

3.3.1.1. Number of research papers in the journals notified on UGC care year wise during the last five year 2018-19

Sl. No.	Title of paper	Name of the Author/s	Department of the teacher	Name of the Journal	Year of publication	ISSN Number	Link to the Journal		
							Link of the website of journal	Link of the article	Is it in UGC care list
1	Antimicrobial activity of ginger root extracts against human pathogenic bacteria	Swamy C.T, Vinay kumar P.G, Varun kumar J.B	Biochemistry	<i>Int.J.of life sciences research</i>	2018-19	Vol .7,1,331-333 ISSN: 2348-3148	https://www.researchpublish.com/journal-details/IJLSR	https://www.researchgate.net	No
2	<i>In vitro</i> antiproliferative and antioxidant activities in peels of Citrus fruits.	Pallavi M, Ramesh C.K, Krishna V and Sameera Parveen	Biotechnology	Research Journal of Life Sciences, bioinformatics, Pharmaceutical and Chemical Sciences	2018	ISSN-2454-6348	http://rjlbpcs.com/	47833 http://www.rjlbpcs.com/article-pdf-downloads/2018/20/299.pdf	Yes
3	Folklore medicinal Orchids from South India: the potential source of antioxidants	Parveen sameera., C. K. Ramesh, R. Mahmood, and M. Pallavi.	Biotechnology	Asian journal of Chemical and pharmaceutical Sciences	2018	20182349-7106	https://www.journals.ebs.com/asian-journal-of-	https://www.researchgate.net/publication/325647065_Folklore_medicinal_orchids_from_south_in	No

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							pharmac eutical- sciences	dia_The_pot ential_sour ce_of_antioxi dants	
4	Anti-Inflammatory and antinociceptive activity of some Orchids. 4(4), 502-515.	Parveen sameera.,C. K. Ramesh, R. Mahmood, and M. Pallavi.	Biotechnology	Research Journal of Life Sciences, bioinformatics, Pharmaceutical and Chemical Sciences	2018	2454-6348	http://rjl bpcs.com /	47833 http://www.r jlbpcs.com/a rticle-pdf- downloads/2 018/20/317. pdf	Yes
5	Peels of Citrus fruits: A potential source of anti-inflammatory and anti-nociceptive agents	Malleshappa, Pallavi, Ramesh Chapeyil Kumaran, Krishna Venkatarangaiah, and Sameera Parveen.	Biotechnology	Pharmacognosy Journal	2018	9753575	https:// www.ph cogj.com /	30569 https://www .phcogj.com /article/764# ::~:~:text=Con clusion%3A %20From% 20the%20re sults%20it,i nflammator y%20and%2 0anti%2Dno ciceptive%2 0agents.	Yes
6	The tumor antagonistic steroidal alkaloid Solanidine prompts the intrinsic suicidal signal mediated DFF-40 nuclear import and nucleosomal disruption	Malojirao VH, Vigneshwaran V, Thirusangu P, Mahmood R, Prabhakar BT	Biotechnology	Life Science	2018	0024-3205	https:// www.ph arma- iq.com/g lossary/li fe- science#:	4666 https://ww w.research gate.net/pu blication/3 23638389_ The_tumor	No

Manuscript

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7	Protective Effect of Dietary Curcumin and Capsaicin on LPS-Induced Inflammation in Mice	Thriveni Vasanthkumar ,Manjunatha Hanu manthappa, Prabhakar BT	Biotechnology	Pharmacognosy Journal	2018	0975- 3575	https:// www.ph cogj.com /	30569 https://www .phcogj.com /article/628	Yes
8	Synthesis and amelioration of inflammatory paw edema by novel benzophenone appended oxadiazole derivatives by exhibiting cyclooxygenase-2 antagonist activity	Puttaswamy N, Malojiao VH, Mohammed YHE, Sherapura A, Prabhakar BT, Khanum SA	Biotechnology	Biomedicine and Pharmacotherapy	2018	0753- 3322	https:// www.sci encedire ct.com/j ournal/bi omedicin e-and- pharmac otherapy	14808 https://pub med.ncbi.nl m.nih.gov/ 29864929/	Yes
9	Antitumor Hybrid BT009K Modulates Inflammation Induced Neovascularization in	Shamant Neralagundi H.G., Zabiulla, Sha	Biotechnology	Journal of Applied Pharmaceutical		2231- 3354	https://j apsonlin	21419	Yes

