



Holy Cross College (Autonomous) Nagercoil - 629 004

Affiliated to Manonmaniam Sundaranar University, Tirunelveli
Nationally Accredited with A+ Grade (CGPA 3.35) by NAAC IV Cycle
An ISO 9001:2015 Certified Institution

SSR
2019-2020
to
2023-2024

3.7.1 Number of functional MoUs/linkages with institutions/ industries in India and abroad for internship, on-the-job training, project work, student / faculty exchange and collaborative research during 2022-2023

DEPARTMENT OF MATHEMATICS AIDED

1. Research Collaboration - Doctoral Committee Member

a. Annai Velankanni College, Tholayavattam.

MANONMANIAM SUNDARANAR UNIVERSITY
CENTRE FOR RESEARCH
ABISHEKAPATTI, TIRUNELVELI - 627 012, TAMIL NADU, INDIA

MINUTES OF THE SECOND DOCTORAL COMMITTEE MEETING FOR CONFIRMATION OF PROVISIONAL REGISTRATION

The Doctoral Committee Meeting of the Ph.D. Scholar, Mr./Ms. S. Andrin Shahila (Reg.No. 19213012092006 (Full-Time / Part-Time) was held on 15/06/2022 at 12 AM/PM in the Department/Institution of Mathematics, Annai Velankanni College, Tholayavattam - 629155.

The following members were present

- Dr. M. Anto (Supervisor & Convener)
- _____ (Joint Supervisor)
- Dr. G. Dominic Babu (Member 1)
- Dr. M.K. Angel Jebitha (Member 2)

Mr./Ms. S. Andrin Shahila has successfully completed the following course works recommended by the Doctoral Committee. He/ She has obtained the following grades in the course works.

Sl. No	Course Code	Course title	Credits	Category	Grade / Marks
1	ACWMA15	Research and Teaching Methodology	4		0
2	ACWMA1P	Mini Project	4		0
3					
4					
5				CGPA	9.0

COE signed result sheet of the course works should be duly attested by the Supervisor with seal.

The scholar had completed the first seminar presentation on 15/06/2022 to the faculty members and research scholars. The attendees list is enclosed herewith. The committee also evaluated the research work carried out by the scholar and satisfied / not satisfied with the performance of the scholar. Hence the Committee recommends / ~~not recommends~~ the confirmation of Provisional registration of the scholar in the Faculty of Mathematics, and permits / ~~not permits~~ the scholar to proceed with his/her research work.

Dr. G. DOMINIC BABU
Professor
(Signature, Name and Seal)
Annai Velankanni College
Tholayavattam - 629 155

Signature of the Joint Supervisor
(Name with seal)
(if applicable)

Dr. M.K. ANGEL JEBITHA
Assistant Professor
(Signature and Seal)
Department of Mathematics and Statistics
Holy Cross College (Autonomous)
Nagercoil - 629 004

Dr. M. Anto
Associate Professor
(Signature and Seal)
Department of Mathematics
Annai Velankanni College
Tholayavattam, Kanniyakumari
District, India - 629155

Head of the Department (University College)
(Name & Seal)
Dr. J. JOHNSON, M.Sc.
PRINCIPAL
ANNAI VELANKANNI COLLEGE
THOLAYAVATTAM - 629 155

Forwarded by
Dr. J. JOHNSON, M.Sc.
PRINCIPAL
ANNAI VELANKANNI COLLEGE
THOLAYAVATTAM - 629 155



2. Research Collaboration - Doctoral Committee Member

a. Nesamony Memorial Christian College, Marthandam.

NESAMONY MEMORIAL CHRISTIAN COLLEGE

(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

(Re-accredited with 'A' Grade by NAAC)

Marthandam – 629 165, Kanniyakumari District,
Tamil Nadu, India.



Dr. K. Paul Raj MSc, MPhil, Ph.D.
Principal
Ph: 04651-272059,
Cell: 9443370257
Fax: 04651-272059
Email: principalnmcc2014@gmail.com
Website: www.nmcc.ac.in

25/08/2022

CERTIFICATE


This is to certify that Dr M K Angel Jebitha, Assistant Professor, Department of Mathematics, Holy Cross College Nagercoil has attended the Doctoral Committee Meeting of C Sheeja (Registration No:20213112092014) and G S Ganeshwari(Registration No:20213112092025) on 25/08/2022 Department of Mathematics, Nesamony Memorial Christian College Marthandam..

PRINCIPAL
PRINCIPAL
NESAMONY MEMORIAL
CHRISTIAN COLLEGE
MARTHANDAM




3. Research Collaboration - Doctoral Committee Member

a. Annai Velankanni College, Tholayavattam.



MANONMANIAM SUNDARANAR UNIVERSITY
CENTRE FOR RESEARCH
 ABISHEKAPATTI, TIRUNELVELI - 627 012, TAMIL NADU, INDIA




MINUTES OF THE THIRD DOCTORAL COMMITTEE MEETING

The Doctoral Committee Meeting of the Ph.D. Scholar Mr/Ms. S. Andrin Shahila
 (Reg. No. 19213012092006) was held on 26.08.2022 at 1:30 A.M. P.M.
 in the Department of (Research Centre) Mathematics, (Annai Velankanni College)
Tholayavattam


The following members were present:


1. <u>Dr. M. Anto</u>	(Supervisor & Convener)
2. _____	(Joint Supervisor, if applicable)
3. <u>Dr. G. Dominic Babu</u>	(Member)
4. <u>Dr. M.K. Angel Jebitha</u>	(Member)

The Doctoral Committee critically reviewed the research work entitled "A study on \mathbb{Q}^* -closed sets in topological spaces."
 carried out by Mr/Ms. S. Andrin Shahila and the contents of the draft thesis. The Scholar has 5 number of publications in the referred journals and 6 number of paper presentations in Seminar / Conference from his/her research work. The Committee is satisfied with the research performance of the scholar and approves the Thesis submission. The committee also recommends the panel of Examiners for the evaluation of the Thesis.


Dr. G. DOMINIC BABU
 (Signature with Name and Seal)
 Associate Professor
 Dept. of Mathematics
 Annai Velankanni College
 Tholayavattam - 629 157.

Joint Supervisor
 (Signature with Name and seal (if applicable))


Dr. M.K. ANGEL JEBITHA
 (Signature with Name and Seal)
 Assistant Professor
 Department of Mathematics
 Holy Cross College (Autonomous)
 Nagercoil - 629 004


Dr. M. ANTO
 (Signature with Name and Seal)
 Supervisor Professor
 Dept. of Mathematics
 Annai Velankanni College
 Tholayavattam, Kanniyakumari
 Tamil Nadu, India - 629157
 Mobile: 9487614009



4. Research Collaboration - Doctoral Committee Member

a. Women's Christian College, Nagercoil.



**WOMEN'S CHRISTIAN COLLEGE
NAGERCOIL - 1
RESEARCH DEPARTMENT OF MATHEMATICS**

NOTIFICATION

Third Doctoral Committee Meeting

Name of the Scholar	: Y.A. SHINY
Register Number	: 19213042092006
Mode of registration	: Full time
Discipline	: Mathematics
Date and time	: 20.10.2022. 11.00 A.M
Venue	: Seminar Hall - II
Name and address of the supervisor	: Dr.T.Anitha Baby, Assistant Professor, Department of Mathematics, Women's Christian College, Nagercoil.
Doctoral Committee Members	: 1. Dr. C.Nirmala Kumari, Associate Professor and Head (Rtd.), Department of Mathematics, Women's Christian College, Nagercoil. : 2. Dr. S. Sujitha, Assistant Professor, Department of Mathematics, Holy Cross College (Autonomous), Nagercoil.



5. Research Collaboration - Doctoral Committee Member

a. Women's Christian College, Nagercoil.



WOMEN'S CHRISTIAN COLLEGE
NAGERCOIL - 629 001

Re-accredited (2nd Cycle) by NAAC with A Grade
91st Rank of the National Level / NIRF 2021
(Affiliated to Manonmaniam Sundaranar University, Tirunelveli - 12)

Dr. D. ESTHER, M.A., Ph.D.
Principal-in-Charge

E-mail : wccnagercoil@yahoo.com
Website : www.wccnagercoil.edu.in



Kanyakumari District,
Tamilnadu, India.
☎ 04652 - 231461
☎ 9443134580

ATTENDANCE CERTIFICATE

This is to certify that **Dr. M.K. ANGEL JEBITHA**, Assistant Professor, Department of Mathematics, Holy Cross College (Autonomous), Nagercoil has conducted the Doctoral Committee meeting of **Mrs. A. Annie Froe**, (Reg.No:20123112092024) Ph.D. Scholar, in the Department of Mathematics, Women's Christian College, Nagercoil on 28.10.2022.

28.10.2022



Principal-in-Charge

Principal - in - Charge
Women's Christian College
Nagercoil.




6. Research Collaboration - Doctoral Committee Member

a. Women's Christian College, Nagercoil



MANONMANIAM SUNDARANAR UNIVERSITY
CENTRE FOR RESEARCH
 ABISHEKAPATTI, TIRUNELVELI - 627 012, TAMIL NADU, INDIA



MINUTES OF THE FIRST DOCTORAL COMMITTEE MEETING

The Doctoral Committee Meeting of the Ph.D. Scholar Mr./Ms. RASHMI CARMEL A (Reg. No 22213282092008) was held on 09.12.2022 at 2.00 A.M. /P.M. in the Department of MATHEMATICS, WOMEN'S CHRISTIAN COLLEGE, NAGERCOIL.

The following members were present:

- Dr. T. MUTHU NEESA BEULA (Supervisor & Convener)
- _____ (Joint Supervisor, if applicable)
- Dr. V. SUDIN FLOWER (Member)
- Dr. M. JASLIN MELBA (Member)

Mr./Ms. RASHMI CARMEL A has presented the overview of the proposed research work. The Doctoral Committee has approved the research topic as "SOLVING LARGE STEINER TREE PROBLEMS WITH LAGRANGIAN RELAXATION IN GRAPHS". The Committee has recommended the scholar to undertake the following course works.

Course Code	Course Title	Core Course / Special Elective
ACWMA01	Commutative Algebra	Core Course
ACWMA03	Banach Algebra and Spectral Theory	Core Course
ACWMA04	Advanced Graph Theory	Core Course
ACWMA11	Combinatorial Theory	Core Course
ACWCRP	Research and Publication Ethics	Core Course

Number of course works as applicable to the scholars

Signature of the Joint Supervisor (Name with seal) (if applicable)

Dr. S.N. LEENA NELSON, Ph.D.
 Head of the Department & Research Centre
 Head of the Department (University / College)
 Women's Christian College, Nagercoil-629 001

Signature of the Supervisor (Name and seal)

Dr. M. JASLIN MELBA, M.Sc., M.Phil., B.Ed., Ph.D.
 Assistant Professor
 Department of Mathematics
 Women's Christian College
 Nagercoil - 629 001

Signature of the Supervisor (Name and seal)

Dr. T. MUTHU NEESA BEULA,
 B.Ed., M.Phil., Ph.D.,
 Assistant Professor in Mathematics,
 Women's Christian College,
 Nagercoil - 1

Signature of the Principal (Name & Seal)


V. Anura das
 Principal of the College
 Women's Christian College
 Nagercoil

Forwarded by




7. Research Collaboration - Doctoral Committee Member

a. Nesamony Memorial Christian College, Marthandam.



MANONMANIAM SUNDARANAR UNIVERSITY
CENTRE FOR RESEARCH
 ABISHEKAPATTI, TIRUNELVELI - 627 012, TAMIL NADU, INDIA



**MINUTES OF THE SECOND DOCTORAL COMMITTEE MEETING FOR
 CONFIRMATION OF PROVISIONAL REGISTRATION**

The Doctoral Committee Meeting of the Ph.D. Scholar, Ms. R. BERYL EN BINK
 Reg.No.20213112092011 (Full-Time) was held on 20. 03. 2023 at 2.15 pm
 in the Department of Mathematics, Nesamony Memorial Christian College, Marthandam.

