

3.4.3 Research Papers Published During Year 2019-20

Sr. No.	Title of paper	Name of the author/s	Department of the teacher	Name of journal	ISSN number	Is it listed in UGC Care list	Page No.
1.	<u>Biogenic silver and silver oxide hybrid nanoparticles: a potential antimicrobial against multi drug-resistant Pseudomonas aeruginosa</u>	Manju Phadke	Microbiology	<u>New Journal of Chemistry</u>	1369-9261	<u>YES</u>	1-3
2.	<u>Biogenic silver and silver oxide hybrid nanoparticles: a potential antimicrobial against multi drug-resistant Pseudomonas aeruginosa</u>	Lynn D'Lima	Microbiology	<u>New Journal of Chemistry</u>	1369-9261	<u>YES</u>	1-3
3.	<u>Biogenic silver and silver oxide hybrid nanoparticles: a potential antimicrobial against multi drug-resistant Pseudomonas aeruginosa</u>	Vishal Dev	Physics	<u>New Journal of Chemistry</u>	1369-9261	<u>YES</u>	1-3
4.	<u>Isolation of a novel poly-γ-glutamic acid-producing Bacillus licheniformis A14 strain and optimization of fermentation conditions for high-level production</u>	Pramod D. Ghogare	Microbiology	<u>Preparative Biochemistry & Biotechnology</u>	1532-2297	<u>YES</u>	4-6
5.	<u>Impact of project based learning at undergraduate level</u>	Subi Yusuf	Biotechnology	<u>Xplore, The Xavier's Research Journal</u>	2249-1878	<u>YES</u>	7-9
6.	<u>Impact of project based learning at undergraduate level</u>	Prajit Nambiar	Biotechnology	<u>Xplore, The Xavier's Research Journal</u>	2249-1878	<u>YES</u>	7-9
7.	<u>Impact of project based learning at undergraduate level</u>	Tara Menon	Biotechnology	<u>Xplore, The Xavier's Research Journal</u>	2249-1878	<u>YES</u>	7-9
8.	<u>Comparative ecological analysis of five freshwater lakes in and around Mumbai, India</u>	Vishnuprasad V	Botany	<u>Journal of Ecology and Natural resource</u>	2578-4994	NO	10-12
9.	<u>Hydroxychloroquine for COVID-19: A review and a debate based on available clinical trials/case studies</u>	Kirtikumar C. Badgujar	Chemistry	<u>Journal of Drug Delivery and Therapeutics</u>	2250-1177	NO	13-14

10.	<u>Synthesis and characterisization of gold nanopraticles using plant extract of Termanalia arjuna with antibacterial activity</u>	Santosh Katariya	Chemistry	<u>International Journal of nanoscience and nanotechnology</u>	2423-5911	NO	15-17
11.	<u>Wendy Wasserstein 's plays as fem enactment</u>	Lakshmi Muthukumar	English	<u>Ruminations: The Andrean Journal of Literature</u>	2249-9059	NO	18-20
12.	<u>Environmantal activism and eco fiction</u>	Lakshmi Muthukumar	English	<u>Setu</u>	2475-1359	NO	21-22
13.	<u>Co-biodegradation studies of naphthalene and phenanthrene using bacterial consortium</u>	Manju Phadke	Microbiology	<u>Journal of Environmental science and Health, part-A</u>	1532-4117	NO	23-24
14.	<u>Study of the characteristics of mycobacteriophage - A novel tool to treat Mycobacterium spp.</u>	Anita Desouza	Microbiology	<u>International Journal of Mycobacteriology</u>	2212-554X	NO	25-27
15.	<u>Effect of Combinations of Mycobacteriophages and Drugs against Mycobacterium Spp.</u>	Anita Desouza	Microbiology	<u>Global Journal Of Science Frontier Research</u>	0975-5896	NO	28-30

NAAC SSR -Cycle 4 : 2018-2023

Metric No.:3.4.3 Number of research papers published in the Journals as notified on UGC CARE list

2019-20

This is to certify that pages from number 1 to 30 of the attached documents/reports are verified and found to be true.



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Cite this: DOI: 10.1039/c9nj04216d

Biogenic silver and silver oxide hybrid nanoparticles: a potential antimicrobial against multi drug-resistant *Pseudomonas aeruginosa*

Lynn D'Lima,^a Manju Phadke^a and Vishal Dev Ashok^b

There is an undying need for inexpensive, energy efficient and eco-friendly protocols to produce biocompatible nanoparticles to be used in the field of medicine. To address this issue, exploratory research was performed to produce silver nanoparticles (AgNPs) using a novel strain of *Kitasatospora albolonga* isolated during the course of the study. The objective was to test their antimicrobial activity against Multi Drug Resistant (MDR) *Pseudomonas aeruginosa*. UV-visible spectroscopy, dynamic light scattering (DLS), X-ray diffractometry (XRD), scanning electron microscopy (SEM) and high resolution transmission electron microscopy (HRTEM) confirmed the presence of hybrid AgNPs. UV-visible spectroscopy showed a localized surface plasmon resonance (LSPR) absorption peak at approximately 420 nm. The DLS and SEM micrographs showed spherical particles ranging between 10 and 50 nm in size. XRD indicated a highly frustrated system comprising silver (cubic, $Fm\bar{3}m$) and silver oxide (cubic, $pn\bar{3}m$: 1) phases as identified from the diffraction peaks. The crystallite sizes of silver (Ag) were smaller than those of silver oxide (Ag₂O), indicating a possible core shell structure, also corroborated by the SEM and TEM studies. The Ag/Ag₂O hybrid nanoparticles (NPs) exhibited antimicrobial activity against MDR *P. aeruginosa*. The NP impregnated discs were compared with various commercially available antibiotic discs. Most of the antibiotic discs did not inhibit the growth of the MDR strain alone or in combination with the NPs. However, a synergistic action between Ag/Ag₂O NPs and carbenicillin (CN) drug was observed through the checkerboard assay against the MDR hospital isolate. The efficacy of this combination proved to be a lethal and viable option against MDR *P. aeruginosa*.

