



# 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 2019-2020

### DEPARTMENT OF MATHEMATICS AIDED

#### 1. Research Collaboration - Doctoral Committee Member

##### a. Annai Velankanni College, Tholayavattam

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

**MINUTES OF THE FIRST DOCTORAL COMMITTEE MEETING**

The Doctoral Committee Meeting of the Ph.D. Scholar,  
Mr./Ms. S. ANDRIN SHAHILA (Reg. No. 19213012092006) was held  
on 08.08.2019 at 11 A.M. / P.M. in the Department of MATHEMATICS.

The following members were present

- Dr. M. ANTO (Supervisor & Convener)
- (Joint Supervisor, if applicable)
- Dr. G. DOMINIC BABU (Member)
- Dr. M.K. ANGEL JEBITHA (Member)

Mr./Ms. S. ANDRIN SHAHILA has presented the overview of the proposed research work. The Doctoral Committee has approved the research topic as " $\mathbb{Q}^*$ -closed sets in topological spaces".

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

Course Code	Course Title	Core Course / Special Elective
<u>ACWMA15</u>	<u>Research and Teaching Methodology</u>	<u>Elective</u>
<u>ACWMA16</u>	<u>Mini Project</u>	<u>Special Elective</u>

Number of course works as applicable to the scholars

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

Member Dr. M.K. ANGEL JEBITHA (Signature with Name and seal)  
Assistant Professor  
Department of Mathematics  
Holy Cross College (Autonomous)  
Nagercoil - 629 004  
8.8.19  
(Signature with Name and seal)

Signature of the HOD/Director of the Centre for Research of the institution where Dr. B. STEPHEN JOHN (Signature with Name and seal)  
Forw. M. Phil, P.H.D.  
Head, Dept. of Mathematics  
Annai Velankanni College  
Tholayavattam 629 157



2. Research Collaboration - Doctoral Committee Member

a. Women's Christian College, Nagercoil.



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

MINUTES OF THE FIRST DOCTORAL COMMITTEE MEETING

The Doctoral Committee Meeting of the Ph.D. Scholar,  
Mr./Ms. S. SOBIBA (Reg. No. 19213042014) was held  
on 12.9.2019 at 10.30 A.M./P.M. in the Department of Mathematics

The following members were present

1. Dr. S. Sujitha (Supervisor & Convener)
2. - (Joint Supervisor, if applicable)
3. Dr. T. Bafija Minnie (Member)
4. Dr. T. Anitha Baby (Member)

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

as "A Study on Geodesic Concepts in Graph Theory".

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

Course Code	Course Title	Core Course / Special Elective
<u>BCWMA03</u>	<u>Advanced Graph Theory</u>	<u>Core Course</u>
<u>BCWMA04</u>	<u>Mini Project</u>	<u>Core Course</u>

Number of course works as applicable to the scholars

Dr. T. Bafija Minnie  
**DR. T. BAFIJA MINNIE**  
Member  
Department of Mathematics  
Holy Cross College (Autonomous)  
Nagercoil - 629 004

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

Signature of the HOD/Director of the Center/Principal of the Institution where the supervisor is working

V. M. Arul Flower Mary  
**Dr. V. M. ARUL FLOWER MARY**  
Forwarded Sc., M. Phil., Ph.D.  
Head of the Research Centre,  
Department of Mathematics,  
Holy Cross College (Autonomous),  
Nagercoil - 629 004.

T. Anitha Baby  
**Dr. T. ANITHA BABY, M.Sc., M.A.**  
Member  
Assistant Professor  
Department of Mathematics  
Women's Christian College  
Nagercoil - 629 004

Dr. S. Sujitha  
**Dr. S. SUJITHA, M.Sc., Ed., M.Phil., Ph.D.**  
(Signature with Name and seal)  
Assistant Professor  
Department of Mathematics  
Holy Cross College (Autonomous)  
Nagercoil - 629 004.





3. Research Collaboration - Doctoral Committee Member

a. Women's Christian College, Nagercoil.



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

MINUTES OF THE FIRST DOCTORAL COMMITTEE MEETING

The Doctoral Committee Meeting of the Ph.D. Scholar,  
Mr/Ms. MICHAEL FLORANCE V.GI (Reg. No. 192230420) was held  
on 12-09-2019 at 11:30 A.M./P.M. in the Department of MATHEMATICS, HOLY CROSS COLLEGE  
NAGERCOIL

The following members were present

1. DR. V. M. ARUL FLOWER MARY (Supervisor & Convener)
2. (Joint Supervisor, if applicable)
3. DR. M. K. ANGEL JEBITHA (Member)
4. DR. T. ANITHA BABY (Member)

Mr/Ms. MICHAEL FLORANCE V.GI has presented the overview of the proposed research work. The Doctoral Committee has approved the research topic as "A STUDY ON TRIMAGIC LABELLING OF SOME GRAPHS".

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

Course Code	Course Title	Core Course / Special Elective
ACWMA04	Advanced Graph Theory	Core course
ACWMA04	Mini Project	

Number of course works as applicable to the scholars

M. K. Angel Jebitha  
Member  
(Signature with Name and seal)  
**Assistant Professor**  
Department of Mathematics  
Holy Cross College (Autonomous)  
Nagercoil - 629 004  
Joint Supervisor  
(Signature with Name and seal)  
(if applicable)

P. Anitha Baby  
**DR. T. ANITHA BABY**  
T. ANITHA BABY, M.Sc., M.Phil., M.Ed., Ph.D.  
Assistant Professor  
(Signature with Name and seal)  
Department of Mathematics  
Women's Christian College  
Nagercoil - 629 001  
V. M. Arul Flower Mary  
Supervisor  
(Signature with name and seal)  
**Dr. V. M. ARUL FLOWER MARY,**  
M.Sc., M.Phil., Ph.D.,  
Head of the Research Centre,  
Department of Mathematics,  
Holy Cross College (Autonomous),  
Nagercoil - 629 004.

V. M. Arul Flower Mary  
Forwarded  
Signature of the HOD/Principal of the institution where the work is done  
**Dr. V. M. ARUL FLOWER MARY,**  
M.Sc., M.Phil., Ph.D.,  
Head of the Research Centre,  
Department of Mathematics,  
Holy Cross College (Autonomous),  
Nagercoil - 629 004.