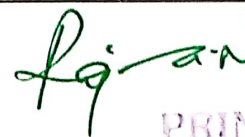
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	Both Tumorigenic and Non-Tumorigenic Model System	ukath Ara Khanum, Manjunatha H, Prabhakar B.T.		Science			e.com/	https://www.researchgate.net/publication/325259413_Antitumor_Hybrid_BT009K_Modulates_Inflammation_Induced_Neovasacularization_in_Both_Tumorigenic_and_Non-Tumorigenic_Model_System	
10	Vimentin and Non-Muscle Myosin IIA are Members of the Neural Precursor Cell Expressed Developmentally Down-Regulated 9 (NEDD9) Interactome in Head and Neck Squamous Cell Carcinoma Cells	Semelakova M, Grauzam S, Prabhakar BT, Tiedeken J, Coaxum S, Neskey DM, Rosenzweig SA 	Biotechnology	Translational Oncology	2019	1936-5233	https://www.sciencedirect.com/journal/translational-oncology	34943 https://www.researchgate.net/publication/327974605_Vimentin_and_Non-Muscle_Myosin_IIA_are_Members_of_the_Neural_Pre	Yes

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								cursor_Cell_Expressed_Developmentally_Down-Regulated_9_NEDD9_Interaction_in_Head_and_Neck_Squamous_Cell_Carcinoma_Cells	
11	Antimicrobial studies of stem bark extract and their phytoconstituents from <i>Semecarpus acardium</i> L.	Venkatesh, Krishna V, Jayabaskaran C, Pradeepa K, Sudesh L Shastri, Lingaraju GM	Biotechnology	International Journal of Fundamental and Applied Sciences	2018	2278-1404	https://www.citefactor.org/journal/index/10306/international-journal-of-fundamental-and-applied-sciences		No
12	Hepatoprotective properties of <i>Caesalpinia bonducella</i> against	Santosh Kumar SR, Venkatesh, Krishna	Biotechnology	Bioscience	2018	2229-3469	https://j		No


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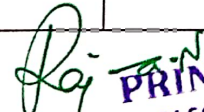
	CCl ₄ induced in Rats.	Venkataraiah, Pradepa Krishnappa, Sudesh L Shastri		Discovery			bsd.in/		
13	Distribution of psoralen in different organs of <i>Psoralea corylifolia</i> L.	Hari Gajula, Vadlapudi Kumar, Poornima D Vijendra, Rajashekar J, TorankumarSa nnabommaji, GiridharaBasa ppa.	Biotechnology	Journal of Pharmacognosy and Phytochemistry	2018	2349- 8234	https:// www.ph ytojourn al.com/		No
14	Medicinal importance of usneoid lichens in Western Ghats, southern, India	Rajeshwari N., Archana R. M., Vinayaka K.S. and Ramesh Babu H.N.	Botany	Plant Archives	2019	ISSN: 0972- 5210	http://w ww.plant archives. org/	https://www.r esearchgate.n et/publication /349004203_ MEDICINAL _IMPORTA _NCE_OF_US NEOID_LIC HENS_IN_W ESTERN_G HATS_SOU THERN_IND IA	Yes
15	Determining the fruit yield of <i>Jatropha curcas</i> L. Accession in hilly zones and southern transition zone of Chickmagalur and Shivamogga Districts, Karnataka, India	Ramesh Babu H.N., Rajeshwari N and Nithisha S.A.	Botany	Plant Archives	2019	ISSN: 0972- 5210	http://w ww.plant archives. org/	http://www.pl antarchives.or g/PDF%20S UPPLEMEN T%202019/2 09_1226- 1228_.pdf	Yes
16	Improved and efficient protocol for direct regeneration from	Ramesh Babu H.N., Rajeshwari	Botany	World Journal of Pharmaceutical and	2019	ISSN: 2454-	https:// www.wj	https://www. wjpls.org/ho me/article_ab stract/1475	No