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rsc.li/njc

Introduction

Nanoparticles have a plethora of applications involving catalysis, electronics, optics, and detection of pollutants and toxins in environmental science and biotechnology. The interaction of light with noble metal nanoparticles produces a collective oscillation of conduction band electrons known as localized surface plasmon resonance (LSPR). Only materials with a negative real and small positive imaginary dielectric constant are capable of supporting surface plasmons. The most common materials used are gold and silver. When the incident electromagnetic field matches that of the oscillating electrons on the surface of the nanoparticle, a resonance condition is met.¹ Recently, LSPR has gained momentum due to its wide spectrum of applications ranging from photovoltaic cells to biological systems.²⁻⁴ Various chemical and physical approaches, such as laser ablation, electrochemical

techniques, and chemical and photochemical reduction have been used frequently to achieve nanoparticles.⁵ However, these processes are expensive, time consuming and typically done on a small scale in the laboratory, rendering these methods less suitable for large-scale production.^{3,6-8} There is a growing need for a newer generation of antibiotics. This is due to an increased rate in drug resistance because of the misuse and overuse of drugs. For centuries, silver has been known for its antimicrobial activity. The enhancement of these properties has been observed with a reduction in the size of the nanoparticles. Preparation of good quality nanoparticles (NPs) is critical as they inhibit the growth of micro-organisms because of their multi-directional attacking mechanism. A combination of nanoparticles and antibiotics gives us the possibility to further increase their potency against harmful organisms. The study of bactericidal nanomaterials is important because of the increase in new strains of bacteria which are resistant against the most potent antibiotics. This has promoted research on the activity of silver ions and silver-based compounds, including silver nanoparticles (AgNP).⁹ This can be harnessed to combat superbugs.^{2,3,5,10}

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Source details

New Journal of Chemistry

Scopus coverage years: from 1996 to Present

Publisher: Royal Society of Chemistry

ISSN: 1144-0546 E-ISSN: 1369-9261

Subject area: Materials Science: Materials Chemistry Chemistry: General Chemistry Chemical Engineering: Catalysis

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Isolation of a novel poly- γ -glutamic acid-producing *Bacillus licheniformis* A14 strain and optimization of fermentation conditions for high-level production

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ABSTRACT

In the present study, bacteria producing poly- γ -glutamic acid were isolated from marine sands, and an efficient producer identified. γ -PGA was rapidly screened by thin-layer chromatography and UV spectrophotometer assay. Media optimization was carried out, and for the cost-effective production of γ -PGA, monosodium glutamate was used as the substrate for the synthesis of γ -PGA instead of glutamic acid. Lastly, Plackett–Buman design (PB) and Response surface methodology (RSM) were used to determine significant media components and their interaction effect to achieve maximum γ -PGA production. With this integrated method, a bacterial strain with a high yield of γ -PGA was obtained rapidly, and the production was increased up to 37.8 g/L after optimization.

KEYWORDS

Integrated method; monosodium glutamate; optimization; poly- γ -glutamic acid; rapid screening

Introduction

Poly- γ -glutamic acid (γ -PGA) is an anionic homo-polyamide composed of D-glutamic acid and L-glutamic acid connected with amide bonds between γ -carboxyl acid and α -amino groups; γ -PGA is biodegradable, non-immunogenic, edible, water-soluble and nontoxic to humans. Because of these properties, it has wide-ranging applications in the field of food, medicine, cosmetics, agriculture, and waste-water treatment.^[1–4] Gram-positive bacteria, especially those belonging to the genus *Bacillus*, are the significant producers of γ -PGA.^[5] *Bacillus subtilis* and *B. licheniformis* are reported to be the efficient producers of γ -PGA.^[6,7] The Gram-negative bacterium *Fusobacterium nucleatum*, the archaeobacterium *Natrialba aegyptiaca*, and eukaryotes such as *Hydra vulgaris* and *Cnidariasp.* are also capable of producing γ -PGA.^[8–11]

γ -PGA producing strains are divided into two groups, L-glutamic acid-dependent and -independent strains, depending on the requirement of L-glutamic acid for biopolymer production.^[12] L-glutamic acid-dependent strains, such as *B. subtilis* and *B. licheniformis*, are most widely studied because of their ability to biosynthesize γ -PGA at high levels on the addition of L-glutamic acid in the medium.^[7,13] Other factors that influence γ -PGA production include carbon and nitrogen sources, aeration, agitation, pH, and temperature.^[11,14]

Low-cost substrates and efficient strains are prerequisites for commercially viable fermentative production of biopolymers.^[15,16] Though γ -PGA can also be produced by

chemical synthesis and biotransformation, these routes are not cost-effective and lead to environmental pollution.^[17,18]

Here, we report the isolation of a novel poly- γ -glutamic acid-producing bacterium and optimization of fermentation medium using a low-cost substrate for high-level production of this biopolymer.