4. Research Collaboration - Doctoral Committee Member

a. Nesamony Memorial Christian College, Marthandam



CENTRE FOR RESEARCH  
MANONMANIAM SUNDARANAR UNIVERSITY,  
TIRUNELVELI, 627012, TAMILNADU, INDIA  
www.nsuniv.ac.in

MINUTES OF THE DOCTORAL COMMITTEE MEETING FOR CONFIRMATION OF PROVISIONAL REGISTRATION

The Doctoral Committee Meeting of the Ph.D. Scholar,  
Mr./Ms. B. Chentil Thanga Bama (Reg.No. 18112132092001) Mode  
Full time-Internal was held on 27/11/2020 at 11.30 A.M./P.M. in  
the Department/Institution of Mathematics, Holy Cross College (Autonomous) Nagercoil

The following members were present

1. Dr. S. Sujitha (Supervisor & Convener)
2. (Joint Supervisor)
3. Dr. M.K. Angel Jebitha (Member 1)
4. Dr. A. Vijayan (Member 2)


Mr./Ms. R. Chentil Thanga Bama 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	<u>PMAM35</u>	<u>Research Methodology</u>		<u>Full-time-Int</u>	<u>A</u>
2		<u>Mini Project</u>		<u>Full-time-Int</u>	<u>90%</u>
3					
4				<u>CGPA</u>	

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

The scholar 27/11/2020 had completed the first seminar presentation on 27/11/2020 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

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

  
Supervisor  
(Signature with Name and Seal)  
**Dr. S. SUJITHA**, M.Sc., B.Ed., M.Phil., Ph.D.  
Assistant Professor,  
Department of Mathematics  
Holy Cross College (Autonomous)  
Nagercoil - 629 004.





5. Research Collaboration - Doctoral Committee Member

a. Scott Christian College (Autonomous), Nagercoil.



CENTRE FOR RESEARCH  
MANONMANIAM SUNDARANAR UNIVERSITY,  
TIRUNELVELI, 627012, TAMILNADU, INDIA  
www.mauniv.ac.in

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

The Doctoral Committee Meeting of the Ph.D. Scholar.  
Mr./Ms. P. Selva Renuka (Reg. No. 1812/315/2019/2021) Mode  
Part time Internal was held on 31/01/2020 at 1:15 A.M./P.M. in  
the Department/Institution of Holy Cross College

The following members were present

1. Dr. M.K. Angel Jebitha (Supervisor & Convener)
2. (Joint Supervisor)
3. Dr. V.S. Irine Shela (Member 1)
4. Dr. V.M. Arul Flower Mary (Member 2)


Mr./Ms. P. Selva Renuka 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		<u>Mini Project - Cartesian</u>			
2		<u>Product of a Hypergraph and</u>			<u>80</u>
3		<u>Directed Hypergraph</u>			
4				CGPA	

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 Cartesian Product of Hypergraph and Directed Hypergraph 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 Dr. M.K. Angel Jebitha, and permits / ~~not permits~~ the scholar to proceed with his/her research work

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

  
Supervisor  
(Signature with Name and Seal)

**Dr. M.K. ANGEL JEBITHA,**  
M.Sc., M.Phil., B.Ed., Ph.D.  
Assistant Professor,  
Department of Mathematics  
Holy Cross College (Autonomous)  
Nagercoil - 629 004.



6. Research Collaboration - Doctoral Committee Member

- a. S. T. Hindu College, Nagercoil
- b. T.D.M.N.S College, T. Kalikulam



CENTRE FOR RESEARCH  
MANONMANIAM SUNDARANAR UNIVERSITY,  
TIRUNELVELI, 627012, TAMILNADU, INDIA  
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MINUTES OF THE SECOND DOCTORAL COMMITTEE MEETING

The Doctoral Committee Meeting of the Ph.D. Scholar, Mr./Ms. J. ANNE MARY LEEMA (Reg.No. 18023162092027 /Mode Post-Doc Internship) was held on 04/03/2020 at 11.15 A.M./P.M. in the Department/Institution of Mathematics, S.T Hindu College Nagercoil.

The following members were present

- 1. Dr. V.M. Arul Flower Mary (Supervisor & Convener)
- 2. Dr. B. Uma Devi (Joint Supervisor)
- 3. Dr. M.K. Angel Jebitha (Member 1)
- 4. Dr. V. Mary Gleeta (Member 2)

Mr./Ms. J. ANNE MARY LEEMA 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	ACU10A01	Commutative Algebra	4		A+
2	ACU00A01	Advanced Analysis	4		A
3	ACU00A01	Algebra and Spectral Theory	4		A
4		Minor Project	4		96
				CGPA	


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 04/03/2020 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 permits / not permits the scholar to proceed with higher research work in the Faculty of Mathematics.

  
**Dr. V. Mary Gleeta**  
Assistant Professor  
Department of Mathematics  
T.D.M.N.S. College, T.Kalikulam - 627 113

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

**Dr. B. UMA DEVI, M.Sc.M.Phil.Ed.Ph.D**  
Associate Professor  
Dept. of Mathematics,  
S.T. HINDU COLLEGE,  
Nagercoil

  
**Dr. A. Vijayalakshmi**  
Associate Professor & Head  
Department of Mathematics  
S.T. Hindu College, Nagercoil  
Tamil Nadu - 629 002

  
**Dr. M.K. ANGEL JEBITHA.**  
M.Sc. M.Phil. B.Ed. M.L.S.  
Assistant Professor  
Department of Mathematics  
Holy Cross College (Autonomous)  
Nagercoil - 629 004  
Supervisor


**Dr. V.M. ARUL FLOWER MARY**  
Associate Professor & Head  
Department of Mathematics  
Holy Cross College (Autonomous)  
Nagercoil - 629 004





7. Research Collaboration: Doctoral Committee Member

a. S. T. Hindu College, Nagercoil.



**CENTRE FOR RESEARCH MANONMANIAM SUNDARANAR**  
UNIVERSITY TIRUNELVELI – 627 012 www.msuniv.ac.in

**MINUTES OF THE FIRST DOCTORAL COMMITTEE MEETING**

The Doctoral Committee Meeting of the Ph.D. Scholar, Mr./Ms. Jaspin Ida P (Reg. No. 2012315209 <sup>2018</sup>) was held on 19.03.2020 at 11.00 A.M./P.M. in the Department of Mathematics

The following members were present

1. Dr. A. Vijayalekshmi (Supervisor & Convener)
2. (Joint Supervisor, if applicable)
3. Dr. V. Nagarajan (Member)
4. Dr. V. Sujin Flower (Member)

Mr./Ms. Jaspin Ida P has presented the overview of the proposed research work. The Doctoral Committee has approved the research topic as "Relation Between Dominator And Total Dominator Coloring With Other Dominating Parameters".