The following members were present

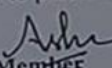
1. DR. G. SUDHANA	(Supervisor & Convener)
2. DR. S. ASHA	(Member)
3. DR. S. SUJITHA	(Member)

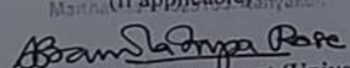
Ms. R. Beryl En Bink has successfully completed the following course works recommended by the Doctoral Committee. She has obtained the following grades in the course works.

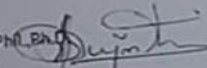
Sl. No	Course Code	Course title	Credits	Category	Grade / Marks
1	ACWMA04	Graph Theory	4	Core Course	O
2	ACWMAP	Mini Project	4	Core Course	O+

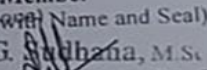
COE's signed result sheet of the course works should be duly attested by the Supervisor with seal.

The scholar had completed the first seminar presentation on 20. 03. 2023 to the faculty members and research scholars. The attendees list is enclosed herewith. The committee also evaluated the research work carried out by the scholar and satisfied / not satisfied with the performance of the scholar. Hence the Committee recommends the confirmation of Provisional registration of the scholar in the Faculty of Mathematics, and permits the scholar to proceed with her research work.



 Member
 (Signature with Name and Seal)
Dr. S. Asha, M.Sc.
 Assistant Professor


 Head of the Department (University / College)
 (Name & Seal)
Dr. A. Pramila Inpa Rose
 Associate Professor
 Head of Department & Research Centre
 Department of Mathematics
 Nesamony Memorial Christian College
 Marthandam - 629 165


 Dr. S. SUJITHA, M.Sc., B.Ed., M.Phil., Ph.D.
 Assistant Professor,
 Department of Mathematics
 Holy Cross College (Nagercoil)
 Nagercoil - 629 009


 Dr. G. Sudhana, M.Sc.
 Assistant Professor
 Research Department of Mathematics
 Nesamony Memorial Christian College
 Marthandam - 629 16

Forwarded by


 Principal of the College
 (Name & Seal)
PRINCIPAL
NESAMONY MEMORIAL
CHRISTIAN COLLEGE,
MARTHANDAM



8. Research Collaboration - Doctoral Committee Member

a. Nesamony Memorial Christian College, Marthandam

NESAMONY MEMORIAL CHRISTIAN COLLEGE

MARTHANDAM - 629 165

KANNIYAKUMARI DISTRICT, TAMIL NADU, INDIA.
(RE-ACCREDITED WITH 'A' GRADE BY NAAC)

AFFILIATED TO MAHONMAJHAM SUNGARAHAR UNIVERSITY, TIRUJHUVELI.

Dr. K. PAUL RAJ, Ph.D.,

Principal

Phone : 04651 - 272059, 270257

Cell : 9443370257

Fax : 04651 - 272059

E-mail : principalmcc2014@gmail.com

Website : www.nmcc.ac.in



Date: 13-04-2023

Attendance Certificate

This is to certify that **Dr. M.K. ANGEL JEBITHA**, Assistant Professor, PG and Research Department of Mathematics, Holy Cross College (Autonomous), Nagercoil has conducted the Doctoral Committee Meeting of the Research Scholars Mrs. D. Jaspin Jeba and Mrs. G.S. Ganeshwari on 13-04-2023 in the Research Department of Mathematics, Nesamony Memorial Christian College, Marthandam.



[Signature]
PRINCIPAL
NESAMONY MEMORIAL
CHRISTIAN COLLEGE
MARTHANDAM

[Signature]



DEPARTMENT OF CHEMISTRY

1. Research Collaboration - Doctoral Committee Member

a. S.T. Hindu College, Nagercoil



CENTRE FOR RESEARCH
MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI - 627 012
www.manuniv.ac.in

MINUTES OF THE FIRST DOCTORAL COMMITTEE MEETING

The Doctoral Committee Meeting of the Ph.D. Scholar,
Mr/Ms D. RAJINI (Reg No. MSURE221596) was held
on 25/06/2022 at 9.00 AM PM in the Department of CHEMISTRY

The following members were present

1. DR. S. BETSY BAI (Supervisor & Convener)
2. - (Joint Supervisor, if applicable)
3. DR. C. VAITHYANATHAN (Member)
4. DR. M. ANITHA MALBI (Member)

Mr/Ms D. RAJINI has presented the overview of the proposed research work. The Doctoral Committee has approved the research topic

as "STUDIES ON THE STATUS OF SOLAR SALT-PANS AND THE IMPACT OF THE SYNTHESIS OF CHEMICALS DERIVED FROM THE BRINE SAMPLES OF DIFFERENT SALT-PANS"

The Committee has recommended the scholar to undertake the following course works

Course Code	Course Title	Core Course / Special Elective
<u>ACWCH01</u>	<u>ANALYTICAL METHODS AND INSTRUMENTATION</u>	<u>CORE COURSE</u>
<u>ACWCH11</u>	<u>HETEROGENEOUS CATALYSIS</u>	<u>CORE COURSE</u>
<u>ACWCH08</u>	<u>ADSORPTION AND CATALYSIS</u>	<u>CORE COURSE</u>
<u>ACWCH06</u>	<u>CHROMATOGRAPHY</u>	<u>CORE COURSE</u>

Number of course works as applicable to the scholars

<u>ACWCH03</u>	<u>RESEARCH AND TEACHING METHODOLOGY</u>	<u>CORE COURSE</u>
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Member
(Signature with Name and seal) 25/6/22

DR. C. VAITHYANATHAN,
M.Sc., M.Phil., Ph.D.
HEAD, Dept. of Chemistry,
and Research Centre,
S.T. HINDU COLLEGE,
NAGERCOIL - 629 002

Joint Supervisor
(Signature with Name and seal)
(if applicable)

Signature of the HOD/Director of the Center/
Dr. C. VAITHYANATHAN,

DR. C. VAITHYANATHAN,
M.Sc., M.Phil., Ph.D.
HEAD, Dept. of Chemistry,
and Research Centre,
S.T. HINDU COLLEGE,
NAGERCOIL - 629 002

Forwarded
Principal of the Institution where the supervisor is working
S.T. Hindu College
Nagercoil

Member
(Signature with Name and seal) 25/6/22
DR. M. ANITHA MALBI,
Assistant Professor of Chemistry,
Research Guide,
Holy Cross College (Autonomous)
Nagercoil 4
S. Betsy Bai,
Supervisor 25/6/2022
(Signature with name and seal)

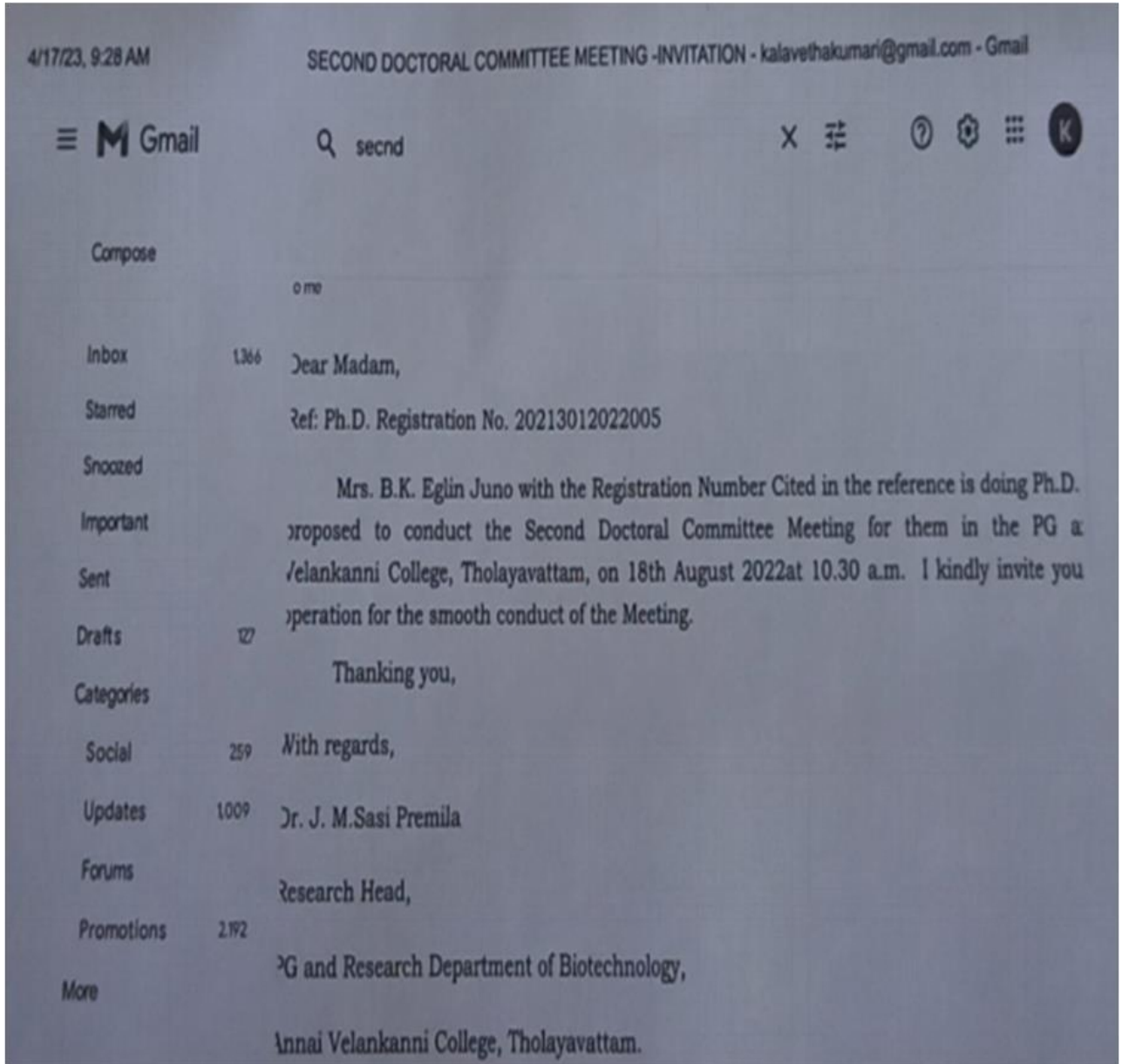
DR. S. BETSY BAI,
M.Sc., B.Ed., M.Phil., Ph.D.
ASSISTANT PROFESSOR
DEPARTMENT OF CHEMISTRY,
S.T. HINDU COLLEGE,
NAGERCOIL - 629 002



DEPARTMENT OF BOTANY

1. Research Collaboration - Doctoral committee

a. Department of Biotechnology, Annai Velankanni College, Tholayavattam



DEPARTMENT OF ZOOLOGY

1. Research Collaboration – Doctoral Committee Member

- a. Centre for Marine Science and Technology, Manonmaniam Sundaranar University,
Rajakkamangalam



MANONMANIAM SUNDARANAR UNIVERSITY
CENTRE FOR MARINE SCIENCE AND TECHNOLOGY

Dr. T. Citarasu, Ph.D.
Associate Professor

Rajakkamangalam - 629 502
Tamil Nadu, India
Telefax: + 91 4652 253078
Mobile : + 91- 9994273822
Email : citarasu@msuniv.ac.in

09.01.2023

ATTENDANCE CERTIFICATE

This is to certify that Dr. S. Mary Mettilda Bai, Associate Professor, Department of Zoology, Holy Cross College, Nagercoil, has attended the first Doctoral Committee meeting of Mrs. J. Stella Jeevalet (Reg. No: 22224012272035), Part time Research Scholar at Aquatic Animal Health Laboratory, Centre for Marine Science and Technology, Manonmaniam Sundaranar University, Rajakkamangalam on 06.01.2023.