Materials and methods

Primary screening of bacteria for γ -PGA

Samples were collected from marine sands of the Mumbai region, India. *Bacillus* species were isolated by streaking samples on HiCrome *Bacillus* agar media (HIMEDIA Laboratories, Mumbai, India), which contains (per liter) peptone 10 g, meat extract 1 g, D-mannitol 10 g, sodium chloride 10 g, chromogenic mixture 3.20 g, phenol red 0.025 g and agar 15 g (pH 7.1). After incubation at 30° C for 24 h, mucoidal growth and color of the colony were observed, and isolated colonies were selected for further screening.

Screening of γ -PGA producing strains

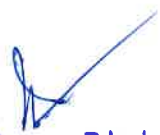
Isolated colonies were inoculated in a 25 ml screening medium consisting of (per liter) glucose 60 g, citric acid 5 g, monosodium glutamate 25 g, MgSO₄·7H₂O 0.5 g, MnSO₄·H₂O 0.1 g, K₂HPO₄ 1.0 g, CaCl₂·2H₂O 0.2 g and FeCl₃·6H₂O 0.02 g (pH 7.0) in 250 ml baffled flasks and incubated aerobically at 150 rpm and 37° C for 48 h.

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Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/lpbb.

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Impact of Project-Based Learning at Undergraduate Level

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Abstract

Project based learning (PBL) is a pedagogical strategy which is envisaged to enable learning by giving control of the process to the learner. In order to promote critical thinking and problem-solving abilities, various educational contexts have adopted PBL. Its implementation can vary across institutions and programs, but in general, it can be viewed as an iterative process made up of first, a problem analysis phase, a period of self-directed learning and lastly, a reporting phase. The purpose of this study is to evaluate whether the PBL introduced at the undergraduate (UG) level has had an impact on the learner with respect to improving their abilities pertaining to computation, critical thinking and oral and written communication skills which eventually would help them in their studies ahead. A survey-based approach was carried out to examine the impact of PBL on student attitudes toward science, problem-solving skills, computational abilities, critical thinking and their perceptions regarding the learning environment. The feedback was also targeted towards improving the quality of UG research if required.

Keywords: Project based learning, Undergraduate research, Survey-based research, Critical thinking, Communication skills, Likert scale.

Introduction

Teaching-learning strategies can be classified into three groups. One of these is Passive learning, where the trainer is active and students are passive, accepting the trainer's authority. Another strategy is Active learning, which involves student based knowledge acquirement. Students themselves search for information, whether through the study of printed material (texts or manuals), graphs and figures, or through carrying out group-work exercises. Student based learning methods are generally centered on group activities like role plays, project work, seminars, etc. involving all members of the group. Action-based learning, the third type, is where after a period of preparation, students will be motivated to develop their creative, innovative and initiative-taking skills, while assuming direct responsibility for their actions (Thomas., 2000).

The difficulties incurred while teaching research methods to undergraduates primarily lies in engaging the students in a subject which they are not basically interested in. (Tiwari, R. et al., 2017). Exposing undergraduates to research can increase the likelihood of creating successful researchers in the

future. Some undergraduates are unsure of their future goals and proceed to graduate school thinking that it is the only next logical step after their undergraduate studies. Exposing them to undergraduate research helps them to understand their aptitude for research. In some cases the passion for research is kindled which otherwise would have remained unknown. (Petrella and Jung, 2000). Despite the burgeoning number of undergraduate researches undertaken, little is known about the success of these programs because of the lack of empirical educational research on them.

The education research or survey-based approach generally use Likert-type scales such as employee rotation trainee feedback, faculty evaluation of trainees, and assessment of performance after an educational intervention. This kind of data frequently collected involves the determination of attitude or feelings with respect to some attribute. That is, the response categories have a rank order, but the intervals between values cannot be presumed to be equal (Jamieson, S. 2004). The typical Likert scale is a 5- or 7-point ordinal scale used by respondents to indicate the degree to which they agree or disagree with a statement (Sullivan, G. M. et al., 2013).

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Xplore

The Xavier's Research Journal

Vol. 11, Issue 1, March 2020

Special Issue - Trends in Higher Education



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Comparative Ecological Analysis of Five Freshwater Lakes in and Around Mumbai, India

Mendonsa L and Vishnuprasad V*

Botany Department, SIES College of Arts, Science and Commerce (Autonomous), Mumbai, India

*Corresponding author: V Vishnuprasad, Assistant Professor, Botany Department, SIES College of Arts, Science and Commerce (Autonomous), Sion, Mumbai, Maharashtra, India, Tel: 0091-8439429827; Email: vitu4life@rediffmail.com

Review article

Volume 3 Issue 5

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Abstract

Quality of water is described by its Physical, Chemical and Biological Characteristics. Various anthropogenic activities like disposal of sewage and industrial water, recreational activities, excess fertilization of lands and use of pesticides have polluted the water bodies. Water quality index is one of the most effective tools to communicate information on the quality of water to the concerned citizens and policymakers. Since lakes form a small yet complex and fragile ecosystem, they readily accumulate all types of pollutants. In a metropolitan city like Mumbai, such freshwater lakes are mostly surrounded by residential areas or industries due to which they constantly face disposal of all types of waste. At the same time, the lakes form a constant source of drinking water for many residents. Five lakes in and around the metropolis were selected in this study and ecological analysis revealed the dangerous threshold values of pollutants in them, which requires timely intervention for the safety and health of the inhabitants who are dependent upon them. The lakes were selected on the basis of their location, the use, amount of apparent pollution and the aesthetics. The ecological health of these lakes has been comparatively studied and analyzed for nine ecological and eco-physiological parameters giving interesting findings.