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	cotyledonary node of groundnut(<i>Arachishypogaea</i> L.)	N., Kiran G., Raddy P.C. and Sujatha M.		Life sciences WIPLS		2229	pls.org/		
17	Distribution of Bioactive Compounds in Usneoid Lichens from Western Ghats.	Archana R.M., Rajeshwari N. and Vinayaka K.S.	Botany	Plant Archives	2019	ISSN: 2581-6063	http://www.plantarchives.org/	http://plantarchives.org/19-2/2163-2168%20(5336).pdf	Yes
18	Physical Properties of Foxtail Millet (<i>Setaria italic L</i>): Variety HMT-100-I.	Shashikalabai B. and Rajeshwari N. 	Botany	International Journal of Tropical Agriculture	2019	ISSN: 0254-8755.	https://www.serialsjournals.com/index.php?route=product/product&product_id=295#:~:text=The%20International%20Journal%20of%20Tropical,applied%20aspects%20of%20tropical%20agricult	Offline	Yes

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19	Processing and value addition of minor millets	Rajeshwari N and Shashikalabai B	Botany	International Journal of Tropical Agriculture	2019	ISSN: 0254-8755.	https://www.serialsjournals.com/index.php?route=product/product&product_id=295#:~:text=The%20International%20Journal%20of%20Tropical,applied%20aspects%20of%20tropical%20agriculture.	Offline	Yes
20	Comparative leaf anatomy of some species of Habenaria Wild (Orchidaceae)	Sowmya M. H. and Krishnaswamy K	Botany	International Journal of Research and Analytical Reviews	2019	ISSN: 2348-1269	http://ijrar.com/	https://www.authorea.com/users/336765/articles/462481-comparative-	Yes

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								leaf-anatomy-of-some-species-of-habenaria-wild-orchidaceae	
21	Phenology of Papilionoideae members of Dummi village, Holalkere taluk, Chitradurga district, Karnataka	Rachitha C.J. and Krishnaswamy K	Botany	International Journal of Research and Analytical Reviews	2019	ISSN: 2348-1269	http://ijrar.com/	https://www.researchgate.net/publication/358890626_Phenology_of_the_Genus_Indigofera_L_Fabaceae-Papilionoideae_of_Holalkere_and_Hosadurga_Thaluk_of_Chitradurga_District	Yes
22	Fresh water algae as a renewable source of energy: Biodiesel Production	Ranjith Y and Parameswaranaik T	Botany	International Journal of Scientific Research and Review	2019	ISSN: 2279-0543	http://www.ijssr.org/	https://www.researchgate.net/publication/326097172_Biodiesel_production_from_freshwater_algae_as_a_renewable_source	Yes
23	Production of Algal Biodiesel from Fresh water Algae – <i>Oedogonium Spp.</i>	Ranjith Y and Parameswaranaik T	Botany	Journal of Information and Computational Science	2019	ISSN: 1548-7741	http://www.joics.org/	http://www.joics.org/gallery/ics-1986.pdf	Yes
24	Transesterification of Algal oil to produce Algal Biodiesel.	Ranjith Y and Parameswaranaik T	Botany	Journal for Modern Trends in Science	2019	ISSN: 2455-	https://journals.indowindex.org/	Offline	No