Thanking You

Sincerely Yours

Dr. T. CITARASU, Ph.D.,
Associate Professor
Centre for Marine Science & Technology
Manonmaniam Sundaranar University
Rajakkamangalam - 629 502
K. K. Dipti, Tamilnadu
Tate: +91 4652-253078
E-mail: citarasu@gmail.com

2. Research Collaboration – Doctoral Committee Member

a. Scott Christian College (Autonomous), Nagercoil



SCOTT CHRISTIAN COLLEGE (AUTONOMOUS)

NAGERCOIL – 629 003, KANYAKUMARI DISTRICT,
TAMILNADU, INDIA.



Dr. R. Leena, M.Sc., M.Phil., Ph.D.
Assistant Professor
Department of Zoology and Research Centre.

Date: 06/02/2023

To

Dr. Brisca Renuga. F,
Associate Professor of Zoology,
Holy Cross College (Autonomous),
Nagercoil.

Dear Madam,

Sub: Invite to attend Doctoral Committee Meeting-reg.

I invite you to the Second Doctoral Committee Meeting of Ms. M. Asha Berlin (Reg. No. 20213162192009) full time Research Scholar, Department of Zoology and Research Centre, Scott Christian College (Autonomous), Nagercoil-3 which will be held on 08/02/2023 (Wednesday) at 2.00 pm in the Zoology Department Library. Kindly make it convenient to attend the meeting.

Thank You

Dr. R. Leena

(Convener)

Phone No. (off) : 04652 – 231807; Fax: 04652 – 229800
Mob : +91-9442704679, E-mail: rleena@yahoo.co.in



DEPARTMENT OF ENGLISH

1. Research Collaboration – Doctoral Committee Member

a. Scott Christian College (Autonomous), Nagercoil



2. Research Collaboration – Doctoral Committee Member

b. Scott Christian College (Autonomous), Nagercoil



SCOTT CHRISTIAN COLLEGE (AUTONOMOUS)

Nagercoil - 629 003, Kanniyakumari District, Tamil Nadu, India.

☎ 04652 - 235240
✉ sccprincipal@yahoo.com
🌐 www.scott.ac.in


Dr. J. Robert Victor Edward
PRINCIPAL

February 2, 2023

ATTENDANCE CERTIFICATE

This is to certify that Dr. H. Jimsy Asha, Assistant Professor of English, Holy Cross College (Autonomous), Nagercoil served as External Examiner for the Doctoral Committee of Ms. G. Jeniffer Shaheena Singh (Reg. No.21113164012017) and Ms. R. Anitha Bai (Reg. No.21213164012042) in the Department of English and Research Centre, Scott Christian College (Autonomous), Nagercoil - 629 003 on 02.02.2023.



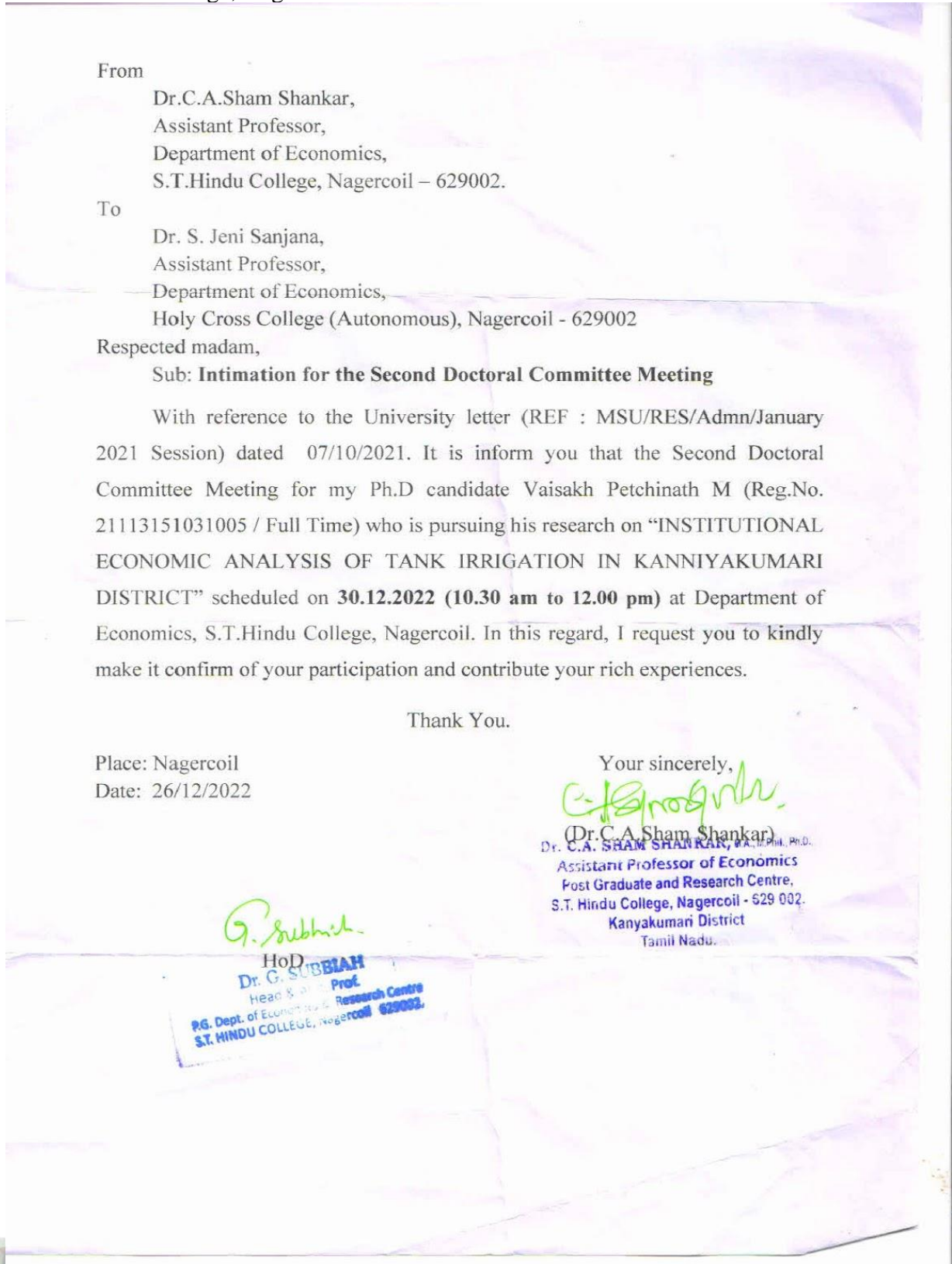

Principal
SCOTT CHRISTIAN COLLEGE
(Autonomous)
NAGERCOIL - 629 003



DEPARTMENT OF ECONOMICS

1. Research Collaboration - Doctoral Committee Member

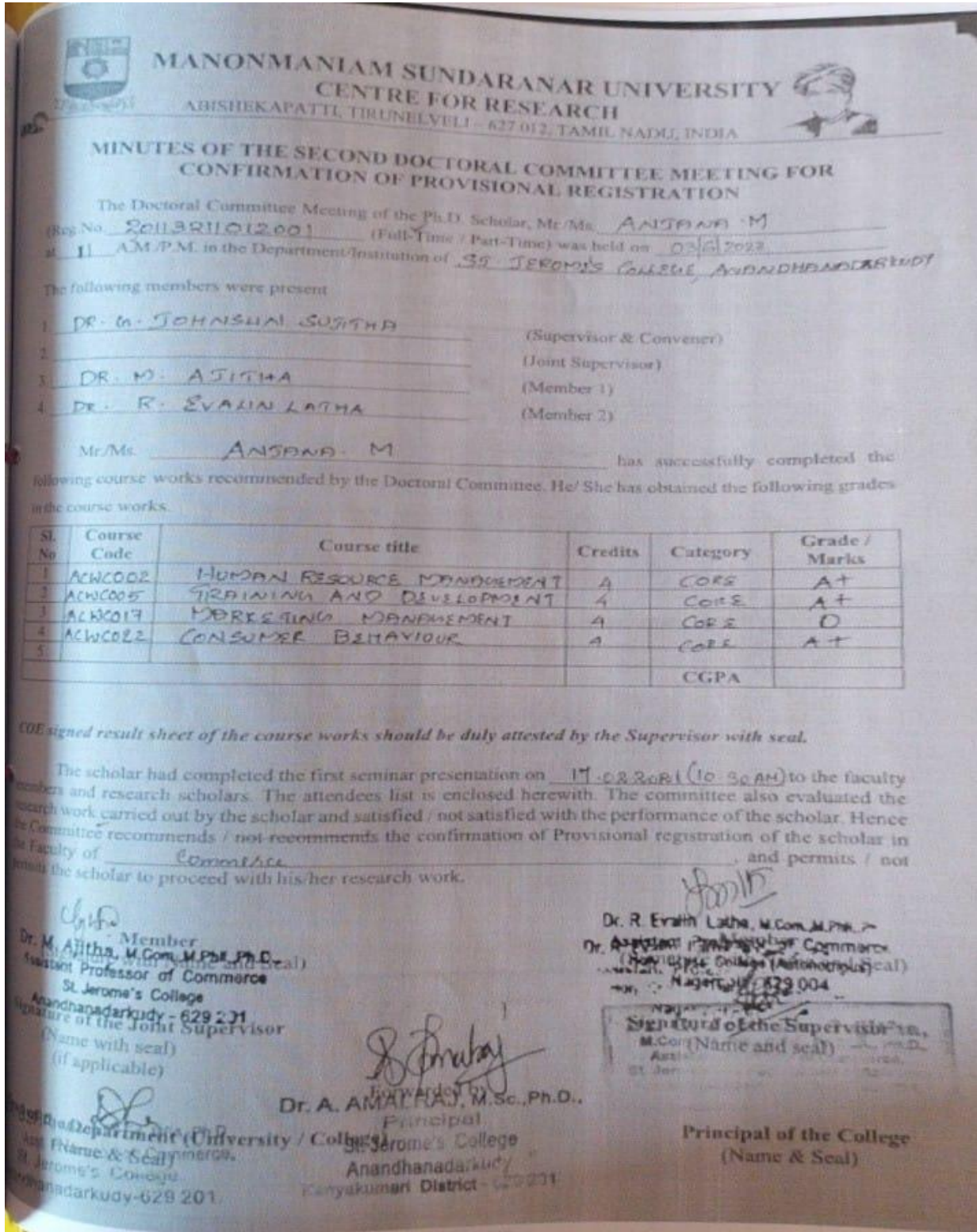
a. S.T. Hindu College, Nagercoil



DEPARTMENT OF COMMERCE S.F1

1. Research Collaboration – Doctoral Committee Member

a. St. Jerome's College, Anandanadarkudy



DEPARTMENT OF MATHEMATICS

1. Research Collaboration – Joint Author Publication

a. Government College of Engineering, Tirunelveli

Journal of the Indian Math. Soc.
Vol. 90, Nos. (1–2) (2023), 01–12.