Keywords: Anthropogenic Activities; Water Quality Index; Freshwater Lakes; Ecological health

Abbreviations: APHA: American Public Health Association; ASTM: American Society of Testing and Material; BIS: Bureau of Indian Standards; BOD: Biochemical Oxygen; COD: Chemical Oxygen Demand; DO: Dissolved Oxygen; EBT: Eriochrome Black; TEC: Electric Conductivity; EDTA: Ethylenediaminetetraacetic Acid; GIS: Geographic Information System; PH: Potential Of Hydrogen; TDS: Total Dissolved Solids; TSS: Total

Suspended Solid; WHO: World Health Organisation; WQI: Water Quality Index.

Introduction

Water being one of the most essential abiotic components of the ecosystem, quality of water is described by its physical, chemical and biological



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Gun Mardiatmoko*

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Aviad Y* and Kutiel H

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Zielinski C*

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Talib VZ*

DOI: 10.23880/jenr-16000360 (<https://doi.org/10.23880/jenr-16000360>)



Review Article

Evaluation of Delbo Small Scale Irrigation Scheme Performance Southern, Ethiopia (evaluation-of-delbo-small-scale-irrigation-scheme-performance-southern,-ethiopia.pdf)

Muluken D*

DOI: 10.23880/jenr-16000359 (<https://doi.org/10.23880/jenr-16000359>)



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Review Article

Hydroxychloroquine for COVID-19: A review and a debate based on available clinical trials/case studies

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ABSTRACT

Hydroxychloroquine (HCQ) as a drug grabbed serious attention of whole world in dealing with COVID-19 pandemic. Recently some in-vitro and in-vivo study showing possible inhibition of SARS-CoV-2 by use of HCQ. However at the same time, some case studies showing NO clinical benefit/ poor clinical outcome with substantial detrimental adverse effects by use of HCQ in treatment of coronavirus disease-2019. Thus, the HCQ use (in COVID-19 treatment) is of current international interest, although a consensus has not yet been reached. More evidences are still required to prove efficacy of HCQ against COVID-19. In view of this, the present review highlights the current ongoing research related to use of HCQ in treatment coronavirus disease-2019. The present review will discuss the possible anti-viral mechanism of HCQ, prophylaxis strategy and effect of HCQ against SARS-CoV-2 virus in-vitro study. Further this review also summarizes and debates all available clinical trials/ case studies of HCQ use against COVID-19 (with clinical outcome). Finally possible detrimental adverse effects are also discussed considering the public health and pharmacovigilance concern.

Keywords: Potency of hydroxychloroquine; COVID-19; Coronavirus disease-2019; Clinical trials; SARS-CoV-2; Adverse effects of hydroxychloroquine; Pharmacovigilance concern

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1. Introduction:

Year 2020 started with the novel coronavirus 2019 disease (COVID-19) which has been declared a pandemic [1]. It is third extremely pathogenic and contagious coronavirus after endemic SARS-CoV and MERS-CoV appeared in humans [2]. The exact origin, transmission, mechanisms of SARS-CoV-2 is not confirmed and clear until now, however, its genome sequence is closely correlated (76-80 %) with the SARS-CoV coronavirus [2]. As of now (25th April 2020), approximately 29,01,305 patients have been confirmed to have COVID-19 infection globally (212 countries) with 2,00,082 fatalities [3]. Development of potential therapy is urgently required in order to prevent pandemic COVID-19. On 30th March 2020, Food and Drug Administration of USA issued an Emergency Use Authorization of HCQ and chloroquine (CQ) for treatment of certain COVID-19 patients [4].

A controversial anti-malaria drug being explored and used in random clinical trials and clinical case studies around the world against potential COVID-19 in order to get relieve from symptoms, or as a preventative measure to stop people being get infected with COVID-19 [5-10]. Some reports showing potential use of the HCQ in treatment of coronavirus disease-2019 (with minimum side effects) [5,6,9]. At the same time some reports are NOT at all supporting potency of HCQ for COVID-19 [7,8,10], conversely they reported increase of adverse events by use of HCQ in COVID-19 patient [10]. Thus, there are several toxic effects of HCQ which are needed to address considering prophylaxis use in view of pharmacovigilance concern [7,8,10]. It may be toxic enough that many people may extensively suffer or may even die due to cardiac problem during the treatment [10]. Hence a very careful analysis is still needed for the use of HCQ in treatment of coronavirus disease-2019 [7,8,10]. Thus, the debate for use



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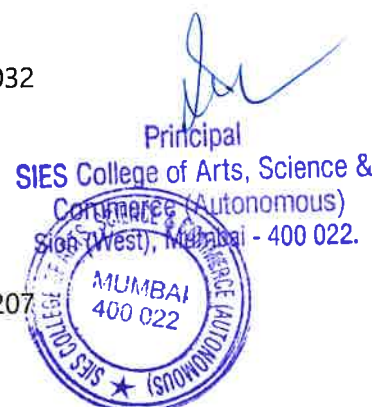
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Synthesis and Characterization of Gold Nanoparticles using Plant Extract of *Terminalia arjuna* with Antibacterial Activity