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

Course Code	Course Title	Core Course / Special Elective
<u>ACWMA04</u>	<u>Advanced graph Theory</u>	<u>Core Course</u>
<u>ACWMA01</u>	<u>Commutative Algebra</u>	<u>Core Course</u>

Number of course works as applicable to the scholars

Dr. V. Nagarajan  
Member  
(Signature with Name and seal)  
M.Sc., M.Phil., M.Ed., Ph.D.  
Asst. Professor of Mathematics,  
Department of Mathematics,  
S.T. Hindu College, Nagercoil

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

Dr. V. Sujin Flower, M.Sc., M.Phil., Ph.D.  
Assistant Professor,  
Department of Mathematics,  
Holy Cross College (Autonomous)  
Nagercoil - 629004

Member  
(Signature with Name and seal)

Dr. A. Vijayalekshmi  
Associate Professor & Head  
Department of Mathematics  
SuperHindu College, Nagercoil  
(Signature with name and seal) - 629 002

Forwarded 3.20  
Signature of the HOD/Director of the Center/Principal of the institution where the supervisor is working  
**Dr. L. CHITTHAMBARATHANU**  
PRINCIPAL  
S.T. HINDU COLLEGE  
NAGERCOIL - 629 002



8. Research Collaboration: Doctoral Committee Member

a. Scott Christian College (Autonomous), Nagercoil



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

MINUTES OF THE FIRST DOCTORAL COMMITTEE MEETING

The Doctoral Committee Meeting of the Ph.D. Scholar,  
Ms. R. DIANA (Reg. No. 20113162092015) was held  
on 20/03/2020 at 11.00 A.M./P.M. in the Department of Mathematics.

The following members were present

1. Dr. T. Binu Selin (Supervisor & Convener)
2. (Joint Supervisor, if applicable)
3. Dr. Y.S. Irine Sheela (Member)
4. Dr. S. Sujitha (Member)

Ms. R. DIANA has presented the overview of the proposed research work. The Doctoral Committee has approved the research topic as A STUDY ON LAPLACIAN ENERGY CONCEPTS OF GRAPHS.

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

Course Code	Course Title	Core Course / Special Elective
<u>ACWMA10</u>	<u>Algebraic Graph Theory</u>	<u>Core Course</u>
<u>ACWMA11</u>	<u>Combinatorial Theory</u>	<u>Core Course</u>

Number of course works as applicable to the scholars 2

Dr. S. Sujitha  
Member  
(Signature with Name and Seal)  
Assistant Professor  
Department of Mathematics  
SCC Cross College (Autonomous)  
Nagercoil - 629 004.  
Joint Supervisor  
(Signature with Name and Seal)  
(if applicable)

Dr. Y.S. IRINE SHEELA  
M.Phil., P.G.D.C.A.  
Associate Professor  
(Signature with Name and Seal)  
Department of Mathematics  
PG & Research  
Scott Christian College (Autonomous)  
Nagercoil - 629 005

Supervisor  
(Signature with name and seal)

Signature of the HOD/Director of the Center/Principal of the institution where the supervisor is working

Dr. S. JOSEPH ROBIN  
Vice Principal & Head  
Dept. of Mathematics & Research Centre  
Scott Christian College (Autonomous)  
Nagercoil - 629 003, Tamilnadu, India






DEPARTMENT OF CHEMISTRY

1. Research Collaboration: Doctoral Committee Member

a. Scott Christian College (Autonomous), Nagercoil


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

**MINUTES OF THE FIRST DOCTORAL COMMITTEE MEETING**

The Doctoral Committee Meeting of the Ph.D. Scholar,  
 Mr./Ms. BENILA S (Reg. No. 192131620325<sup>809</sup>) was held  
 on 07.08.2019 at \_\_\_\_\_ A.M./P.M. in the Department of Chemistry.

The following members were present:

1. Dr. R Ragel Mabel Saroja (Supervisor & Convener)
2. \_\_\_\_\_ (Joint Supervisor, if applicable)
3. Dr. J Prema Kumari (Member)
4. Dr. R. Gladis Latha (Member)

Mr./Ms. BENILA S has presented the overview of the proposed research work. The Doctoral Committee has approved the research topic as "PHYTOCHEMICAL SCREENING AND PHARMACOGNOSTIC STUDY OF CASTUS IGNEUS".

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

Course Code	Course Title	Core Course / Special Elective
<u>ACWCH06</u>	<u>Chromatography</u>	
<u>ACWCHP</u>	<u>Mini Project</u>	

Number of course works as applicable to the scholars

**Member**  
 (Signature with Name and seal)  
Dr. J. PREMA KUMARI, M.Sc., M.Phil., Ph.D.  
 Associate Professor  
 Dept. of Chemistry  
 Scott Christian College (Autonomous)  
 Nagercoil - 3

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

**Member**  
 (Signature with Name and seal)  
R. Gladis Latha  
 Department of Chemistry  
 Scott Christian College (Autonomous)  
 Nagercoil - 3

**Supervisor**  
 (Signature with name and seal)  
RAGEL MABEL SAROJA, Ph.D.  
 H.E.A.F.  
 Department of Chemistry, S. Research Centre  
 Scott Christian College (Autonomous)  
 Nagercoil - 629 003


**Forwarded**

Signature of the HOD/Director of the Center/Principal of the institution where the supervisor is working



2. Research Collaboration: Doctoral Committee Member

a. Scott Christian College (Autonomous), Nagercoil



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

**MINUTES OF THE FIRST DOCTORAL COMMITTEE MEETING**

The Doctoral Committee Meeting of the Ph.D. Scholar,  
Mr./Ms. J. Anusha Rajala (Reg. No. 1921316203 <sup>2008</sup> <sub>2008</sub>)  
on 7/8/2019 at 3:00 A.M. / P.M. in the Department of Chemistry

The following members were present

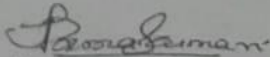
1. Dr. R. Ragel Mabel Saroja (Supervisor & Convener)
2. - (Joint Supervisor, if applicable)
3. Dr. J. Prema Kumari (Member)
4. Dr. R. Gladis Latha (Member)

Mr./Ms. J. Anusha Rajala has presented the overview of the proposed research work. The Doctoral Committee has approved the research topic as "Comparative Study of Natural Radioactivity in the Coastal Sediments of Kanyakumari District".

