustainability. This paper examines the diverse sources of wastewater, including domestic, agricultural, and industrial contributions, and categorizes them into stormwater runoff, sewage, and non-sewage wastewater. It underscores the critical need for the advanced waste water treatment systems to address the complex composition of effluents, which often contain harmful pollutants like as heavy metals, organic and inorganic compounds, and pathogens. The study highlights various sustainable practices and innovative technologies that can enhance wastewater management, including low-impact development strategies like permeable pavements and green roofs, as well as water reclamation and reuse techniques. The role of microorganisms in bioremediation processes is also discussed, emphasizing their potential in the biosorption and bioaccumulation of toxic substances from wastewater. Furthermore, the paper advocates for a holistic approach that integrates community engagement, effective policy frameworks, and investment in infrastructure to foster sustainable water management practices. By promoting water conservation, nutrient recovery, and energy management, urban areas can mitigate the adverse effects of wastewater on freshwater resources and ecosystems. Ultimately, this research objective is to deliver a complete understanding of the importance of wastewater management in urban settings, offering insights into sustainable applications that in spite of continuous environmental problems, it can guarantee the robustness and well-being of metropolitan water systems.

Keywords Wastewater · Urbanization · Industrial · Heavy metals · Sustainbiity

Chapter 08

Pharmacognostic Characterization of Simarouba glauca ("Lakshmi Taru")

Sonal Singh[1], Manglam Soni[2], Mansi Sharma[2], Shalini Pathak[2], Kuldip Dwivedi[1]*, Surendra Singh Parihar[2]

ABSTRACT

Simarouba glauca a therapeutic plant conventionally used in tropical regions, has expanded courtesy for its various beneficial or therapeutic potential. It contains several secondary metabolites such as terpenoids, phenolics, steroids, proteins, and carbohydrates, which support its biological activity, is shown by pharmacognostic analysis of its leaf's extracts. These components are confirmed by microscopic and phytochemical analysis. This plant also has strong antioxidants and mild antibacterial properties. Induction of apoptosis in colorectal and breast cancer cell lines, isolated chemicals, such as tricaproin, have demonstrated specific anticancer effects. Use of nanotechnology is also helpful for the reduction of different types of cancer. S. glauca nanoparticle compositions increase its bioactivity and show new potential for their uses in medicine. The pharmacognostic assessment of S. glauca supports its use in ethnomedicine and its potential to become a natural medicinal agent by highlighting it as a valuable source of bioactive chemicals.

Keywords: *Bioactive, phytochemical, sources, natural, anticancer*

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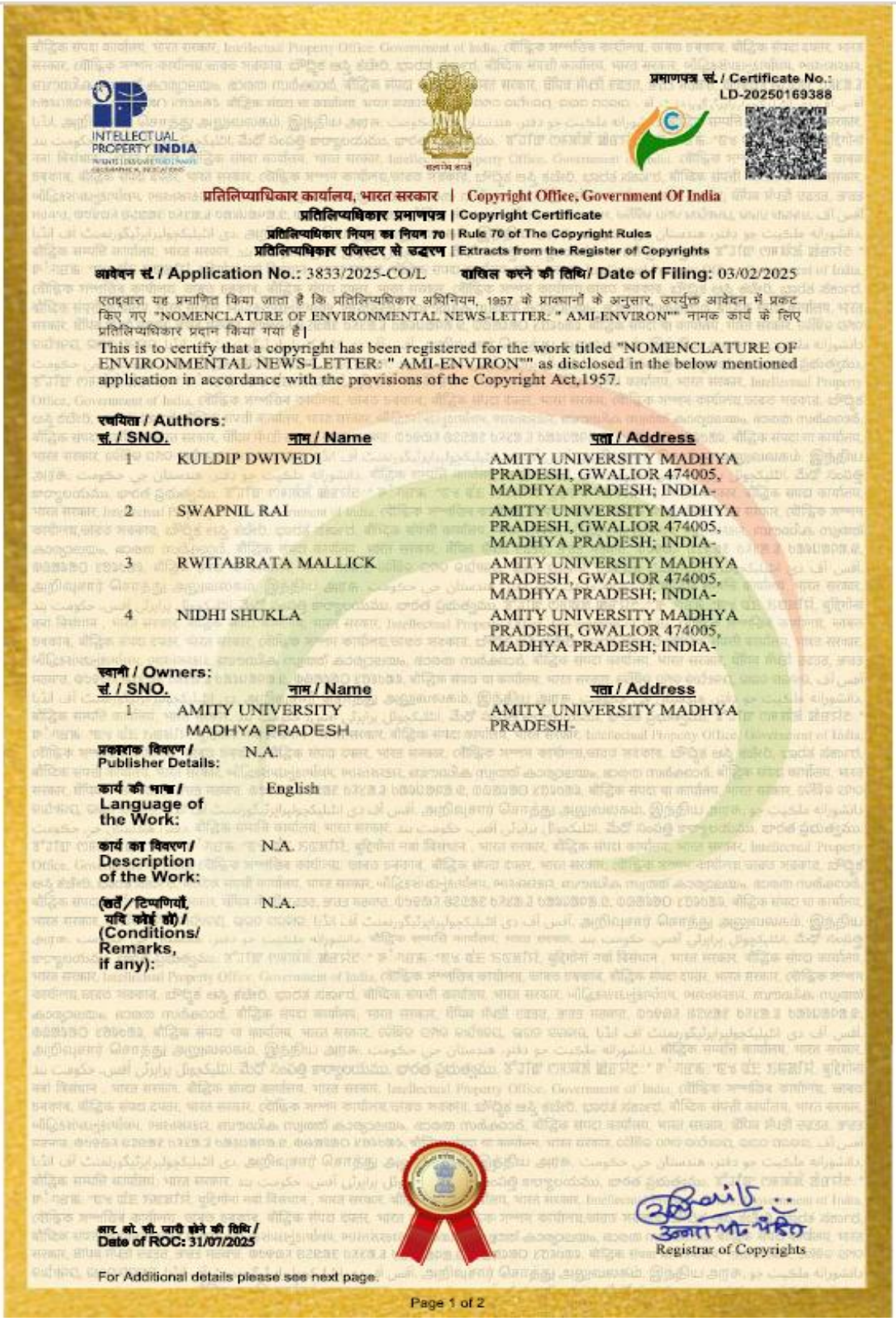

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2	SWAPNIL RAI	AMITY UNIVERSITY MADHYA PRADESH, GWALIOR 474005, MADHYA PRADESH; INDIA-
3	RWITABRATA MALLICK	AMITY UNIVERSITY MADHYA PRADESH, GWALIOR 474005, MADHYA PRADESH; INDIA-
4	NIDHI SHUKLA	AMITY UNIVERSITY MADHYA PRADESH, GWALIOR 474005, MADHYA PRADESH; INDIA-

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रचयिता / Authors:

क्र. / SNO.	नाम / Name	पता / Address
5	ABHISHEK KUMAR BHARDWAJ	AMITY UNIVERSITY MADHYA PRADESH, GWALIOR 474005, MADHYA PRADESH, INDIA-
6	DEEP CHAKRABORTY	AMITY UNIVERSITY MADHYA PRADESH, GWALIOR 474005, MADHYA PRADESH, INDIA-

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