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Abstract

The use of plant extracts for nanoparticles synthesis are green, economical and cost effective approach. The present study reports the bio-synthesis of gold nanoparticles (Au NPs) using leaf extract of *Terminalia arjuna*. After exposing the gold ions to aqueous solution of leaf extract, rapid reduction of gold ions into gold nanoparticles is observed within few minutes. The characterization of biosynthesized Au NPs were carried out by ultraviolet-visible spectroscopy (UV-Vis), transmission electron microscopy (TEM) and energy-dispersive X-ray spectroscopy (EDX) techniques. UV-visible spectrum of the aqueous medium containing gold nanoparticles showed a peak of 530 nm. TEM analysis was performed to examine the size and shape of the biosynthesized gold nanoparticles. TEM analysis indicated that gold nanoparticles were well dispersed and ranged between 15 to 30 nm in size. Antibacterial activity of the biosynthesized Au NPs was studied against common human pathogens such as *Staphylococcus aureus* (NCIM 5021), *Pseudomonas aeruginosa* (NCIM 5029), and *Salmonella typhimurium* (NCIM 2501) by agar well diffusion method. This method exploits the economical and greener approach for the synthesis of metallic nanoparticles.

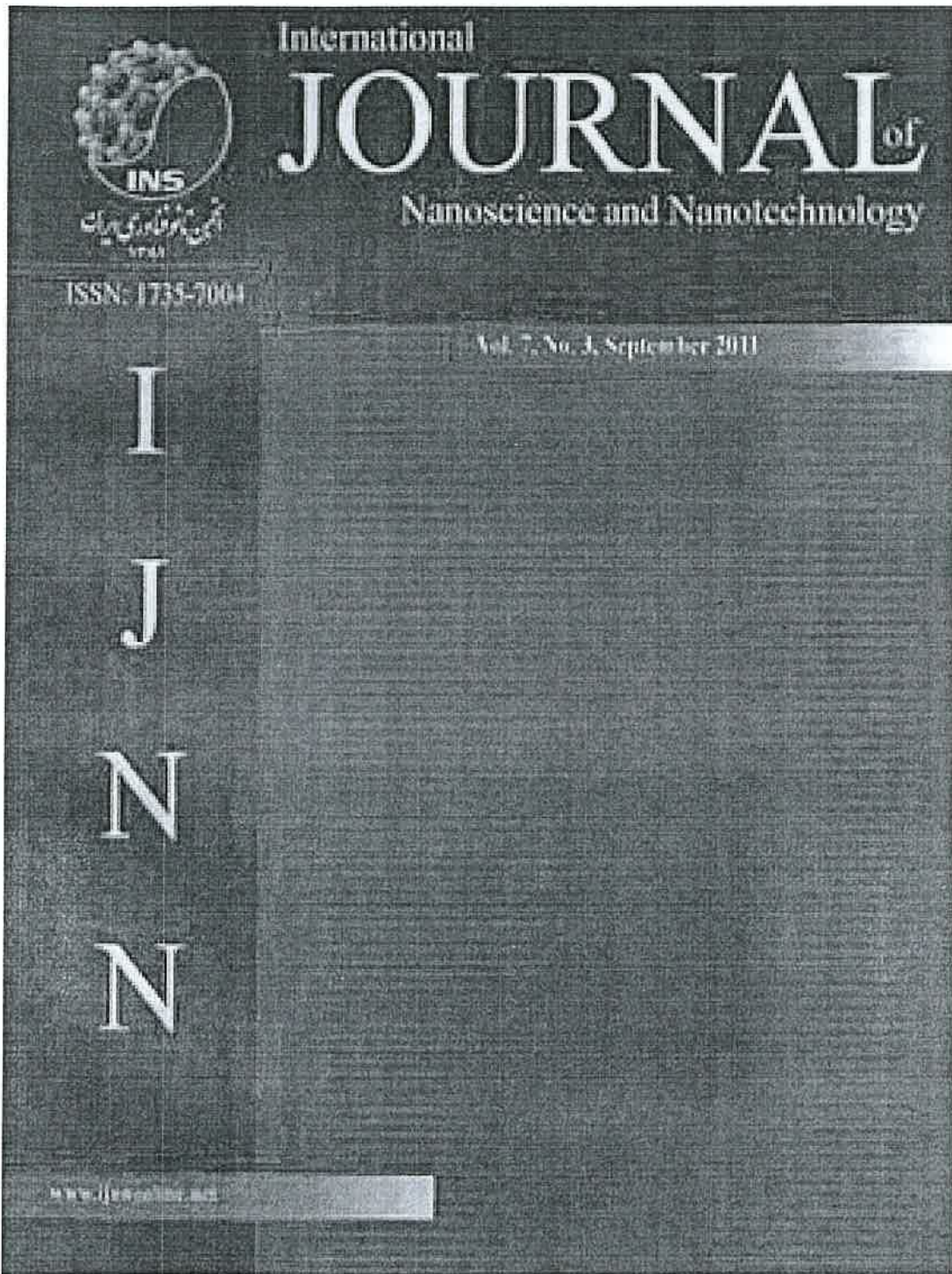
Keywords: *Terminalia arjuna*, Au NPs, TEM, Antibacterial activity, Green synthesis.

1. INTRODUCTION

Currently, nanoparticles (NPs) have drawn significant attention because of their valuable properties and their applications in various fields such as medicinal, sensor, catalytic, electronic and optical [1]. Nanotechnology has major applications in biomedical research for diagnostic as well as therapy. Au NPs are used in magnetic resonance imaging; X-ray computed tomography, drug delivery, cancer diagnosis and photo thermal therapy [2, 3,

4]. Various chemical and physical approaches are usually employed to synthesize well-defined NPs with desirable sizes and shapes. The chemical synthesis route of NPs involves pyrolysis, inert gas condensation, laser ablation, hydrothermal and solvo-thermal processes [5, 6, 7]. Due to extreme conditions of synthesis, chemical toxicity and expensive physical methods, greener routes for NP synthesis are explored over last decade.