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		k T		and Technology		3778	ernicus.com/journal/43683		
25	Biodiesel Production from Marine Macro algae of Karwar Region, Karnataka	Kishore Naik K., Ranjith Y and ParameswaraNai k T	Botany	Journal of Information and Computational Science	2019	ISSN: 1548-7741	http://www.joics.org/	http://www.joics.org/gallery/ics-2088.pdf	Yes
26	Documentation of exotic plants in Shivamogga district, Karnataka	Nafeesa Begum and Kiran B.R.	Botany	International Journal of Scientific and Technology Research	2019	ISSN: 2277-8616	https://www.ijstr.org/	http://www.ijstr.org/final-print/jan2020/Documentation-Of-Exotic-Plants-In-Shivamogga-Districtkarnataka.pdf	No
27	Documentation of macrofungi in Thirthahalli region of Karnataka a case study	Nafeesa Begum and Kiran B.R.	Botany	International Journal of Innovative Knowledge Concepts	2019	ISSN: 2454-2415	https://portal.issn.org/resource/ISSN/2454-2415	Offline	Yes
28	Mulberry cultivation practices and diseases an overview.	Nafeesa Begum, Kiran B.R. and Purushothama R.	Botany	Technical Research Organization India	2019	ISSN: 2393-8374	http://www.troindia.in/	http://troindia.in/journal/ijcesr/vol5iss2part3/61-68.pdf	No
29	Phytochemical screening of <i>Angiopteris evecta</i> and <i>Blechnum orientale</i>	Gopala T.D., Nataraja S., Krishnappa K. and	Botany	International Journal of Scientific Research	2019	ISSN: 2279-543x	http://www.ijssr.org/	http://www.dynamicpublisher.org/gallery/r-15.pdf	Yes

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		Prashanth K.M.		and Review					
30	A survey of human traits with simple inheritance pattern in Sahyadri Science College, Shivamogga	Sindhu N.N. and Ranjith Y	Botany	International Journal of Scientific Research and Review	2019	ISSN: 2279-543X	http://www.ijssr.org/	http://www.dynamicpublisher.org/gallery/r-18.pdf	Yes
31	Macrofungus <i>Nitschkiamacrospora</i> Teng (Ascomycetes: Nitschkiaceae), a new report to India.	Nandan Patel K J., Krishnappa M. and Krishna V	Botany	Journal of Threatened Taxa	2018	ISSN: 0974-7907	https://threatenedtaxa.org/	https://threatenedtaxa.org/DOI/article/view/4083/4505	Yes
32	<i>Sarcoxylon compunctum</i> (Jung.) Cooke. A new record to Western Ghats of India.	Nandan Patel K J., Krishnappa M. and Krishna V	Botany	Journal of Mycopathological Research	2019	ISSN: 0971-3719	https://www.researchgate.net/journal/Journal-of-Mycopathological-Research-0971-3719	https://www.cabdirect.org/cabdirect/abstract/20193109969	No
33	Novel bioactive azo-azomethine based Cu (II), Co (II) and Ni(II) complexes, structural determination and biological activity	Krishnamurthy G.	Chemistry	J. Mol. Struct	2019	2019I2019S20SN: 0022-2860	https://www.sciencedirect.com/journal/journal-of-	24702(N)	No

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							molecula r- structure		
34	Electrochemical behaviour of 5-methoxy-5,6-bis(3-nitrophenyl)-4,5-dihydro-1,2,4-triazine-3(2H)-thione in presence of salicylaldehyde on zinc cathode with surface morphology and biological activity,	Krishnamurthy G.	Chemistry	Asian Journal of Green Chemistry	2019	ISSN: 2588-5839	http://www.ajgreenchem.com/	24702(N)	No
35	Synthesis, XRD, thermal, spectroscopic studies and biological evaluation of Co(II), Ni(II) Cu(II) metal complexes derived from 2- benzimidazole	Krishnamurthy G.	Chemistry	J. Mol. Struct.	2018	ISSN: 0022-2860	https://www.sciencedirect.com/journal/journal-of-molecular-structure	24702(N)	No
36	Mixed ligand Co(II) complexes: synthesis, Characterization, DNA binding and photoluclease studies	Krishnamurthy G.	Chemistry	Journal of Applicable Chemistry	2018	ISSN : 2278-1862	http://www.joac.info/		Yes
37	Synthesis, characterization and tumor inhibitory activity of a novel Pd(II) complex derived from methanethiol bridged(2-((1H-benzo[d]imidazole-2-yl)methylthio)-1H-benzo[d]imidazole-5-yl)(phenyl) methanon	Krishnamurthy G.	Chemistry	New J. Chem	2018	ISSN: 1369-9261	https://pubs.rsc.org/en/journals/journal/nj	62886(N)	No