ISSN (Print): 0019–5839
ISSN (Online): 2455–6475

**THE CONNECTED EDGE-TO-VERTEX
 GEODETIC NUMBER OF A GRAPH**

J. JOHN AND SUJITHA. S

ABSTRACT. Let $G = (V, E)$ be a graph. A subset $S \subseteq E$ is called an *edge-to-vertex geodesic set* of G if every vertex of G is either incident with an edge of S or lies on a geodesic joining a pair of edges of S . The minimum cardinality of an edge-to-vertex geodesic set of G is $g_{ev}(G)$. Any edge-to-vertex geodesic set of cardinality $g_{ev}(G)$ is called an *edge to vertex geodesic basis* of G . A *connected edge to vertex geodesic set* of a graph G is an edge-to-vertex geodesic set S such that the subgraph $G[S]$ induced by S is connected. The minimum cardinality of a connected edge-to-vertex geodesic set of G is the *connected edge to vertex geodesic number* of G and is denoted by $g_{cev}(G)$. Some general properties satisfied by this concept are studied. The connected graphs G of size q with connected edge-to-vertex geodesic number 2 or q or $q - 1$ are characterized. It is shown that for any three positive integers q, a and b with $2 \leq a \leq b \leq q$, there exists a connected graph G of size q , $g_{cev}(G) = a$ and $g_{ev}(G) = b$.

(Received: October 30, 2020, Accepted: January 23, 2022)

1. INTRODUCTION

By a graph $G = (V, E)$, we mean a finite undirected connected graph without loops or multiple edges. The *order* and *size* of G are denoted by p and q respectively. We consider connected graphs with at least three vertices. For basic definitions and terminologies we refer to [1], [5]. For vertices u and v in a connected graph G , the *distance* $d(u, v)$ is the length of a shortest $u - v$ path in G . An $u - v$ path of length $d(u, v)$ is called an $u - v$ *geodesic*. Two vertices u and v of G are *antipodal* if $d(u, v) = \text{diam } G$ or $d(G)$. The *geodesic number* $g(G)$ of G is the minimum order of a geodesic set and any geodesic set of order $g(G)$ is called a *geodesic basis* of G . The geodesic number of a graph

2010 *Mathematics Subject Classification.* 05C12 .

Keywords and phrases: Geodesic, Edge-to-vertex geodesic number, Connected edge-to-vertex geodesic number.

DOI: 10.18311/jims/2023/26328

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2. Research Collaboration – Joint Author Publication

a. Government College of Engineering, Tirunelveli

Graphs and Combinatorics (2022) 38:142
<https://doi.org/10.1007/s00373-022-02521-y>

ORIGINAL PAPER



On the Forcing Domination and the Forcing Total Domination Numbers of a Graph

J. John¹ · V. Sujin Flower²

Received: 16 July 2019 / Revised: 21 June 2022 / Accepted: 24 June 2022 /

Published online: 14 August 2022

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Abstract

Let G be a connected graph with at least two vertices and S a γ_t -set of G . A subset $T \subseteq S$ is called a *forcing subset* for S if S is the unique γ_t -set containing T . The *forcing total domination number* of S , denoted by $f_{\gamma_t}(S)$, is the cardinality of a minimum forcing subset of S . The *forcing total domination number* of G , denoted by $f_{\gamma_t}(G)$ is defined by $f_{\gamma_t}(G) = \min \{f_{\gamma_t}(S)\}$, where the minimum is taken over all minimum total dominating sets S in G . Some general properties satisfied by this concepts are studied. The forcing total dominating number of certain standard graphs are determined. It is shown that for every pair a, b of integers with $0 \leq a < b$ and $b \geq 1$, there exists a connected graph G such that $f_{\gamma_t}(G) = a$ and $\gamma_t(G) = b$, where $\gamma_t(G)$ is total domination number of G . It is also shown that for every pair a, b of integers with $a \geq 0$ and $b \geq 0$, there exists a connected graph G such that $f_{\gamma_t}(G) = a$ and $f_{\gamma}(G) = b$, where $f_{\gamma}(G)$ is the forcing domination number of G .

Keywords Domination number · Total domination number · Forcing domination number · Forcing total domination number

Mathematics Subject Classification 05C69

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fermentation



Article

Synthesis, Characterization, Antibacterial, Antifungal, Antioxidant, and Anticancer Activities of Nickel-Doped Hydroxyapatite Nanoparticles

Saleth Sebastiammal^{1,*}, Arul Sigamani Lesly Fathima¹, Johnson Henry², Mohammad Ahmad Wadaan³, Shahid Mahboob³, Arwa Mohammad Wadaan⁴, Irfan Manzoor⁵, Kasi Gopinath⁶, Mohan Rajeswary⁷ and Marimuthu Govindarajan^{8,9,*}

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Abstract: The purpose of this research was to investigate the possible antibacterial, antifungal, an-

2. Research Collaboration– Joint Author Publication



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Research Articles

Vibrational spectroscopic signatures, effect of rehybridization and hyperconjugation on the dimer molecule of N-(4-chlorophenyl)-2-[(4,6-di-aminopyrimidin-2-yl)sulfanyl]acetamide- quantum computational approach

S. J. Jenepha Mary, Sayantan Pradhan & C. James 

Pages 447-463 | Received 04 Dec 2021, Accepted 23 Jun 2022, Published online: 13 Jul 2022

 Cite this article <https://doi.org/10.1080/00387010.2022.2098339> Check for updates Full Article Figures & data References Supplemental Citations Metrics Reprints &[Read this article](#)

Abstract

The antiviral active molecule N-(4-chlorophenyl)-2-[(4,6-di-aminopyrimidin-2-yl)sulfanyl] acetamide has been characterized to obtain vibrational signatures via Raman and Fourier transform infrared spectroscopy, comparing the results generated by ab initio calculations. The density functional theory model, performed by GAUSSIAN 09 packages, based on the Becke, 3-parameter, Lee-Yang-Parr exchange correlation functions augmented with 6-311++(d,p) basis set. The geometric equilibrium,

3. Research Collaboration– Joint Author Publication

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Quantum Chemical Investigations on the Hydrogen-Bonded Interactions of Bioactive Molecule N²-(4-Methoxysalicylidene) Arginine Hemihydrate

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ABSTRACT

The geometry optimization, natural bond orbital analysis, and vibrational analysis of a Schiff base compound N²-(4-Methoxysalicylidene) Arginine Hemihydrate (4MSAH) were carried out using the density functional B3PW91 method with the 6–31G (d,p) basis set. Natural Bond Orbital (NBO) analysis is carried out to examine the various intra and inter molecular interactions of molecular system. Normal coordinate analysis was carried out to elucidate the vibrational modes and the assignments were made on the potential energy distribution. From the vibrational analysis, it is endorsed that the stretching wave number of hydrogen bond donor COO⁻ and hydrogen bond acceptor NH₂⁺ is shifted due to the interaction. MO (Molecular Orbital) analysis was accomplished to propose the biological activity of the molecule and the impact of the transition of electrons from n→π* was studied using the UV transmittance spectrum. The molecular orbital contributions are studied by using DOS spectral analysis. Topological studies of 4MSAH were conducted utilizing the Electron Localization Function (ELF) and the Local orbital locator (LOL). Hirshfeld surface analysis and reduced density gradient analysis were conducted to

ARTICLE HISTORY

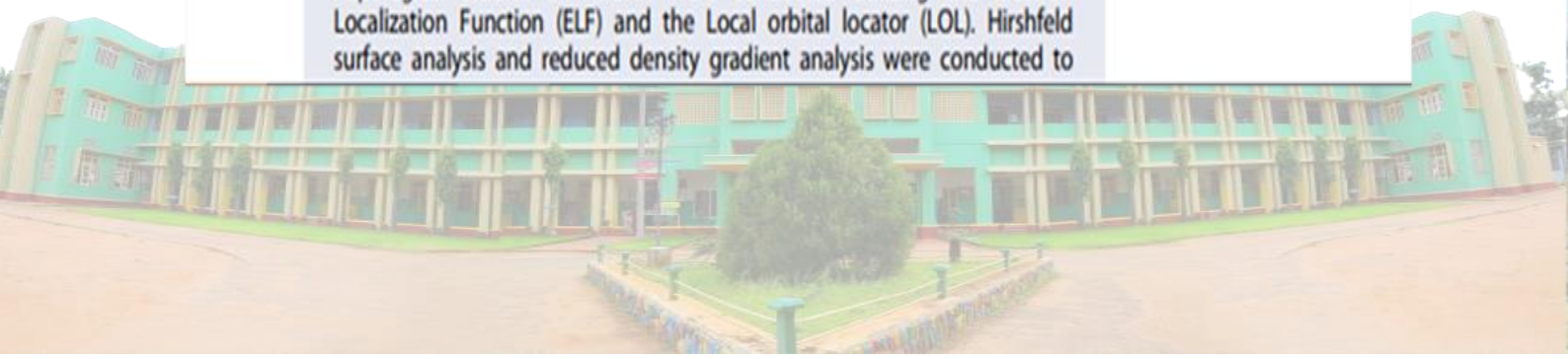
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KEYWORDS

Interaction; density of states; reduced density gradient; Hirshfeld; docking

Activa
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4. Research Collaboration– Joint Author Publication

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Volume 64, Part 5, 2022, Pages 1671-1678

Enhancement on the electrical and optical behaviour of ZnFe_2O_4 nano particles via transition metal substitution

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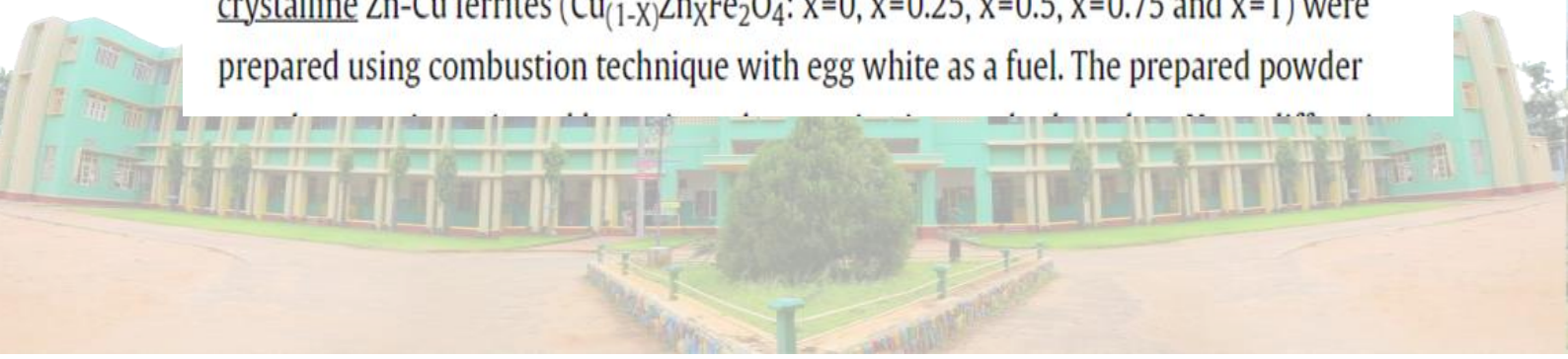
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Abstract


The present study aimed to investigate the behavior of nano Zinc Ferrite particles by copper substitution in various concentrations in order to fabricate novel material for future use in optoelectronic and electromagnetic shielding devices. To that end, Nano crystalline Zn-Cu ferrites ($\text{Cu}_{(1-x)}\text{Zn}_x\text{Fe}_2\text{O}_4$: $x=0$, $x=0.25$, $x=0.5$, $x=0.75$ and $x=1$) were prepared using combustion technique with egg white as a fuel. The prepared powder



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Review

Lignocellulose biohydrogen towards net zero emission: A review on recent developments

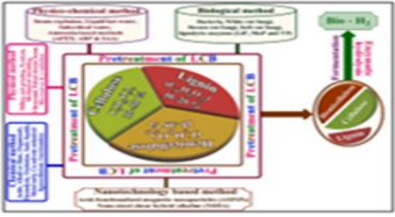
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HIGHLIGHTS

- Recent lignocellulosic pretreatments have been documented.
- Radiation energy based pretreatment techniques were discussed.
- Role of nanotechnology in bio–H₂ production has been highlighted.
- Challenges in the development of pretreatments and remedies are suggested.