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Wendy Wasserstein's Plays as Fem-enactment

Dr. Lakshmi Muthukumar

Abstract

The American playwright, Wendy Wasserstein's plays are perceived in this paper as dramatized, fictive presentations of the feminist critique of the Habermasian public sphere. Wasserstein's work is significant as performance drama that is self-critically feminist in its intent. Her plays are almost faithful chronicles of the changes that have come about in the landscape of feminism, albeit in a fictive context. This paper argues that Wasserstein's plays can be seen as an enactment of the feminist critique of the Habermasian conception of the public sphere. They reveal that the private and the public spheres are interpenetrative, mutually collapsible and, by their very nature, fluid. Seen through this critical and dramatic lens, the private-public dichotomy comes across as a patriarchal assertion that is at once disenabling and debilitating.

Wasserstein uses the stage very effectively to demystify and challenge the private-public dichotomy. She employs the geography of the stage metaphorically in unique ways to bring to crisis the historical separation of the spheres. For example, she uses the dorm as a liminal or a threshold space in her thesis play *Uncommon Women and Others*. Similarly, the living room in *The Sisters Rosensweig* and the garden gate in *An American Daughter* are used as interesting in-between or in-the-cusp spaces. The modern American woman's straddling of the private and public spheres and the resultant dilemmas are echoed on stage through the voiceover in *Uncommon Women and Others*, and her use of stage props such as the sofa cum bed and the answering machine in *Isn't It Romantic*.

Her characters mature through candidly self-reflexive dialogues and monologues. Wasserstein's oeuvre progressively becomes more inclusive and sensitive to issues of race, class and gender. Her later plays deal

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Environmental Activism and Eco-Fiction

- Lakshmi Muthukumar

Abstract

This paper attempts to present eco-fiction as a genre that offers great potential for amateur writers of fiction. It also tries to spell out its salient features. It seeks to clarify questions such as, "Is eco-fiction simply fiction set in nature?" and "What is the rubric for writing such a work?" Another objective of the presentation is to make budding writers aware of the scope such fiction offers. Last, but not the least, the paper also tries to make a case for eco-fiction to be included in the syllabi of literature programmes that teach papers in Popular Culture or World Literature not only as samples of how creative artists might become inspirational change makers but also of how young minds might be made aware of the challenges posed by climate change for humanity.



Keywords: Green fiction, Environmental consciousness raising and Cli-Fi

Bionote: Dr. Lakshmi Muthukumar heads the Department of English at the South Indian Education Society's College of Arts, Science and Commerce, Sion West, Mumbai. She has 25 years of experience in teaching undergraduate students language and literature. She also teaches postgraduate students at the National College as a visiting faculty and is a registered guide for Ph.D. Her areas of interest include language studies, gender studies and creative writing.
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English Literature courses in India focus largely on British Literature, Indian Literature in English and American Literature in a genre-based format while also acquainting students with critical tools to appreciate these literary works. These critiques include feminist, modernist and postmodern interpretations. While learners who study feminism are subjected to some consciousness-raising when it comes to gender, the environmental awareness that is so crucial to our times takes a backseat. In what can only be termed as an exercise in tokenism, courses on literature and gender sometimes include a segment on Eco-feminism. This does not even come close to making the youth aware of the challenges that humans pose to the environment today, let alone focus serious attention on issues such as global warming and seasonal change.

One of the objectives of this paper is to recommend that syllabi of literature programmes include a course on Eco-Fiction. This will not only make the learners aware of the dangers that the environment is beset with today but also give them a glimpse into world literatures written in English in various forms such as Poetry for Climate change, Cli-Fi or Green Fiction or Eco-Fiction and even graphic novels such as *The Rime of the Modern Mariner* by Nick Hayes. Written in 2010, this graphic novel is a take-off on Coleridge's famous poem "The Rime of the Ancient Mariner" and is an excellent example of graphic eco-fiction. It is an engaging Eco Fable set in the cesspool of the North Atlantic Garbage Patch, thus adding another dimension to Eco-Fiction. Such an innovative course could be titled as a paper on World Literature and could have environmental awareness as one of its objectives. Another important objective of such a course could be to introduce learners to literatures written in English in parts of the world other than the West.

Another suggestion that will instill environmental consciousness raising and awareness amongst young learners is to offer creative writing programmes with a focus on green fiction. That way students not just from the Humanities, but also from Life Sciences such as Biology, Botany, Zoology, Microbiology and Biochemistry with a yen to tell a tale may be taught how to do just that by marrying their knowledge of species of flora and fauna that are going extinct with a fictive account of how the human race is responsible for such extinction. In

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Co-biodegradation studies of naphthalene and phenanthrene using bacterial consortium

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ABSTRACT

Degradation studies of phenanthrene and naphthalene as a mixture was carried out using a developed bacterial consortium. The isolates used in consortium were identified as *Chryseobacterium* sp., *Sphingobacterium* sp., *Stenotrophomonas* sp., *Agromyces* sp. and *Pseudomonas* sp. Limited work is done on genus *Agromyces* in degradation studies of PAHs. Catechol production was detected using Arnow's assay suggested that the pathway used for degradation is the meta-cleavage pathway. Results showed that Tween 80, as a surfactant, had maximum effect on the growth of isolates during PAH degradation. This suggests that use of Tween 80 as a surfactant enhanced the uptake of PAH by bacterial isolates during degradation. The study further revealed that, bacterial consortium was successfully utilized in the treatment of water contaminated with PAH in a laboratory-scale biofilm bioreactor. The bacterial consortium was able to degrade 99.9% of naphthalene and 92.9% of phenanthrene as a mixture at a high concentration of 2000 mg/L within 6 days. Further scaling up of the biofilm bioreactor can prove beneficial in large scale treatment of PAH contaminated water. This study showed promising results and these bacterial strains can be used as potential tools for bioremediation of PAH in contaminated sites.