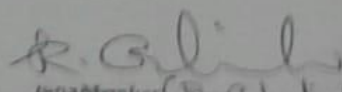
The Committee has recommended the scholar to undertake the following course works

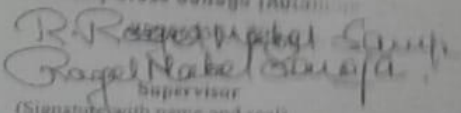
Course Code	Course Title	Core Course / Special Elective
ACWCH06	Chromatography	Elective
ACWCH10	Phyto-Biosynthesis and Applications of Metal Nanoparticles	Elective

Number of course works as applicable to the scholars

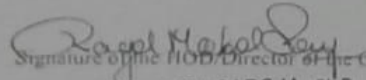
  
Member J. Prema Kumari  
(Signature with Name and seal)

Dr. J. PREMA KUMARI, M.Sc., Ph.D., Ph.D.  
Associate Professor  
Dept. of Chemistry  
Scott Christian College (Autonomous)  
Joint Supervisor  
Nagercoil - 3  
(Signature with Name and seal)  
(if applicable)

  
Member R. Gladis Latha  
(Signature with Name and seal)  
Nagercoil - 3

  
Supervisor  
R. Ragel Mabel Saroja  
(Signature with name and seal)  
Dr. R. RAGEL MABEL SAROJA, Ph.D.  
HEAD  
Department of Chemistry & Research Centre  
Scott Christian College (Autonomous)  
Nagercoil - 629 003

Forwarded

  
Signature of the HOD/Director of the Center/Principal of the institution where the supervisor is working

Dr. R. RAGEL MABEL SAROJA, Ph.D.  
HEAD  
Department of Chemistry & Research Centre  
Scott Christian College (Autonomous)  
Nagercoil - 629 003.





DEPARTMENT OF MATHEMATICS

1. Research Collaboration – Joint Author Publication

a. Applied Mathematics and Information Technical University, Kerala.

*CUBO A Mathematical Journal*  
Vol. 21, No 02, (15-35). August 2019

$Z_k$ -Magic Labeling of Path Union of Graphs

P. JEYANTHI<sup>1</sup> K. JEVA DAISY<sup>2</sup> AND ANDREA SEMANIČOVÁ-FEŇOVČÍKOVÁ<sup>3</sup>

<sup>1</sup>Research Centre, Department of Mathematics,  
Govindammal Aditanar College for Women,  
Tiruchendur 628215, Tamilnadu, India  
jeyajeyanthi@rediffmail.com

<sup>2</sup>Department of Mathematics,  
Holy Cross College, Nagercoil, Tamilnadu, India  
jeyadaisy@yahoo.com

<sup>3</sup>Department of Applied Mathematics and Informatics,  
Technical University, Košice, Slovak Republic  
andrea.fenovicikova@tuke.sk

ABSTRACT

For any non-trivial Abelian group  $A$  under addition a graph  $G$  is said to be  $A$ -magic if there exists a labeling  $f : E(G) \rightarrow A - \{0\}$  such that, the vertex labeling  $f^+$  defined as  $f^+(v) = \sum f(uv)$  taken over all edges  $uv$  incident at  $v$  is a constant. An  $A$ -magic graph  $G$  is said to be  $Z_k$ -magic graph if the group  $A$  is  $Z_k$ , the group of integers modulo  $k$  and these graphs are referred as  $k$ -magic graphs. In this paper we prove that the graphs such as path union of cycle, generalized Petersen graph, shell, wheel, closed helm, double wheel, flower, cylinder, total graph of a path, lotus inside a circle and  $n$ -pan graph are  $Z_k$ -magic graphs.



2. Research Collaboration - Joint author Publication  
 a. Govindammal Aditanar Women's College, Tiruchendur

Some Results on  $Z_k$ -Magic Labeling

P. Jeyanthi and K. Jeya Daisy

Communicated by Ayman Badawi

MSC 2010 Classifications: 05C78.

Keywords and phrases:  $A$ -magic labeling,  $Z_k$ -magic labeling,  $k$ -magic graph, shell, generalised Jahangir, double wheel, splitting graph.

**Abstract** For any non-trivial abelian group  $A$  under addition a graph  $G$  is said to be  $A$ -magic if there exists a labeling  $f : E(G) \rightarrow A - \{0\}$  such that, the vertex labeling  $f^+$  defined as  $f^+(v) = \sum f(uv)$  taken over all edges  $uv$  incident at  $v$  is a constant. An  $A$ -magic graph  $G$  is said to be  $Z_k$ -magic graph if the group  $A$  is  $Z_k$  the group of integers modulo  $k$  and these graphs are referred as  $k$ -magic graphs. In this paper we prove that shell graph, generalised jahangir graph,  $(P_n + P_1) \times P_2$  graph, double wheel graph, mongolian tent graph, flower snark, slanting ladder, double step grid graph, double arrow graph and semi jahangir graph are  $k$ -magic and also prove that if the graph  $G$  is  $k$ -magic with magic constant 0 then the splitting graph of  $G$  is  $k$ -magic.

1 Introduction

Graph labeling is currently an emerging area in the research of graph theory. A graph labeling is an assignment of integers to vertices or edges or both subject to certain conditions. A detailed survey was done by Gallian in [6]. If the labels of edges are distinct positive integers and for each vertex  $v$  the sum of the labels of all edges incident with  $v$  is the same for every vertex  $v$  in the given graph then the labeling is called a magic labeling. Sedláček [8] introduced the concept of  $A$ -magic graphs. A graph with real-valued edge labeling such that distinct edges have distinct non-negative labels and the sum of the labels of the edges incident to a particular vertex is same for all vertices. Low and Lee [7] examined the  $A$ -magic property of the resulting graph obtained from the product of two  $A$ -magic graphs. Shiu, Lam and Sun [9] proved that the product and composition of  $A$ -magic graphs were also  $A$ -magic.