GRAPHICAL ABSTRACT



ARTICLE INFO

Keywords:
 Lignocellulosic biomass
 Bio–H₂
 Pretreatment
 Nanotechnology
 Challenges

ABSTRACT

This review mainly determines novel and advance physical, chemical, physico–chemical, microbiological and nanotechnology–based pretreatment techniques in lignocellulosic biomass pretreatment for bio–H₂ production. Further, aim of this review is to gain the knowledge on the lignocellulosic biomass pretreatment and its priority on the efficacy of bio–H₂ and positive findings. The influence of various pretreatment techniques on the structure of lignocellulosic biomass have presented with the pros and cons, especially about the cellulose digestibility and

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Copper Ferrite nanoparticles synthesised using a novel green synthesis route: Structural development and photocatalytic activity

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The copper ferrite nanoparticles, recognized for their ferromagnetic characteristics, minimal conductivity, and superior electrochemical stability, were synthesized by a facile auto combustion approach using egg white as fuel via a green synthesis route. CuFe₂O₄ nanoparticles' structural, morphological, and optical properties were examined. XRD is used to determine the phase formation, particle size, and lattice parameter of spinel ferrite. X-ray Diffractometer (XRD), Fourier Transform Infrared Spectrometer (FTIR), Scanning Electron Microscopy (SEM), and Energy Dispersive X-ray analysis were used to rigorously examine the phase purity of the synthesized spinel ferrite. For morphological analysis, SEM and TEM were employed, whereas EDAX was used for elemental analyses. For a better knowledge of the conduction band (CB) and valence band (VB) boundaries of the produced nanoparticles, optical experiments were conducted by UV Diffuse Reflectance Spectroscopy. The degradation of Rhodamine B dye determined the photocatalytic competence of the synthesized sample under visible light. At regular intervals of time, the entire process was observed with a spectrophotometer. CuFe₂O₄ nanoparticles reveal a maximum photocatalytic degradation efficiency of around 94%, which is higher than that of CuFe₂O₄ nanoparticles prepared via other chemical route.

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Bibcode: 2023.JMoSt127734807U 



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Environmental Research




Volume 210, July 2022, 112979



Synthesis and physicochemical characteristics of Ag-doped hydroxyapatite nanoparticles, and their potential biomedical applications

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DEPARTMENT OF CHEMISTRY

1. Research Collaboration– Joint Author Publication

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SYNTHESIS AND CHARACTERIZATION OF QUERCETIN-LAYER DOUBLE HYDROXIDE (LDH) NANOHYBRID AND THEIR ENHANCED ANTIOXIDANT ACTIVITY

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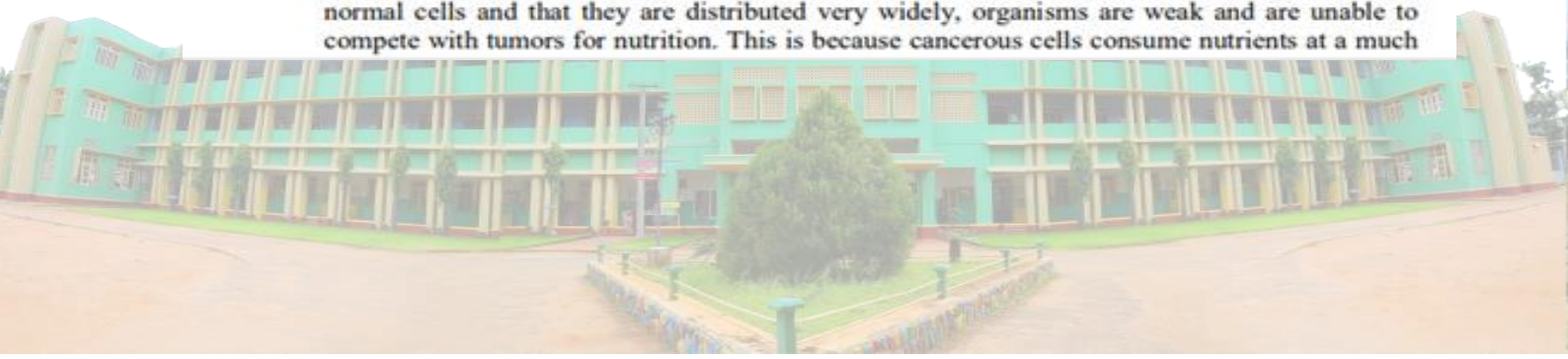
(Received December 13, 2022; Revised February 24, 2023; Accepted February 25, 2023)

ABSTRACT. This research included the synthesis of pristine nitrate-type Zn₂Al-LDH by means of Co-precipitation, which was then followed by hydrothermal treatment. Ion exchange is used to stabilize the produced pristine LDH nano layer, which is used for the encapsulation of bioactive molecules. Quercetin, which has an antioxidant function, is used. XRD was used to investigate the newly synthesized quercetin-LDH (QC-LDH) compound. Quercetin was discovered to be entirely deprotonated as a result of XRD research, and it was also shown to be stabilized in between LDH lattices as a result of electrostatic contact. On the basis of the diphenyl picrylhydrazyl (DPPH) method, the anti-oxidant property was discussed, and it was discovered that the quercetin that was free from the LDH layer helped as an owing antioxidant to scavenge DPPH radicals in ethanol solvent at concentrations ranging from 80-100%, depending on the concentration level. The powder X-ray diffraction patterns indicate that the incorporation of quercetin into the interlayer led to an expansion of the interlayer arrangement to 0.88 and 1.46 nm, respectively. According to the findings of a variety of characterization techniques, the QC-LDH may be regarded as a good antioxidant material with potential drug delivery system.

KEY WORDS: Layer double hydroxide, Antioxidant activity, Quercetin, Biocompatibility

INTRODUCTION

Cancer has increasingly become one of the most significant obstacles to be faced in terms of the world's public health. According to the data published by the World Health Organization (WHO), cancer is responsible for the deaths of 8.97 million individuals worldwide each year. As a result of this, cancer has now surpassed coronary artery disease to become the second leading cause of death, falling just behind ischemic heart disease as the leading cause of death. Due to the fact that tumors are made up of cancer cells that are encircled by normal healthy cells within the extracellular matrix, such as adipocytes and immune cells, tumours can only be removed surgically and the microenvironment of a tumors is both complicated and distinct. In compared to typical rates of cell growth, it is distinguished by an abnormally rapid rate of cell growth, which is one of its defining characteristics. Because it is now common knowledge that the metabolic state and consumption power for nutrients of cancerous cells is significantly higher than that of normal cells and that they are distributed very widely, organisms are weak and are unable to compete with tumors for nutrition. This is because cancerous cells consume nutrients at a much



2. Research Collaboration– Joint Author Publication

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Original Article

DNA Binding and Cleavage Study of Novel Ruthenium (II)-Polypyridine-5-(3-pyridyl)-4H-1,2,4-Triazole-3-Thiol Complex on *Escherichia Coli* Genomic DNA

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Abstract

Background: Transition metal complexes especially Ruthenium-Polypyridyl complexes interact with multidentate ligands considered as a new therapeutic agent to make the possible DNA probes and conformers due to their potential applications. The aim of the present work is to concentrate on the binding and cleavage activity of $[\text{Ru}(\text{bpy})_2(\text{pytrzSH})]^{2+}$ (complex 1) and $[\text{Ru}(\text{phen})_2(\text{pytrzSH})]^{2+}$ (complex 2) (bpy = 2,2'-bipyridine, phen = 1,10-phenanthroline, pytrzSH = 5-(3-pyridyl)-4H-1,2,4-triazole-3-thiol) on *Escherichia coli* genomic DNA (gDNA). **Materials and Methods:** DNA binding and cleavage activity is carried out using ultraviolet-Visible spectral technique and Agarose gel electrophoresis method at three different concentrations against the standard genomic DNA isolated from *E. coli* bacteria. **Results:** The changes in the absorbance and wavelength upon incremental addition of the complexes on gDNA clearly depict the binding nature of complexes. The binding constant values for ligand centered and metal to ligand charge transfer transitions obtained from the Benesi Hildebrand plots are found to be 1.560×10^4 and $9.586 \times 10^4 \text{ M}^{-1}$ for complex 1 and 3.594×10^4 and $9.801 \times 10^4 \text{ M}^{-1}$ for complex 2. The results revealed that complex 2 shows better binding property than complex 1 on *E. coli* gDNA. The extent of DNA cleavage activity of the synthesized complexes on *E. coli* gDNA is determined from the band intensities, complex 2 shows full cleavage in all the three concentrations, whereas complex 1 exhibits full cleavage at 100 $\mu\text{g}/\text{mL}$. The cleaving ability depends on the nature of the ligands present in the complexes. **Conclusion:** The synthesized $[\text{Ru}(\text{bpy})_2(\text{pytrzSH})]^{2+}$ (complex 1) and $[\text{Ru}(\text{phen})_2(\text{pytrzSH})]^{2+}$ (complex 2) bind with the *E. coli* gDNA through electrostatic and intercalative modes. The $[\text{Ru}(\text{phen})_2(\text{pytrzSH})]^{2+}$ complex 2 shows better cleavage activity than $[\text{Ru}(\text{bpy})_2(\text{pytrzSH})]^{2+}$ complex 1.

Keywords: Binding constant, DNA binding, DNA cleavage, *E. coli* genomic DNA, ruthenium(II)-polypyridine complexes

INTRODUCTION

Bacterial genomic DNA (gDNA) is a highly condensed and functionally organized nucleus-like structure without a nuclear membrane resides inside the cells. The first important genome which gets completely sequenced and contributes major to recombinant DNA technology is *E. coli*.^[1-3] It survives when released to the natural environment and gets colonized in the lower gut of animals allowing widespread dissemination to new hosts.^[4] Therefore, *Escherichia coli* is frequently used as a model organism in microbiology and molecular biology studies.^[5] The *E. coli* chromosome is composed of the gDNA, RNA and protein.^[6,7]

Nowadays, research is focused toward the introduction of novel and biologically safe therapeutic agents. Metal complexes play

a vital role in pharmaceutical and medicinal chemistry and are used as therapeutic agents.^[8-10] Researchers have reported that the binding of a drug to a metal complex increases its activity.^[11] Among the transition metal complexes, particularly ruthenium(II)-polypyridyl complexes have significant interest for developing new diagnostic and therapeutic agents that can

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3. Research Collaboration– Joint Author Publication

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3/16/23, 5:44 AM Synthesis, Characterization, In vitro Antiproliferative and Cytotoxic Effect of Ruthenium(II)-Bipyridine-Benzoylpicolinic Acid Co...