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38	Cd(II) Mixed Ligand Complex Containing 2-Aminothiazole and Triphenylphosphine; Synthesis, Spectral, DFT and Biological Activity Studies	Krishnamurthy G.	Chemistry	Journal of Pharmaceutical, Chemical and Biological Sciences	2018	ISSN: 2348-7658	https://iindexin.com/journal-details/Journal-of-Pharmaceutical,-Chemical-and-Biological-Sciences/	www.jpebs.in for	No
39	Synthesis and characterization of 2-substituted-4-(naphtha[2,1-b]furan-2-yl)-2,3-dihydrobenzo[b][1,4]thiazepine for antibacterial activity	Latha K P	Chemistry	RJLBPCS	2019	ISSN: 2454-6348	http://rjlbpcs.com/		No
40	New Approach for the Synthesis of N-(4-oxo-3-substituted-2-Sulfanylidene Imidazolidin-1-yl)Naphtho[2,1-b]Furan-2-Carboxamide Derivatives and Their Antimicrobial Activity	Latha K P	Chemistry	IJPCBS	2018	ISSN: 2277-5005	http://www.jpCBS.info/ndexing.html	www.ijpcbs.com	No
41	Synthesis, spectral studies, XRD, thermal analysis and biological screening of metal complexes derived from (N-(3-methoxyphenyl)-2-[(2E)-3-phenylprop-2-enoyl]hydrazinecarboxamide	Parameshwara Naik P	Chemistry	Journal of the Turkish Chemical Society	2018	ISSN: 2149-0120	https://dergipark.org.tr/en/pub/jotcsa	doi.org/10.18596/jotesa.341379	No

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42	Synthesis, spectral and evolution biological activity of Ni(II) mixed ligand complex containing aminothiazole and triphenylphosphine,	Parameshwara Naik P	Chemistry	Int. Journal of Research and Analytical Reviews	2018	ISSN: 2349-5138	http://ijrar.com/	http://ijrar.com	No
43	Design, Synthesis of biologically active heterocycles containing indol- thiazolyl- thiazolidinone derivatives	PrabhakerWalmik	Chemistry	Asian J Pharm Clin Res	2018	ISSN: 0974-2441	https://innovareacademic.in/journals/index.php/ajpcr/	doi.org/10.22159/ajpcr.20186113.22.199	No
44	Spectral, DFT Calculations, Biological and Molecular Docking Studies of 2-[(Thiophen-2-Ylsulfanyl) Methyl]-1H-Benzimidazole Based Metal (II) Complexes.	Yuvaraja TCM	Chemistry	IJSRR	2019	ISSN: 2279-0543	http://www.ijssr.org/	www.ijssr.org	No
45	ಉನ್ನತ ಶಿಕ್ಷಣದಲ್ಲಿ ಶಿಕ್ಷಕರ ದಕ್ಷತೆ : ಸಮಕಾಲೀನ ಅನುಭವಗಳು	Dr. S.M Muthaiah	Kannada	ಹೊಸತು, ಡಿಸೆಂಬರ್	2018	2319-7307		offline	No
46	Ambedkar chintaneyahadiyallimanavikara nadpratimegalu	Dr. Rajeeva Naik S	Kannada	Hosatu 12/2018	2018	2319-7307		offline	No
47	Indigenous Ornamental Cyprinid Fish Diversity Of Bhadra Reservoir, Karnataka.	Dr. K.L. Naik and Kiran B.R	Zoology	Star research journal	2018-19	Volume-06, Issue-01(3). ISSN:2321-676X	http://starresearchjournal.com/	http://www.starresearchjournal.com/	No
48	Population dynamics of yellow stem scirphophagaincertulas (walker) on rice (oryza sativa):	Shilpa D, Dr. K.L. Naik and B.B. Hosetti	Zoology	International Journal of Engineering Science Invention	2018-19	Vol-07, Issue - 10. (ISSN:2319-6726)	https://publons.com/wos-op/journ	https://ijsei.in/index.php/ijsei	No