For any non-trivial Abelian group  $A$  under addition a graph  $G$  is said to be  $A$ -magic if there exists a labeling  $f : E(G) \rightarrow A - \{0\}$  such that, the vertex labeling  $f^+$  defined as  $f^+(v) = \sum f(uv)$  taken over all edges  $uv$  incident at  $v$  is a constant. An  $A$ -magic graph  $G$  is said to be  $Z_k$ -magic graph if the group  $A$  is  $Z_k$ , the group of integers modulo  $k$ . These  $Z_k$ -magic graphs are referred to as  $k$ -magic graphs. Shiu and Low [10] determined all positive integers  $k$  for which fans and wheels have a  $Z_k$ -magic labeling with a magic constant 0. Motivated by the concept of  $A$ -magic graph in [8] and the results in [7], [9] and [10] Jeyanthi and Jeya Daisy [1]-[5] proved that the open star of graphs, subdivision graphs, cycle of graphs and some standard graphs admit  $Z_k$ -magic labeling. In this paper we prove that shell graph, generalised jahangir graph,  $(P_n + P_1) \times P_2$  graph, double wheel graph, mongolian tent graph, flower snark, slanting ladder, double step grid graph, double arrow graph and semi jahangir graph are  $k$ -magic and also prove that if the graph  $G$  is  $k$ -magic with magic constant 0 then the splitting graph of  $G$  is  $k$ -magic. We use the following definitions in the subsequent section.

**Definition 1.1.** A shell  $S_n$  is the graph obtained by taking  $n - 3$  concurrent chords in a cycle  $C_n$ . The vertex at which all the chords are concurrent is called the apex.

**Definition 1.2.** A generalised Jahangir graph  $J_{k,s}$  is a graph on  $ks + 1$  vertices consisting of a cycle  $C_{ks}$  and one additional vertex that is adjacent to  $k$  vertices of  $C_{ks}$  at distance  $s$  to each other on  $C_{ks}$ .

**Definition 1.3.** The Cartesian product  $(P_n + P_1) \times P_2$  is a graph with the vertex set  $V((P_n + P_1) \times P_2) = \{u, u_i, v, v_i : 1 \leq i \leq n\}$  and the edge set  $E((P_n + P_1) \times P_2) = \{uu_i, vv_i, u_i v_i : 1 \leq i \leq n\} \cup \{u_i u_{i+1}, v_i v_{i+1} : 1 \leq i \leq n - 1\} \cup \{uv\}$ .

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### 3. Research Collaboration - Joint author Publication

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### $Z_k$ -Magic Labeling of Cycle of Graphs

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#### Abstract

For any non-trivial Abelian group  $A$  under addition a graph  $G$  is said to be  $A$ -magic if there exists a labeling  $f : E(G) \rightarrow A - \{0\}$  such that, the vertex labeling  $f^+$  defined as  $f^+(v) = \sum f(uv)$  taken over all edges  $uv$  incident at  $v$  is a constant. An  $A$ -magic graph  $G$  is said to be  $Z_k$ -magic graph if the group  $A$  is  $Z_k$ , the group of integers modulo  $k$  and these graphs are referred as  $k$ -magic graphs. In this paper we prove that the graphs such as cycle of generalized peterson, shell, wheel, closed helm, double wheel, triangular ladder, flower and lotus inside a circle are  $Z_k$ -magic graphs and also prove that if  $G$  is  $Z_k$ -magic graph and  $n$  is even then  $C(n, G)$  is  $Z_k$ -magic.

#### Author Keywords

A-Magic Labeling,  $Z_k$ -Magic Labeling,  $Z_k$ -Magic Graph, Cycle of Graphs, Smarandachely A-Magic

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## 4. Research Collaboration - Joint author Publication

## a. Pioneer Kumara Swamy College, Nagercoil.

193 R. Chenthil Thanga Bama et.al/ Journal of Computational Information Systems 15: 1 (2019) 193-196

## Distance Parameters for a Ferrers Graph

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## Abstract

A simple graph  $G = (V, E)$  is a Ferrers graph if for all distinct  $x, y, z, w \in V$  if  $xy \in E$  and  $zw \in E$  then either  $xw \in E$  or  $yz \in E$ . Since  $xy \in E \Leftrightarrow yx \in E$  holds for all simple graphs, the definition of Ferrers graph must be extended to if  $xy \in E$  and  $zw \in E$  then either  $xw \in E$  or  $yz \in E$  or  $yw \in E$  or  $xz \in E$ . It is shown that, for a ferrers graph  $d(u, v) \leq 3$  for all vertices  $u, v \in V(G)$ .

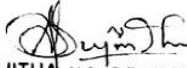
**Keywords:** Ferrers Graph, Ferrers Tree, Distance, Diameter, Radius.

**AMS Subject Classification:** 05C12

## 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. The degree of a vertex  $v$  in a graph  $G$  is the number of edges of  $G$  incident with  $v$  and is denoted by  $deg_G v$  or  $deg v$ . A vertex of degree 0 in  $G$  is called an isolated vertex and a vertex of degree 1 is called a pendent vertex or an end-vertex of  $G$ . For vertices  $u$  and  $v$  in a connected graph  $G$ , the distance  $d(u, v)$  is the length of a shortest  $u \rightarrow v$  path in  $G$ . If no such path exists (if the vertices lie in different connected components), then the distance is set equal to  $\infty$ . The eccentricity ( $e(v)$ ) of a vertex  $v$  in  $G$  is the maximum distance from  $v$  and a vertex of  $G$ . The minimum eccentricity among the vertices of  $G$  is the radius,  $rad G$  or  $r(G)$  and the maximum eccentricity is its diameter,  $diam G$  of  $G$ . Two vertices  $u$  and  $v$  of  $G$  are antipodal if  $d(u, v) = diam G$  or  $d(G)$ . A bipartite graph  $G$  is a graph whose vertex set  $V(G)$  can be partitioned into two subsets  $V_1$  and  $V_2$  such that every edge of  $G$  joins  $V_1$  with  $V_2$ ;  $(V_1, V_2)$  is called a bipartition of  $G$ . If  $G$  contains every edge joining  $V_1$  and  $V_2$ , then  $G$  is called a complete bipartite graph. The complete bipartite graph with bipartition  $(V_1, V_2)$  such that  $|V_1| = m$  and  $|V_2| = n$  is denoted by  $K_{m,n}$ . A star is the complete bipartite graph  $K_{1,n}$ . A graph  $G$  is called acyclic if it has no cycles. A connected acyclic graph is called a tree. A non-trivial path is a tree with exactly two end-vertices. A caterpillar is a tree of order 3 or more, for which the removal of all

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5. Research Collaboration - Joint author Publication

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204 L. Mary Jenitha et.al/ Journal of Computational Information Systems 15: 1 (2019) 204-207

The Average Connectivity of an Arithmetic Graph

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Abstract

The average connectivity  $\bar{\kappa}(G) = \frac{\sum_{u,v \in V(G)} \kappa_G(u,v)}{\binom{v}{2}}$  is defined to be the maximum value of  $k$  for which  $u$  and  $v$  are  $k$ -connected. In this paper, we consider the concept of the average connectivity of an arithmetic graph. It is shown that  $\bar{\kappa}(G) \leq \frac{(v-2)\binom{v-\beta}{2} + (v-\beta)\binom{\beta}{2} + (v-\beta)^2\beta}{\binom{v}{2}}$  where  $v$  is the order and  $\beta$  is an independence number of an arithmetic graph. Also, it is clear that, if  $\beta$  is increasing then  $\bar{\kappa}(G)$  is decreasing for an arithmetic graph  $G = V_n$ , where  $n = P_1^{a_1} \times P_2$ .