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Research Articles

Synthesis, Characterization, In vitro Antiproliferative and Cytotoxic Effect of Ruthenium(II)-Bipyridine-Benzoylpicolinic Acid Complex on SK-MEL-28 and Normal L6 Cell Lines

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DOI: <https://doi.org/10.48048/tis.2022.3040>

Keywords: [Ru(bpy)₂(bzpic)₂]²⁺ complex, SK-MEL-28 and L6 cell lines, MTT assay, Antiproliferative effect, Fluorescence microscopy, Anti-skin cancer activity

ABSTRACT

The most seriously spread malignant tumor of melanocytes throughout the body is a melanoma type of skin cancer. SK-MEL-28 cell line is one of a series of melanoma cell lines. The objective of the present investigation is to study the anticancer activity and cytotoxicity of novel [Ru(bpy)₂(bzpic)₂]²⁺ (bpy = 2,2'-bipyridine and bzpic = 3-Benzoylpicolinic acid) complex on SK-MEL-28 and normal L6 cell lines using MTT assay method. The morphology of the cancerous SK-MEL-28 cell line at various concentrations of the [Ru(bpy)₂(bzpic)₂]²⁺ complex is assessed by 2-fold dilution method, and the *in vitro* antiproliferative effect of the complex on the cancerous SK-MEL-28 cell line is analyzed by direct microscopic observation method. The percentage viability of the complex on cancerous SK-MEL-28 cell line at various concentrations is determined. The IC₅₀ value of the complex against the SK-MEL-28 cell is found to be 39.109 µg/mL which shows good antiproliferative effect. The IC₅₀ value of the complex against normal L6 cell line is found to be 55.315 µg/mL. The results revealed that the percentage of growth inhibition of the cell is based on



4. Research Collaboration– Joint Author Publication

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Synthesis and characterization of natural fibre with ZnO nanocomposites | SpringerLink

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Synthesis and characterization of natural fibre with ZnO nanocomposites

[Y. Brucely](#), [Y. Christabel Shaji](#), [G. Paulraj](#), [D. Manikandan](#), [N. Nagaprasad](#), [Rajesh Singh](#), [Lovi Raj Gupta](#), [Jule Leta Tesfaye](#), [Bayissa Badassa](#) & [R. Krishnaraj](#) 

International Journal on Interactive Design and Manufacturing (IJIDeM) (2022)

78 Accesses | [Metrics](#)

Abstract

The applications of nanocomposites are not limited to a single field but are widely spread across a wide range. The application of nanocomposites embraces automotive, solar panels, sporting goods, aerospace, structural, cryogenic vessels, structural gas and oil pipelines. The polyester resin matrix-based polymer ZnO nanocomposites will be synthesized by the solution casting method. Manufacturing of nanocomposite is recommended by adding nano ZnO and nano coconut shell filler in polyesters at various weight ratios using the hand layup process. The crystalline structure of both nano-particles will be investigated using the X-ray diffraction method. Purity and base polymer composition will be determined by the Fourier



5. Research Collaboration– Joint Author Publication

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Online acoustic emission measurement of tensile strength and wear rate for AA8011-TiC- ZrB2 hybrid composite - IOPscience

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PAPER

Online acoustic emission measurement of tensile strength and wear rate for AA8011-TiC- ZrB2 hybrid composite

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6. Research Collaboration– Joint Author Publication

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A novel synthesis of phyto-mediated silver nanoparticles and its bacterial performance against microbes - ScienceDirect



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A novel synthesis of phyto-mediated silver nanoparticles and its bacterial performance against microbes

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Abstract

Green chemistry is the design, development, and execution of chemical products and processes to minimize or eliminate the use and procreation of substances unsafe to human health and the environment.

Nanoparticles are often mentioned as clusters, nanospheres, nanorods, and nano cups are just a few of the shapes at the small end of the size ranges from 1 to 100nm. The development of an eco-friendly process through various biological means helps to traverse various plants for their ability to interpret silver nanoparticles. In this investigation, we delineate the synthesis of silver nanoparticles using the leaf elicits of *Euphorbia hirta* and *Cardiospermum halicacabum*. Synthesized particles are characterized by UV-Spectrophotometer and FT-IR analysis. The antibacterial effects of Ag salts have been noticed since antiquity and Ag is currently used to control bacterial growth in a variety of applications, including dental work, catheters, and burn wounds. It is illustrious that Ag ions and Ag-based compounds are highly venomous to microbes, revealing strong biocidal effects. Further, the interpreted silver nanoparticles were tested against common bacterial pathogens.

[Previous](#)

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Keywords

Characterization; *Euphorbia hirta*; *Cardiospermum halicacabum*; Leaf extract; Silver nanoparticles; Antimicrobial activity

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7. Research Collaboration– Joint Author Publication

- a. Government Polytechnic College, Nagercoil, Kanyakumari District, Tamil Nadu.

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Computational Study of Ruthenium(II)-Benzimidazole Complex

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ABSTRACT

The computational study of $[\text{Ru}(\text{H}_2\text{pbbzim})_2]^{2+}$ ($\text{H}_2\text{pbbzim} = 2,6\text{bis}(\text{benzimidazole-2-yl})\text{pyridine}$) complex having tridentate ligands has been investigated using Gaussian 09 software. The DFT calculation of the complex is carried out by the B3LYP method in the LANL2DZ basis set. The bond lengths and the bond angles of the complex can be determined from the optimized structure. Quantum chemical parameters like E_{HOMO} , E_{LUMO} , HOMO-LUMO energy gap, chemical potential, electronegativity, chemical hardness, ionization energy, electron affinity, Softness and electrophilicity index of the $[\text{Ru}(\text{H}_2\text{pbbzim})_2]^{2+}$ complex is calculated. The energy gap of $[\text{Ru}(\text{H}_2\text{pbbzim})_2]^{2+}$ complex obtained from the theoretical calculation is 0.7319 eV. The theoretical values predict that $[\text{Ru}(\text{H}_2\text{pbbzim})_2]^{2+}$ complex is appropriate for optical sensing studies. Thus, the computation study may shed some light on the future applications of the complex.

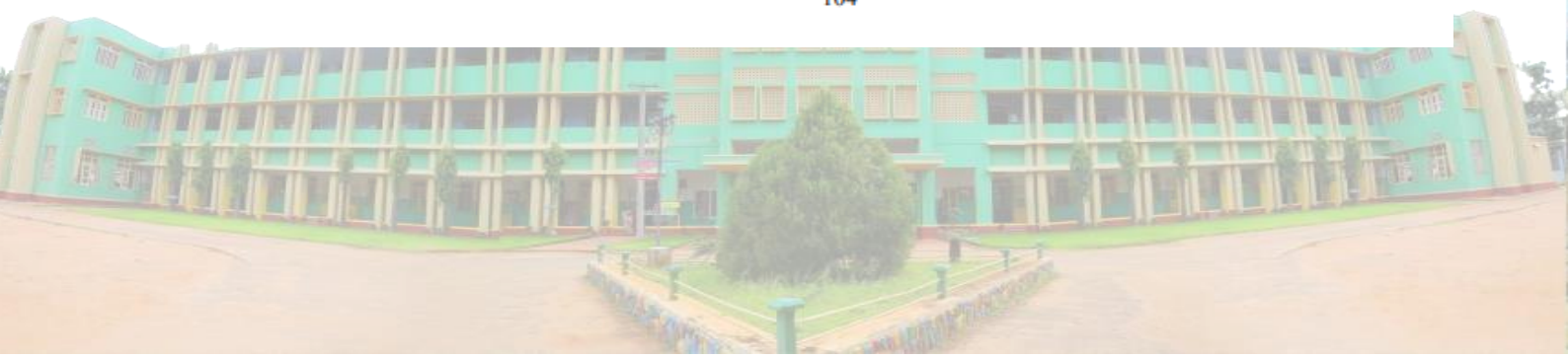
Keywords: Computational study, $[\text{Ru}(\text{H}_2\text{pbbzim})_2]^{2+}$ complex, DFT calculation, Quantum chemical parameters

Introduction

Transition metal-based materials are much more advantageous over pure organic frameworks, as they can offer better tunability of the structural, optical, electrochemical and electronic properties [1]. Among the various transition metals, coordination complexes based on Ru(II) metal are considered as potential building blocks for the design of suitable functional materials, as they possess outstanding photophysical and optoelectronic properties which primarily evolve from their metal to ligand charge transfer (MLCT) excited states [2,3].

Ruthenium complexes are widely used and studied in different chemical fields. They attract the attention of researchers due to their high stability and the easy modification of their

properties by employing carefully controlled synthetic methods. Complexes bearing π -conjugated ligands or systems that enable electronic delocalization have shown specific



8. Research Collaboration– Joint Author Publication

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Green synthesis and characterization of chitosan doped nickel oxide nanocomposites using *Euphorbia hirta* and its antimicrobial activity

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Abstract

Chitin is extracted from shells of shrimps and characterized using UV-drs spectroscopy. It is converted to chitosan by the process of deacetylation and to nanochitosan by the process of sonication. Chitosan and nanochitosan are characterised using UV-Vis and FTIR spectroscopy. Nickel oxide nanoparticles (NiO) are green synthesised from Nickel chloride crystals using *Euphorbia hirta* medicinal plant leaf extract which contains alkanes, triterpenes, phytosterols, tannins, polyphenols and flavanoids as reducing agent. *E. hirta* serves as a good medicine for treating female disorders, respiratory ailments, worm infestations in children, dysentery, jaundice, pimples, gonorrhoea, digestive problems and tumors. The formation of nano NiO is characterised by UV-Vis, FTIR and XRD spectroscopic techniques.

The nano NiO particles are doped with nanochitosan and the antimicrobial activity of the resulting composite is analysed with *Staphylococcus aureus* and *Pseudomonas aeruginosa* bacterium using amikacin as the control. The results shows the enhancement in the antibacterial nature of the composite.

Keywords: Chitin, chitosan, *E. hirta*, nickel oxide, antimicrobial properties.

Introduction

Chitin is a waste product obtained from fish processing company. It has limited applications due to its poor solubility in water, however its properties can be modified by converting it into chitosan by deacetylation^{5,9,11}. Chitins present in the shells of crustaceans are abundant sources of chitosan. Chitosan is a natural polymer obtained by deacetylation of chitin. Both chitin and chitosan possess antimicrobial activity⁴. The biomedical applications of chitin and chitosan are restricted because of its insoluble nature in most solvents, low mechanical properties^{13,21}. The physicochemical and biological properties of chitosan can be improved by surface modification by doping with metal oxide nanoparticles. Enormous work is available in the literature about the preparation and doping of chitosan with nanometal oxide, synthesised using various methods¹⁹ which

contribute to environmental pollution. Only limited work is reported related to preparation of metal nanoparticles using green methods^{16,18}, utilising medicinal plant extracts as reducing agents^{3,15}. This study compares antibacterial activity of the resulting NiO doped and undoped chitosan with that of NiO nanoparticles alone².

This study reveals that the method of preparation of nickel oxide nanoparticles from Nickel (II) chloride hexahydrate using ethanolic extract of *E. hirta* medicinal plants is cheap, environmentally friendly and easily available. It also proves that doping of nickel oxide nanoparticles in chitosan improves its antibacterial activity and hence chitosan nickel oxide nanocomposite can be used as a good antibacterial reagent.

Material and Methods

Materials: The raw material chitin required for the present study is prepared from the shells of shrimps collected from fish market, Nagercoil, Kanyakumari District. Chitosan was synthesised from chitin by deacetylation. *Euphorbia hirta* leaves were collected from Kurusady, Nagercoil, Kanyakumari District, India. Shells of shrimps were selected as primary source for chitosan in the present study. The shells were collected from Ramanputhoor, (Nagercoil, Tamilnadu, India) fish market.

Methods: The shells were cleaned, washed with water and dried in sunlight for 15 days and UV-drs spectroscopy of chitin in absorbance & reflectance mode was recorded and demineralised by adding 1:1 HCl solution. The demineralised chitosan was heated with 1M HCl for 15 minutes near to 100°C and decolourised using H₂O₂. Deacetylation was done by treatment with 50% NaOH at 100 - 150°C for one hour and was washed well with distilled water and then dried at hot air oven at 60°C for 4 hours.

Euphorbia hirta leaves were shade dried for 15 days, powdered and the Ethanolic extract of the leaves was obtained using Soxhlet extractor. Nickel chloride hexahydrate was obtained from Merck, India. Only deionised water was used in the entire study.

Preparation of nickel oxide nanoparticles: Nickel oxide nanoparticles are synthesised by the reduction of Nickel (II)



9. Research Collaboration– Joint Author Publication

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- PSN Engineering College, Tirunelveli.