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	using sex pheromone trap at shivamogga district, karnataka.						al/28418 5/international-journal-of-engineering-science-inven/		
49	Studies on water quality evaluation of nidhige tank (chunchadri water sports), shivamogga, karnataka, india.	Sayeswara HA and H.M.Ashashree	Zoology	<i>Int. J. Engineering Science Invention</i>	2018-19	Vol. 9, 29-38, ISSN: 2455-4286.	https://publons.com/wosop/journal/284185/international-journal-of-engineering-science-inven/	https://ijsei.in/index.php/ijsei	No
50	Butterfly species diversity, occurrence and abundance in gandhi park of shivamogga, karnataka, india.	Sayeswara HA	Zoology	<i>Int. J. Engineering Science Invention.</i>	2018-19	Vol. 7, 67-75, ISSN: 2455-4286.	https://publons.com/wosop/journal/284185/international-journal-of-engineering-science-inven/	https://ijsei.in/index.php/ijsei	No

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Antimicrobial activity of ginger root extracts against human pathogenic bacteria

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²Research Scholar, Department of Microbiology, Davangere University, Shivamogga city, Davangere-577401.

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Abstract: Plant and their derived products have been used as a medicine for several centuries. In ancient Indian medicine system, Ginger (*Zingiber officinale*) and many other plants also used as medicine. In this study the antimicrobial activity of the ethanol extract of ginger root was tested against six standard bacteria: *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Salmonella enterica* ser. Typh1 and *Escherichia coli* by agar well method. In agar well method ethanol ginger extract showed maximum zone of inhibition against *Pseudomonas aeruginosa* and minimum zone inhibition observed in *K. pneumoniae*. From these results we can conclude that ethanol extract of ginger showed potential antibacterial activity against pathogenic bacteria, it can be used as a conventional medicine against these bacteria after proper validation.

Keyword: Ginger (*Zingiber officinale*), ethanol extract, Zone of inhibition (ZOI), and agar well method.

I. INTRODUCTION

A medicinal plant Ginger (*Zingiber officinale*) belongs to the family Zingiberaceae, it has been widely used as a spice in the diet in many of Asian countries [1]. Since long back Ginger has been used for medicinal and dietary purpose in India and China [2, 3, 4]. United States FDA agency listed ginger in GRAS (Generally recognised as safe) consumables document [5]. Ginger commonly used to control wide range of problems like arthritis, cramps, rheumatism, sprains, sore throats, muscular aches, pains, constipation, vomiting, hypertension, indigestion, dementia, fever and infectious diseases [6].

Human health has been threatened by the pathogenic microbes and its food poisoning activities. To curb the activity of microbes several antimicrobial agents have been widely used however, some of them are weakened by microbial resistance [7]. A wide range of phytochemicals like alkaloids, cardiac glycoside, tannin, saponin, flavonoids and terpenoids presence has reported from *Z. officinale* root extracts, these are very effective against wide range of pathogenic fungi and bacteria [8]. In the present study, we focused on the antibacterial activity of ginger against selective human pathogenic bacteria.