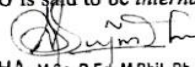
**Keywords:** Average Connectivity, Arithmetic Graph, Total Connectivity.

**AMS subject classification:** 05C12

1. Introduction

A graph  $G$  is an ordered triple  $(V(G), E(G), \psi_G)$  consisting of a nonempty set  $V(G)$  of vertices, a set  $E(G)$  of edges and an incidence function  $\psi_G$  that associates with each edge of  $G$  an unordered pair of vertices of  $G$ . The number of vertices in  $G$  is denoted by  $v = |V(G)|$  is called the order of  $G$  while the number of edges in  $G$  is denoted by  $\epsilon = |E(G)|$  is called the size of the graph  $G$ . A graph of order  $v$  and size  $\epsilon$  is called  $(v, \epsilon)$  graph. A graph is simple if it has no loops and no two of its links join the same pair of vertices. A simple graph in which each pair of distinct vertices is joined by an edge is called complete graph. The degree of a vertex  $v$  in a graph  $G$  is the number of edges of  $G$  incident with  $v$  and is denoted by  $deg_{Gv}$  or  $d(v)$ . A vertex of degree one is called a pendent vertex or an end vertex of  $G$ . The maximum and minimum degree of a graph  $G$  is denoted by  $\Delta(G)$  and  $\delta(G)$  respectively.

A vertex  $v$  of  $G$  is a cut vertex if  $E$  can be partitioned into  $E_1$  and  $E_2$  such that  $G[E_1]$  and  $G[E_2]$  have just the vertex  $v$  in common. A bipartite graph  $G$  is a graph whose vertex set  $V(G)$  can be partitioned into two subsets  $V_1$  and  $V_2$  such that every edge of  $G$  joins  $V_1$  with  $V_2$ ;  $(V_1, V_2)$  is a bipartition of  $G$ . A graph  $G$  is called acyclic if it has no cycles. A connected acyclic graph is called a tree. A non trivial path is a tree with exactly two end vertices. A family of paths in  $G$  is said to be internally disjoint if no vertex of  $G$  is



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## 6. Research Collaboration - Joint author Publication

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## Hausdorff Property of $G^{++-}$ , $G^{+-+}$ and their Complement Graphs

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### Abstract

A simple graph  $G$  is said to be Hausdorff graph if for any two vertices  $u$  and  $v$  of  $G$  satisfy at least one of the following conditions: [1] both  $u$  and  $v$  are isolated [2] either  $u$  or  $v$  is isolated [3] there exists two non-adjacent edges  $e_1$  and  $e_2$  of  $G$  such that  $e_1$  is incident with  $u$  and  $e_2$  is incident with  $v$ . In this paper, we discuss Hausdorff property on some specific transformation graphs namely  $G^{++-}$ ,  $G^{+-+}$ ,  $G^{--}$  and  $G^{-}$ .

**Key words:** Hausdorff graph, transformation graph

**AMS classification:** 05C76, 05C99.

### 1. Introduction

In [10], Wu Baoyindureng and Meng Jixiang introduced and studied eight types of transformation graph. These transformation graphs have been studied separately by several authors [1, 2, 3, 4, 6, 7].

Let  $G=(V(G),E(G))$  be a simple undirected graph and  $x,y,z$  be three variables taking values  $+$  or  $-$ . The transformation graph  $G^{xyz}$  is the graph having  $V(G) \cup E(G)$  as the vertex set, and for  $\alpha, \beta \in V(G) \cup E(G)$ ,  $\alpha$  and  $\beta$  are adjacent in  $G^{xyz}$  if and only if one of the following holds: (i) for  $\alpha, \beta \in V(G)$ ,  $\alpha$  and  $\beta$  are adjacent in  $G$  if  $x=+$ ;  $\alpha$  and  $\beta$  are not adjacent in  $G$  if  $x=-$ .(ii) for  $\alpha, \beta \in E(G)$ ,  $\alpha$  and  $\beta$  are adjacent in  $G$  if  $y=+$ ;  $\alpha$  and  $\beta$  are not adjacent in  $G$  if  $y=-$ .(iii) for  $\alpha \in V(G), \beta \in E(G)$ ,  $\alpha$  and  $\beta$  are incident in  $G$  if  $z=+$ ;  $\alpha$  and  $\beta$  are not incident in  $G$  if  $z=-$ .

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DEPARTMENT OF MATHEMATICS SF

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## The geodetic vertex covering number of a graph

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### Abstract

A subset  $S$  of vertices in a connected graph  $G$  of order at least two is called a geodetic vertex cover if  $S$  is both a geodetic set and a vertex covering set. The minimum cardinality of a geodetic vertex cover is the geodetic vertex covering number of  $G$  denoted by  $g_{\alpha}(G)$ . Any geodetic vertex cover of cardinality  $g_{\alpha}(G)$  is a  $g_{\alpha}$ -set of  $G$ . Some general properties satisfied by geodetic vertex covering number of a graph are studied. The geodetic vertex covering number of several classes of graphs are determined. Some bounds for  $g_{\alpha}(G)$  are obtained and the graphs attaining these bounds are characterized. A few realization results are given for the parameter  $g_{\alpha}(G)$ .

### Keywords

Geodesic, geodetic set, vertex covering set, geodetic vertex cover, geodetic vertex covering number.

### AMS Subject Classification

05C12.

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### 1. Introduction

For basic graph theoretic terminology and basic definitions not given here we refer to Harary [5]. We consider finite, undirected, connected graphs without loops and multiple edges. Denote the number of vertices and edges of a graph  $G$  as  $n = |V(G)|$  and  $m = |E(G)|$  respectively. A vertex  $v$  is a *simplicial vertex* or an *extreme vertex* of  $G$  if the subgraph induced by its neighbors is complete.