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ZnO Polymer Nano Composites Synthesis, Characterization, and Thermo-Mechanical Property Comparison

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Abstract

Both the polyester resin matrix-based polymer ZnO nano composites and pure polyester sheet were synthesised using the solution casting method. The crystalline structure of the nano-particles was examined inside using X-ray diffraction (XRD). The fundamental polymer composition, additives, organic contaminants, and purity were all assessed by FTIR. A minor alteration in the absorption bands was seen in the polyester system with ZnO added. The thermal properties were examined using differential scanning calorimetry (DSC) and thermo gravimetric analysis (TGA), and the results unmistakably demonstrated the creation of a highly cross-linked polyester molecular structure or improved free volume fractions in polymer nano composites. A mechanical analyzer's tensile and flexural strength tests revealed the potential for nanoparticle aggregation due to a strong interaction with resin. To calculate the relative permittivity and the loss of tangents (\tan), dielectric studies had been used. Analysis of the hydrophobic properties of the pure and ZnO polyester nano composite.

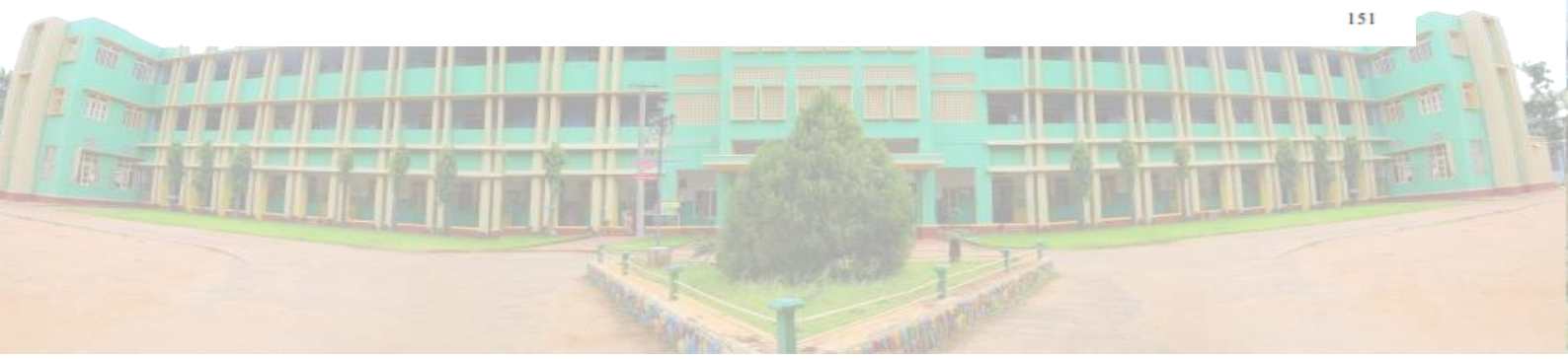
Keywords: Polyester resin, Polymer ZnO Nano composites, Pure polyester sheet, Thermal, Mechanical properties, Dielectric spectroscopy, Hydrophobic character.

1.0 Introduction

Thermosetting resins and the composites made from them are widely used in a number of applications due to their remarkable properties and low cost [1-3]. In order to preserve the resins from environmental deterioration, inorganic particles are also added; nevertheless, the addition of several common inorganic particles has a tendency to decrease the material's strength and transparency. The strength of the

material is not in any way diminished by this binding process because nano-particles typically have a more active surface and bind to the resins with sufficient strength. As a result, a sizable amount of research has focused on using nano-particles to improve thermosetting resins [4]. ZnO nano-particles, also referred to as ZnO NPs, have a strong absorption ability. It can be used on matrices to protect them from environmental effects and increase the tensile strength of the materials [5]. The material's smaller diameter and the

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DEPARTMENT OF BOTANY

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Original article

Green synthesized ZnO NPs as effective bacterial inhibitor against isolated MDRs and biofilm producing bacteria isolated from urinary tract infections

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ABSTRACT

Based on the importance of multi drug resistant and biofilm forming bacterial spread, the current research work aimed on synthesizing the nanoparticles of zinc oxide from the plant parts of *Limonia acidissima*. They were assayed for their antibacterial activities against biofilm forming urinary tract infected pathogens including *Salmonella paratyphi*, *Shigella*, *Streptococcus*, *Staphylococcus* and *Klebsiella pneumoniae* which was confirmed by anti-microbial susceptibility test, 24-well polystyrene plate and modified tube test methods. The formulation of nanoparticles was confirmed by UV-Visible spectrophotometry. Fourier transform infrared spectroscopy revealed the formation of biomolecules that has great involvement in stabilizing the zinc oxide. The size as well as the shape with high resolution was confirmed with electron microscopical studies. It is very clear that zinc oxide nanoparticles have great antimicrobial effect because of its inhibition role against tested urinary tract bacteria by various invitro experiments. This provides a positive thinking on novel drug discovery, in which human health can be improved. Hence, this study provides a scientific support to the medicinal uses of zinc oxide nanoparticles for the treatment of microbial infections.
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1. Introduction

Worldwide, most prevalence infections are urinary tract infection, and it affected >10% peoples every day among the total of 150 million (Abad et al., 2019). Recent years, the most of the physicians reported that the urinary tract infection is the most recognized bacterial infection and the treatment is failure (Soto et al., 2006). In women, it is very complicated infection due to the sud-

den increase of pregnancy diabetics, functional abnormalities, immunocompromised nature and failure of existing drugs (Hashemzadeh et al., 2021; Katongole et al., 2020). More reports are pointed out about urinary tract infection and it account 80% of multi drug resistant behavior (Al-Mahfoodh et al., 2021; Rajivgandhi et al., 2018). Recently, multiple reports are evidenced that bundles of virulence factors are the important specific reasons for developed multi drug resistant in urinary tract infection (Baiou et al., 2021; Govindan et al., 2018). Especially, extended spectrum beta lactamases, quorum sensing and biofilm formation by exopolysaccharide are the more possible reason (Jafarzadeh et al., 2020; Cheng et al., 2015). Among the urinary tract infection, these three virulence factors contributed almost 75% and developed more resistant against existing drugs (El mekes et al., 2020; Chitra et al., 2010). Almost all the beta lactum antibiotics are ineffective or more susceptible to multi drug resistant bacterium which leads to biofilm formation.

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ETHNOMEDICINAL PLANTS USED BY THE PEOPLE OF THICKANAMCODE VILLAGE, KANYAKUMARI DISTRICT, TAMIL NADU, INDIA

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ABSTRACT

Plants have been used since ancient times for the treatment of various ailments. The present study documents the commonly used medicinal plants used by the people of Thikkanamcode village through Participatory Rural Appraisal (PRA) method and interview method. A total of 70



3. Research Collaboration – Joint Author Publication

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AES

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EVALUATION OF BIODEGRADABLE WASTE AS MANURE FOR TERRACE GARDEN

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ABSTRACT

Communities will grow more congested as civilizations become more wealthy and urbanized. As a result, trash disposal, particularly biodegradable waste, will become more difficult since it will be thrown in the streets, having a detrimental effect on both human health and the environment. This biodegradable waste can be turned into vegetable manure for the terrace garden, which would lessen the immediate family needs. Terrace gardening not only helps households obtain fresh produce free of chemicals but also returns some land to agriculture.

Keywords: Negative impact, Manure, Chemical-free, Biodegradable waste

1. INTRODUCTION

The need for the production of organic food in agriculture, which is quickly becoming an appealing source of income generating, is the result of an increased awareness of health and environmental challenges in agriculture. These days, cultivating vegetables has evolved into an economic activity that may be classified as a company. Products labeled as organic have been produced in accordance with a method of agriculture that forgoes the use of chemical fertilizers and pesticides in favor of tending to one's social and environmental responsibilities. This type of farming is effective at the grass roots level, preserving the reproductive and regenerative capacity of the soil. It also produces nutritious food rich in vitality that is resistant to diseases. Good plant nutrition and sound soil management are also important components of this type of farming (Thiripurasundari 2015). When purchasing veggies at the grocery store, you run the risk of ingesting traces of pesticides and other agricultural pollutants. The cultivators employ an excessive amount of chemical fertilizers and pesticides in order to increase their yield and hence their income. The majority of farmers aren't able to determine the precise amount of fertiliser or pesticide to use, so they just throw it on, assuming that the more fertiliser they use, the better the crop will turn out. As a direct consequence of this, the vast majority of the vegetables that are offered for sale in the market contain hazardous compounds. however, the vegetables that you cultivate yourself on your terrace at home won't be exposed to any of those chemicals. It is simple to convert all biodegradable garbage into organic manure that can

4047



4. Research Collaboration – Joint Author Publication

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Review on the Medicinal Applications of Zinc Oxide Nanoparticles

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Abstract

Nanotechnology has advanced dramatically over the last several decades. Zinc oxide (ZnO), which can have a wide range of nanostructures, has unique semiconducting, optical, and piezoelectric properties and has thus been studied for a wide range of applications. Low toxicity and biodegradability are important characteristics of ZnO nanomaterials. Zn²⁺ is an essential trace element for adults (a daily dose of 10 mg is recommended) and is involved in many aspects of metabolism. ZnO's surface is chemically rich in -OH groups, which can be easily functionalized by various surface decorating molecules. We summarised the current state of the use of ZnO nanomaterials for biomedical applications such as biomedical imaging (including fluorescence, magnetic resonance, positron emission tomography, and dual-modality imaging), drug delivery, gene delivery, and biosensing of a wide range of molecules of interest in this review article. Over the next decade, research in biomedical applications of ZnO nanomaterials will flourish, and much effort will be required to develop biocompatible/biodegradable ZnO nanoplatforams for potential clinical translation.

Keywords: Zinc oxide, nanomaterials, drug delivery, gene delivery.

Introduction

Nanomaterials are nanometer-sized falls with diameters ranging from 1 to 100 nm, and these materials have enhanced unique properties. Physical, chemical, and



5. Research Collaboration – Joint Author Publication

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RESEARCH ARTICLE

Ethnomedicinal plants used by the Vetans of Kanniyakumari District, Tamil Nadu, India

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ABSTRACT

An ethnobotanical survey was carried out among the Vetan community people who inhabit in periphery of the southern Western Ghats of Kanniyakumari district. A total of 153 plant species distributed in 134 genera belonging to 60 families were identified as commonly used ethnomedicinal plants used by the Vetan communities for the treatment of various ailments. The documented ethnomedicinal plants were mostly used to cure skin diseases, fever, ulcer, cold and cough and rheumatism. Leaves were the most frequently used plant parts. Herbs (70 taxa) were the primary source of medicine, followed by shrubs (52 taxa) trees (30 taxa), climbers (8 taxa). Medicinal plants are arranged alphabetically to their botanical names, vernacular names, family, part of the plant used and ethnomedicinal uses are tabulated along with their major phytochemical constituents. This finding reveals that the study area rich in medicinal flora and the community people still using medicinal plants in their daily life. Traditional knowledge of

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DEPARTMENT OF ZOOLOGY

1. Research Collaboration – Joint Author Publication

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Purification and Characterization of a Sialic Acid Specific Lectin Isolated from the Marine Crab *Grapsus albolineatus* (GaLec)

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Abstract
Lectins one of the defensive protein molecules have become the focus of intense interest for biologists and in particular for the research and applications in medicine. In this study, a lectin GaLec was purified from the marine crab *Grapsus albolineatus* by affinity chromatography using Fetusin-Sepharose 4B column. GaLec showed specific affinity for rat erythrocytes as evident from the hemagglutination assay. Physico chemical analysis of the GaLec demonstrated high hemagglutination activity ranging from pH 7.5 to 9 and temperature 0 to 40°C. The GaLec was dependent on calcium, magnesium and manganese. It was reversibly sensitive to EDTA and trisodium citrate. Hemagglutination activity was inhibited by the sugar N-acetyl D-glucosamine and N-acetyl D-galactosamine and the glycoproteins fetusin and lactoferrin. Reduction in HA with disialylated fetusin confirms the sialic acid specificity of the lectin. The reduction of HAI following de-O-acetylation confirms the specificity of the lectin for O-acetyl sialic acid.