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Environment pollutants; bacterial PAH degradation; biofilm bioreactor; soapnut surfactant; agromyces PAH degradation; polycyclic aromatic hydrocarbon biodegradation; bioremediation application

Introduction

Polycyclic aromatic hydrocarbons (PAHs) are aromatic hydrocarbons that constitute two or more fused benzene rings that originate from natural as well as anthropogenic sources. They are of great concern since they are widely distributed environmental contaminants that have detrimental biological effects. PAHs are listed among the MPCB, US EPA and the EU priority pollutants list (Maharashtra Pollution Control Board (MPCB)). PAHs are usually deposited in surface waters and sediment from the atmosphere, urban run-off, domestic, municipal and industrial effluents, and oil leakage or spillage.^[1] They are toxic, mutagenic and carcinogenic. They are considered as potent immune-suppressants. PAHs interfere with the regular function of cellular membranes as well as with the enzyme systems associated with the membrane. Detrimental effects have been documented on immune system development, humoral immunity and host resistance.^[2]

Thus, suggesting that the contamination of PAHs is a large threat to the safety of human health if consumed by any means. PAHs are major components formed during the incomplete combustion of wood, fossil fuels, coal, gas and oil, domestic garbage, tobacco smoke, soot, etc. PAHs are commonly detected in air, soil, and water. Therefore, PAHs are considered ubiquitous in the environment.^[3,4] In the environment, PAHs are degraded via volatilization, photo-oxidation, chemical oxidation, bioaccumulation, and adsorption to soil particles.

However, the most preferable and principal process is thought to be of microbial transformation and degradation. Biodegradation is accepted widely as the primary dissipation mechanism for most organic pollutants including PAHs in the environment. Microbial degradation is considered as one of the main applications for PAH remediation in the environment.^[5] Naphthalene and phenanthrene are the most abundantly found low-molecular-weight PAHs found in the environment. Naphthalene which is found naturally in fossil fuels like coal is produced when these fuels are burned and when tobacco or wood is burned. It can damage the erythrocytes causing hemolytic anemia along with symptoms like symptoms of exposure include nausea, vomiting, diarrhea, and blood in the urine. Phenanthrene could lead to symptoms like irritation of the skin and respiratory tract, cough, sore throat, abdominal pain. The majorly affected organs are skin, can lead to multiple tumors in mammary organs, stomach, lungs, and skin, if exposed to levels higher than the permissible exposure limit.

Naphthalene and phenanthrene are often used as a model substance for microbial metabolism of PAHs. Recent studies have shown that naphthalene and phenanthrene can be degraded by different bacteria such as species of *Pseudomonas*, *Sphingomonas*, *Rhodococcus*, *Xanthomonas*, *Novosphingobium* and *Mycobacterium*.^[6] Metabolic pathways have been identified in many PAH degrading microorganisms, which lead to complete degradation of polycyclic aromatic hydrocarbons or partial transformation to dead-end intermediates.^[7,8] In

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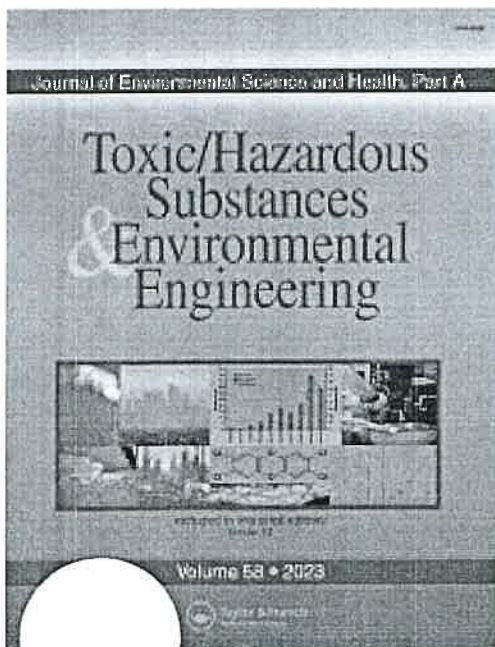
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Study of Characteristics of Mycobacteriophage – A Novel Tool to Treat *Mycobacterium* spp.

Rajitha Satish, Anita Desouza

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Abstract

Background: Mycobacteriophages are viruses that infect *Mycobacterium* spp. Till date, 10427 mycobacteriophages have been isolated and 1670 mycobacteriophage genomes have been sequenced <https://phagesdb.org/hosts/genera/1/> (cited on 30th December, 2018). In the previous study, 10 different mycobacteriophages from 14 soil samples were isolated, by qualitative plaque formation method using *Mycobacterium smegmatis* as host. Among these, three phages were found to infect four different species of *Mycobacterium*, i.e., *Mycobacterium fortuitum* subsp. *fortuitum* MTCC993, *Mycobacterium kansasii* MTCC3058, *Mycobacterium avium* subsp. *avium* MTCC1723, and *Mycobacterium tuberculosis* MTCC300, besides the host *M. smegmatis*. The phage lysates were concentrated by polyethylene glycol (PEG) precipitation. One of the three phages showing host diversity was selected for further study. The various phage growth parameters such as incubation temperature, time of adsorption, host cell density and effect of cations were standardised. **Methods:** The studies were done by qualitative and quantitative plaque assay method. **Results:** The phage selected for further study showed an optimum adsorption time of 15 min. The optimum temperature for propagation was found to be 37°C. The phage was found to be stable at 42°C. In the presence of calcium, the phage showed a higher rate of infectivity. **Conclusion:** Understanding the biology of mycobacteriophages and their host diversity is the key to understanding mycobacterial systems. This could be the first step toward exploiting the potential of phages as therapeutic agents.