Let  $I[u, v]$  denote the set consisting of  $u, v$ , and all the vertices lying on a  $u - v$  geodesic and for  $S \subseteq V(G)$ ,  $I[S]$  denote the union of all  $I[u, v]$  for  $u, v \in S$ . The *geodetic number*  $g(G)$  of  $G$  is the minimum cardinality of its geodetic sets and any geodetic set of cardinality  $g(G)$  is a *minimum geodetic set* or a  $g$ -set of  $G$ . The geodetic number of a graph was introduced in [1, 6] and further studied in [2-4]. A subset  $S \subseteq V(G)$  is

called a *vertex covering set* of  $G$  if every edge has at least one end point in  $S$ . A vertex covering set with minimum cardinality is a *minimum vertex covering set* of  $G$ . The *vertex covering number* of  $G$  is the cardinality of any minimum vertex covering set of  $G$  denoted as  $\alpha(G)$ . The vertex covering number of a graph was studied in [7].

A set of vertices (edges) in a graph  $G$  is *independent* if no two of the vertices (edges) are adjacent. The *independence number*  $\beta(G)$  of  $G$  is the maximum number of vertices in an independent set of vertices of  $G$ . By a *matching* in a graph  $G$ , we mean an independent set of edges in  $G$ . A *caterpillar* is a tree of order 3 or more, the removal of whose end vertices produces a path called the spine of the caterpillar. A graph  $G$  is called *triangle free* if it does not contain cycles of length 3. A subset  $S \subseteq V(G)$  is a *dominating set* if every vertex in  $V - S$  is adjacent to at least one vertex in  $S$ . A *geodetic dominating set* of  $G$  is a subset  $S$  of vertices which is both a geodetic set and a dominating set. The minimum cardinality of a geodetic dominating set of a graph  $G$  is its *geodetic domination number* denoted by  $\gamma_g(G)$ .

In this paper, we define geodetic vertex covering number  $g_{\alpha}(G)$  of a graph and initiate a study of this parameter. We investigate about some general properties satisfied and some bounds attained by this parameter. Also few realization re-



## DEPARTMENT OF PHYSICS

## 1. Research Collaboration – Joint Author Publication

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# Albumen Assisted Green Synthesis of NiFe<sub>2</sub>O<sub>4</sub> Nanoparticles and Their Physico-Chemical Properties

P. Aji Udhaya<sup>a</sup>  M. Meena<sup>b</sup> 

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## Abstract

Spinel ferrites with general formula AB<sub>2</sub>O<sub>4</sub> possess fascinating magnetic and electrical properties due to their thermal and chemical firmness. Nickel ferrite (NiFe<sub>2</sub>O<sub>4</sub>) is one of the most vital spinel ferrite having inverse spinel structure showing ferrimagnetism that originates from magnetic moment of anti-parallel spins linking the metal ions (Ni<sup>2+</sup> and Fe<sup>3+</sup>). Here a simple technique of self-combustion with aid of albumen is made to synthesize nano crystalline Nickel ferrite (NiFe<sub>2</sub>O<sub>4</sub>) particles. The egg white (albumen) used in the synthesis process plays the role of fuel in the combustion process. The powder X-ray diffraction (PXRD) and Fourier Transform Infrared Spectroscopy (FTIR) results indicated that the synthesized nanoparticles are of single phase and show evidence of spinel structure. The Photoluminescence studies showed a doublet peak at 360-380nm. Also the functional groups present in the synthesized nanoparticles was found using FTIR. EDX results give account of the percentage composition of the elements Fe, Ni and O present in the synthesized sample. The Field Emission Scanning Microscope (FESEM) reveals the agglomerated nature of ferrite nanoparticles. Magnetic moment and retentivity of the as synthesized nickel ferrite (NiFe<sub>2</sub>O<sub>4</sub>) nanoparticles were obtained using Vibrating Sample Magnetometer (VSM). Dielectric properties of the as prepared samples were measured by two-probe method for various frequencies ranging from 100Hz-1MHz





## 2. Research Collaboration – Joint Author Publication






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Spectroscopic investigation of  
supramolecular organometallic compound  
L-threonine cadmium acetate monohydrateAbila Jeba Queen M<sup>a, b</sup>  , Bright K.C<sup>c</sup>, Mary Delphine S<sup>a</sup>, Aji Udhaya P<sup>a</sup>how more  Add to Mendeley  Share  Cite<https://doi.org/10.1016/j.saa.2019.117802> [Get rights and content](#) 

## Highlights

- A new  $[\text{Cd}(\text{C}_2\text{H}_3\text{O}_2)(\text{C}_4\text{H}_8\text{NO}_3)(\text{H}_2\text{O})]\text{H}_2\text{O}$  crystal prepared by the chemical reaction between L-Threonine and Cadmium acetate.
- The asymmetric structural unit tends to increase the ionic polarization, which results better dielectric material.
- Low UV absorption ability might be used as a corrosion resistant semiconductor material for optical device fabrication system.



## DEPARTMENT OF CHEMISTRY

## 1. Research Collaboration – Joint Author Publication

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*Multidisciplinary Research in Global Challenges and  
 Perspectives of Sustainable Development*  
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### Green Synthesis of Manganese Oxide Nanoparticles and Characterization USING UV- Vis and FTIR Spectroscopy

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#### Abstract

Green methods of synthesis of nanoparticles have various advantages over chemical methods. Manganese oxide nanomaterials are biosynthesized from manganese (II) chloride using medicinal plant extracts *Acalypha indica*, *Cassia occidentalis*, *Cleome viscosa*, *Euphorbia hirta* and *Ecbolium ligustrinum* as reducing agents. The resulting nanoparticles are characterized using UV- Vis and FTIR. The UV- Vis absorbance peak from 265 – 269 nm indicates the formation of Manganese oxide nanoparticles. The FTIR results of all the samples confirm the formation of manganese oxide nanoparticles.