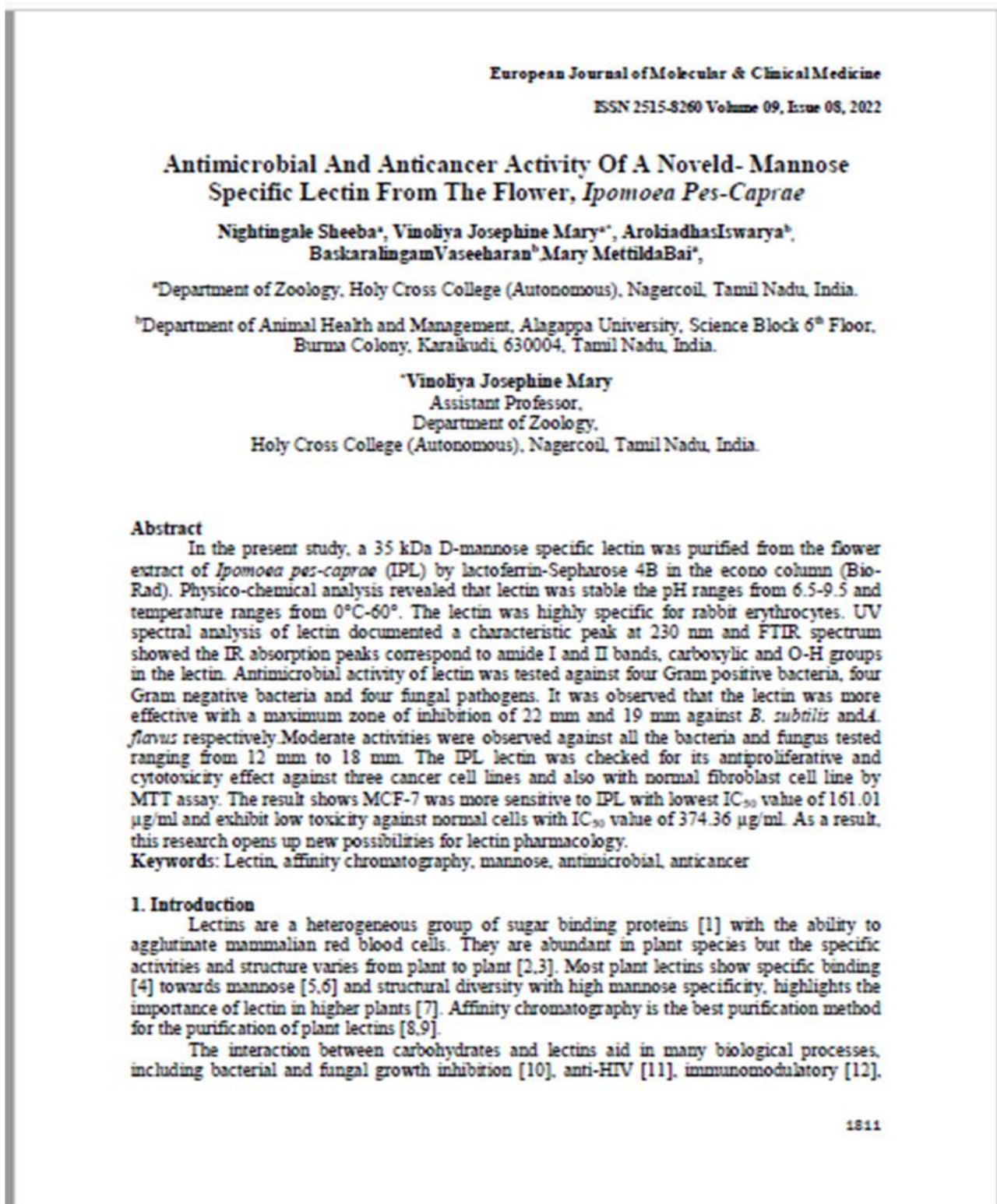
Keywords: *Grapsus albolineatus*, Fetusin, Sepharose, EDTA, Hemagglutination, Sialic acid

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2. Research Collaboration – Joint Author Publication

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DEPARTMENT OF ECONOMICS

1. Research Collaboration – Joint Author Publication

a. Vellore Institute of Technology, Chennai

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A STUDY ON PSYCHOLOGY AND MEMORIES OF THE PEOPLE IN NAGERCOIL TOWN

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Neil Beeto Jerrin

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INTRODUCTION

Past life regression is a method that uses hypnosis to recover what practitioners believe are memories of past lives or incarnations. The practice is widely considered discredited and unscientific by medical practitioners, and experts generally regard claims of recovered memories of past lives as fantasies or delusions or a type of confabulation. Past-life regression is typically undertaken either in pursuit of a spiritual experience, or in a psychotherapeutic setting. Most advocates loosely adhere to beliefs about reincarnation,^[2] though religious traditions that incorporate reincarnation generally do not include the idea of repressed memories of past lives.

Memory

Memory is the way in which we record the past and later refer to it so that it may affect the present. It is hard to think of humans without this capacity. The more we can evaluate, understand, train, and strengthen our relationship with the mind, the more successfully we navigate our lives and overcome challenges.

PSYCHOLOGICAL BACKGROUND

Psychology is the science of mind, sometimes as the science of behaviour, i.e., how and why organisms do what they do. For example, why do birds sing and why do we remember how to ride a bicycle twenty years after the last try. All of these are behaviours, and psychology is the science that studies them all. The technique used during past-life regression involves the subject answering a series of questions while hypnotized to reveal identity and events of alleged past lives, a method similar to that used in recovered memory therapy and one that, similarly, often misrepresents memory as a faithful recording of previous events rather than a constructed set of recollections. The use of hypnosis and suggestive questions can tend to leave the subject particularly likely to hold distorted or false memories. The source of the memories is more likely cryptomnesia and confabulations that combine experiences, knowledge, imagination and suggestion or guidance from the hypnotist than recall of a previous existence. Once created, those memories are indistinguishable from memories based on events that occurred during the subject's life. Investigations of memories reported during past-life regression have revealed that they contain historical inaccuracies which originate from common beliefs about history, modern popular culture, or books that discuss historical events. Experiments with subjects undergoing past-life regression indicate that a belief in reincarnation and suggestions by the hypnotist are the two most important factors regarding the contents of memories reported.

STATEMENT OF THE PROBLEM

Nagercoil is the place for good education and better climate. People in Nagercoil are somewhat safe and happy. They have psychological problems and several memories in the



DEPARTMENT OF CHEMISTRY





Internship Programme

Institution: BITS Pilani, Hyderabad

Activity: Lab Procedures and Practices

Date: 23-05-2022 to 17-07-2022

Beneficiaries: 1

		
<p>Indian Academy of Sciences, Bengaluru Indian National Science Academy, New Delhi The National Academy of Sciences India, Prayagraj SUMMER RESEARCH FELLOWSHIPS — 2022</p>		
<hr/>		
Name of the candidate	:	Devika P Jayan
Application Registration no.	:	CHES1384
Date of joining	:	23-05-2022
Date of completion	:	17-07-2022
Total no. of days worked	:	56 days
Name of the guide	:	Prof. Ahmed Kamal
Guide's institution	:	BITS-Pilani Hyderabad Campus
Project title	:	Lab Procedures and Practices
<hr/>		
<p>Address with pin code to which the certificate could be sent: 1-14-7/26, 2nd cross street, 2nd main street, Perumalnagar-1 Aasarippallam post, Nagercoil, Kanyakumari dst. Tamil Nadu, 629201</p>		
<p>E-mail ID: pjayandevika@gmail.com</p>		
<p>Phone No: 8903303018</p>		
TA Form attached with final report	:	YES <input checked="" type="checkbox"/> NO
If, NO, Please specify reason	:	
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<p>Deika P Jayan</p>		
<p>Signature of the candidate</p>		<p>Signature of the guide</p>
<p>Date: <u>20-07-2022</u></p>		<p>Date: <u>20-07-2022</u></p>
<p>IMPORTANT NOTES: * This format should be the first page of the report and should be stapled with the main report. The final report could be anywhere between 20 and 25 pages including tables, figures etc. ^ The final report must reach the Academy office within 10 days of completion. If delayed fellowship amount will not be disbursed.</p>		
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Student:	Teacher:	Deduction:
Guide's name:		TA fare:
KVPY Fellow:	INSPIRE Fellow:	Amount to be paid:
Others		A/c holder's name:



DEPARTMENT OF ZOOLOGY

1. Research Collaboration – Seminar

a. Indian National Trust for Arts and Cultural Heritage

REPORT

The Department of Zoology and Startup Committee of the Institution's Innovation Council of Holy Cross College (Autonomous), Nagercoil along with Indian National Trust for Art and Cultural Heritage (INTACH), organized a workshop entitled

"Eco-Entrepreneurship: Paving the Way to Financial Upliftment of Women"

on 21st December 2022. Dr. Jeni Chandar Padua and Dr.P.T.Arolyva. Glory were the organizing secretaries of the seminar. The seminar commenced with a prayer song by I MSc Zoology Students. Ms. Agnel, I MSc Zoology was the Master of Ceremony. Ms. Salomeia, III BSc Zoology, welcomed the gathering. Dr. F. Brissa Sanyal, Head of the Department of Zoology, and Ms. Anitha Natarajan, Convener of INTACH, Nagercoil Chapter, felicitated the participants. Dr. Sunil Richardson, Co-Convener, INTACH, enlightened the participants with his excellent presentation on Palm leaf Craft: Promoting Eco-Entrepreneurship and Conserving Palmyra Trees.

He highlighted the importance of preservation and conservation of palm trees and displayed palm leaf manuscripts of ancient forms. He described the methods of producing palm leaf manuscripts which were followed in south Indian traditional communities for medicinal documentation and astrological forecasting as followed by tribal populations. He also described and exhibited various forms of stylus used for inscribing on palm leaf manuscripts and encouraged students to plant palmyra trees and conserve the dying palm industry for entrepreneurship related activities. Following this, Mr. Ponnambalam, Create Foundation Nagercoil, explained about " Agricultural Entrepreneurship: A Socio-Economic Perspective." He spoke on the varieties of traditional paddy seeds and also about paddy cultivation and encouraged students to revive paddy cultivation, and become agro-entrepreneurs in future.





DEPARTMENT OF ECONOMICS

2. Research Collaboration - National Seminar

a. S.T. Hindu College, Nagercoil



The poster features logos of Holy Cross College (Nagercoil - 629004) and S.T. Hindu College (Nagercoil - 629002) at the top. The main text reads: 'PG & RESEARCH DEPARTMENT OF ECONOMICS HOLY CROSS COLLEGE (AUTONOMOUS) Affiliated to Manonmaniam Sundaranar University, Accredited with A+ Grade (CGPA - 3.35) by NAAC (IV Cycle), Nagercoil - 629004, Tamil Nadu in collaboration with PG & RESEARCH DEPARTMENT OF ECONOMICS S.T. HINDU COLLEGE Affiliated to Manonmaniam Sundaranar University, NIRF 2022 - Rank Band 151-200, Nagercoil- 629002, Tamil Nadu Organizes National Seminar on DIGITALIZATION IN INDIA On 21-03-2023 Resource Persons'. Three resource persons are listed: Dr. P. Arunachalam (Professor of Economics, Cochin University of Science and Technology, Kochi, Kerala), Dr. P. Geetha (Associate Professor, Department of Economics, Sri GVG Visalakshi College for Women, Udumalpet), and Dr. M. Selvaraj (Assistant Professor, Department of Economics, Loyola College (Autonomous), Chennai). The venue is 'Multipurpose Hall, Holy Cross College (Autonomous), Nagercoil'.