Keywords: Cations, host cell density, multiplicity of infection, mycobacteriophage, temperature

INTRODUCTION

Worldwide, tuberculosis (TB) is one of the major causes of death. In India, as per the Global TB report of 2017 the estimated cases of TB were approximately 2,800,000 accounting for about a quarter of the world's TB cases (<https://tbcindia.gov.in/showfile.php?lid=3314> (cited on 21st November, 2018) (WHO Global TB report 2018).. Drug-resistant TB is a major crisis. Worldwide in 2017, 558,000 people developed rifampicin-resistant TB, and of these, 82% of people had multidrug-resistant TB. A combined strategy, based on improved drugs, accurate diagnostic tests, and better preventive measures is necessary, to eradicate *Mycobacterium tuberculosis* (<http://apps.who.int/iris/bitstream/handle/10665/274453/9789241565646-eng.pdf?ua=1> (cited on 21st November, 2018). WHO Global TB report 2018). Phage therapy as an alternative has several advantages over antibiotics such as host-specificity, self-amplification, biofilm degradation and low toxicity to humans.^[1] Mycobacteriophages have tremendous potential in

the study of mycobacterial genetics and as antimycobacterial agents. In this study, we characterized the growth parameters of a mycobacteriophage showing host diversity.

METHODS

Cultivation of host *Mycobacterium smegmatis* MTCC 994
Mycobacterium smegmatis MTCC 994 (IMTECH, Chandigarh); a nonvirulent mycobacterial strain was used as the host for isolation and characterization of mycobacteriophage. The host strain was cultivated at 37°C in Nutrient Broth for 48 h.

Phage isolation

In a previous study, 10 mycobacteriophages were obtained

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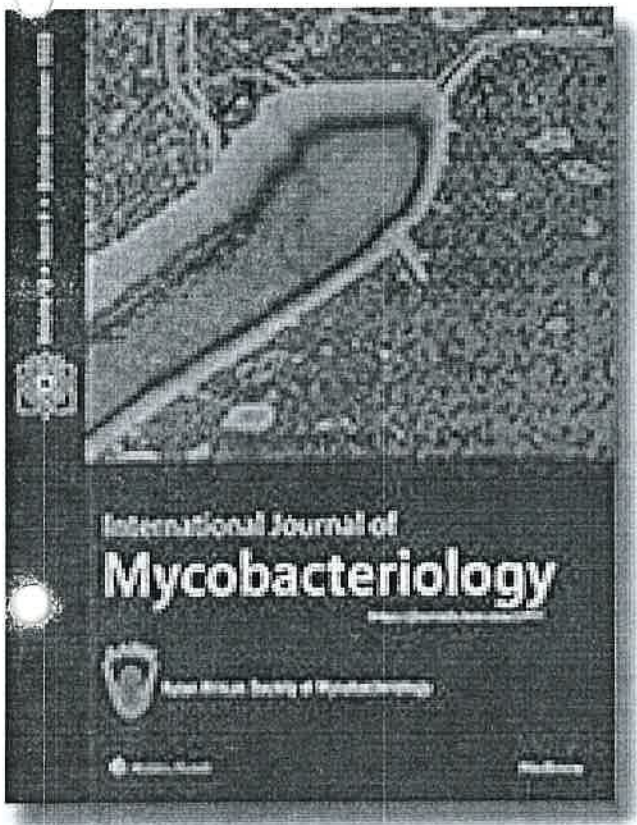
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Effect of Combinations of Mycobacteriophages and Drugs Against *Mycobacterium Spp.*

By Rajitha Satish & Anita Desouza

University of Mumbai

Abstract- The emergence of multidrug-resistant tuberculosis (MDR-TB) is a matter of global concern. The use of mycobacteriophages alone or in combination with antibiotics could be used as an alternative approach to treat drug-resistant Mycobacteria. The aim of the study was the evaluation of the effect of an isolated mycobacteriophage in combination with Isoniazid, Rifampicin, Streptomycin, and Ampicillin against *Mycobacterium tuberculosis* and *Mycobacterium smegmatis*. Determination of the MIC of the above drugs for each strain was done by the standard tube dilution method. Further, the inhibitory effect of varying drug concentrations in combination with different dilutions of the mycobacteriophage was studied. The growth inhibition pattern for both the organisms was also studied in the presence of different dilutions of mycobacteriophage by turbidometric and resazurin dye reduction method. The killing pattern of drugs, at concentrations below the MIC, when combined with mycobacteriophage, was determined. The phage induced lysis of bacteria assisted in decreasing the inhibitory concentration of the drugs.

Keywords: phage therapy; mycobacteriophages; combination therapies; MDR TB; *Mycobacterium tuberculosis*; isoniazid, rifampicin, streptomycin, ampicillin, *Mycobacterium smegmatis*, MIC.

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