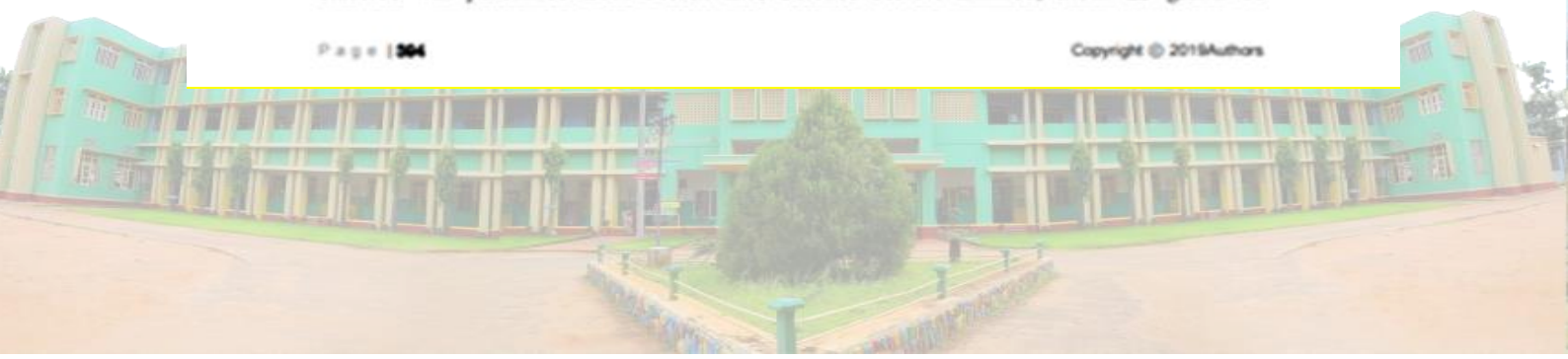
**Key Words:** Manganese oxide, green methods, reducing agents, *Ecbolium ligustrinum*, *Cassia occidentalis*.

#### INTRODUCTION

Medicinal plant extracts play very important role in our daily life [1] The increase in environmental pollution motivates us to think of an alternative way of synthesizing nanoparticles that can be carried out in an environmentally friendly manner. Plant extracts can play a vital role in synthesizing nanoparticles. Hundreds of plant extracts are found to have the capacity of reducing metal salts to their corresponding metal oxides. Plant mediated synthesis reduces the expense of synthesizing nanoparticles and follows green methods [2,3,4]. Medicinal plant extracts using alcohol as solvent possess a large number of organic compounds which helps in reducing metal salts to the corresponding nano metal oxides. Leaves of five medicinal plants *Acalypha indica*, *Cassia occidentalis*, *Cleome viscosa*, *Euphorbia hirta* and *Ecbolium ligustrinum* were selected for the study.

#### Materials and methods

The leaves of medicinal plants like *Acalypha indica*, *Cassia occidentalis*, *Cleome viscosa*, *Euphorbia hirta* and *Ecbolium ligustrinum* were collected from Kurusady village, Kanyakumari District, Tamilnadu and shade dried. The dried leaves were powdered in a mixer grinder and extracted using ethyl alcohol in a soxhlet extractor. Manganese (II) chloride was purchased from Merck Life Science Private Limited, India. 25 grams of





DEPARTMENT OF BOTANY

1. Research Collaboration – Joint Author Publication

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**Prevalence of Laccase Producing Endophytic Microbes in *Musa acuminata* and *Hevea brasiliensis* Roots**

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**ABSTRACT**

The present investigation clearly focuses on isolating, screening and biochemical characterization of laccase producing endophytic bacteria from the root samples of *Musa acuminata* and *Hevea Brasiliensis*. In this study, *Musa acuminata* showed 18 distinct morphological colonies and *Hevea Brasiliensis* Exhibited 10 distinct colonies. Among the 28 colonies isolated, 9 colonies showed laccase producing capabilities. These isolates were identified by morphological, cultural and biochemical characteristics. The identified species were *Bacillus* sp., *Klebsiella* sp., *Pseudomonas* sp., *Clavobacter* sp., *Micrococcus* sp., *Xanthomonas* sp., *Enterobacter* sp., *Serratia* sp. And *Escherichia coli*.

**KEYWORDS:** Enzymes, Laccase, Endophytes, Microorganisms,

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Original article

# *In-vitro* antibacterial, antioxidant potentials and cytotoxic activity of the leaves of *Tridax procumbens*

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## Abstract

The present study explored the phytochemicals, antibacterial, antioxidant and cytotoxic effect of *Tridax procumbens* leaves. The leaves were dried and extracted with various organic solvents. The leaves contained the phytochemicals such as alkaloids, carbohydrates, polyphenols and tannins respectively. Antimicrobial potentials of the extracts were determined by performing the disc diffusion techniques. Results revealed that different organic solvents extracts namely methanol, ethanol and ethyl acetate extracts documented comparatively good activity against the studied microbial strains. The methanol extract of leaves of *T. procumbens* showed comparatively better antioxidant potential. The tested plant leaf extract showed high activity against human lung cancer cells than breast cancer cell lines. 250µg/ml plants extract showed 84±2.8% toxicity against human lung cancer cells.





### 3. Research Collaboration – Joint Author Publication

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## SSCREENING OF FUNGAL ISOLATES PRODUCING LACCASES FROM SOIL SOURCES AND TREE BARKINGS

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#### Abstract:

The enzyme laccase (*p*-diphenol: oxygenoxidoreductase; EC 1.10.3.2) is known to degrade many phenolic aromatic compounds. This enzyme is found in many plant species and is widely distributed in fungi including wood-rotting fungi where it is often associated with lignin peroxidase or manganese dependent peroxidase, or both. Fungi can exploit marginal living conditions in large part because they produce unusual enzymes capable of performing chemically difficult reactions. In present study, 13 fungal strains were isolated on PDA plate containing the 0.02% guaiacol. Out of these 13 isolates, only 10 fungal isolates showed reddish brown zones on the medium. The most potent fungal strain for laccase production was screened on 0.06% guaiacol containing PDA medium.

#### Keywords:

Laccases, Fungal strains, Guaiacol, Potato Dextrose Agar.

#### 1. Introduction

Laccases belongs to multinuclear copper-containing oxidase and can act on a variety of aromatic and non-aromatic compounds. Due to their broad substrate specificity, they are considered as a promising candidate in various industrial and biotechnological sectors. Laccases are *p*-diphenol:dioxygen oxidoreductase belonging to the family of multi-copper proteins. Laccases have the ability to oxidize a wide range of aromatic and non-aromatic compounds which includes substituted phenols, some inorganic ions, and variety of non-phenolic compounds. Laccases have high catalytic efficiency and are used for technical applications in various industrial and biotechnological domains <sup>1</sup>, which includes improving properties of fibers, bio-synthesis, energy exploitation, environmental protection, bio-detection, degradation of synthetic dyes, printing and dyeing industry, bio-pulping in paper industry, conversion of aromatic compounds, and removal of phenols which causes cancer and teratogenicity when present in waste water <sup>2</sup>.