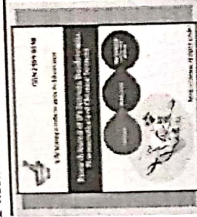
II. MATERIALS AND METHODS

Collection of Ginger sample:

The rhizomes of ginger (*Z. officinale*) were collected from the local market of Shivamogga city (Karnataka, India). The roots were washed with distilled water repeatedly to remove the adhered soil and dried at room temperature for 15 days.

Solvent extraction of ginger contents:

After wash and dry ginger roots were powdered using cryogenic tissue grinder, 100 grams of the powder was dissolved in 100 ml of ethanol. Further this solution was allowed to stand for 3 days, after settling filtered through sterile muslin cloth followed by Whatman filter paper No.1. The filtrate obtained was evaporated to dryness by placing in the hot air oven at 40 °C for 24 hrs. The precipitate was made into a concentration of 100mg/ml. Then diluted in ethanol solvent and made different concentrations of 5µl, 10µl and 15µl was prepared [9, 10, 8].



Original Research Article

IN VITRO ANTIPROLIFERATIVE AND FREE RADICAL SCAVENGING ACTIVITIES IN PEELS OF CITRUS FRUITS

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ABSTRACT: The present study was contemplated to evaluate the *in vitro* antiproliferative and antioxidant activities in ethanolic extracts of citrus fruits peels *viz.*, Lime (*Citrus aurantifolia*), Orange (*Citrus reticulata*), Sour Orange (*Citrus aurantium*), Pomello (*Citrus grandis*) and Citron (*Citrus medica*) on MCF-7 breast cancer cell line and U-87MG glioblastoma cell line. The peels of the fruits were separated and subjected to cold extraction using 70% alcohol. The extracts obtained were subjected for qualitative phytochemical analysis to detect the presence of different phytoconstituents and the antiproliferative activity of the extracts was investigated *in vitro* through MTT assay. Further the antioxidant activity of the extracts was assessed by using ABTS and hydroxyl radical scavenging methods. The results of qualitative phytochemical analysis revealed the presence of several bioactive compounds such as polyphenols, flavonoids, terpenoids, steroids, glycosides, saponins and alkaloids. The peels of all five citrus fruits registered notable increase in the cell proliferation inhibition and antioxidant activities in a dose dependent manner. The results of anti-proliferative activities were expressed in terms of IC₅₀ where pomello peel extract showed considerable cytotoxicity and cell proliferation inhibition in MCF-7 with an IC₅₀ value of 872±0.43 µg/mL, followed by lime (978±0.55µg/mL), sour orange (1920±0.42µg/mL), orange (1965±0.83 µg/mL) and citron (2000±0.49 µg/mL). While for U-87MG orange peel extract showed significant decrease in cell proliferation with an IC₅₀ value of 778±0.768 µg/mL whereas sour orange, lime, citron and pomello exhibited 870±0.57, 1076±0.45, 1116±0.66 and 1647±0.42 µg/mL IC₅₀ respectively. The findings from study thus indicated that citrus fruit peels possessed immense potential as therapeutic sources in treatment of cancer and support their health promoting claims of plethora of investigations.

KEYWORDS: Citrus peel, anti-proliferative, MTT, antioxidant, ABTS, Hydroxyl.

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FOLKLORE MEDICINAL ORCHIDS FROM SOUTH INDIA: THE POTENTIAL SOURCE OF ANTIOXIDANTS

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ABSTRACT

Objective: Orchids are widely used the economically important ornamental plant. Conventionally, they were also used for the treatment of several diseases. In the present study, five species of medicinal Orchids from South India were selected to evaluate their antioxidant potential.

Methods: The selected species were extracted by Soxhlet method using 70% ethanol. The extracts obtained were analyzed for various quantitative and antioxidant assays followed by correlation analysis in between quantitative and antioxidant activity.

Results: Antioxidant data revealed that among the extracts of five orchids, *Coelogyne breviscapa* was proved to be superior in terms of antioxidant activities, followed by *Aerides maculatum*, *Dendrobium macrostachyum*, *Pholidota pallida*, and *Vanda testacea*. Correlation analysis was performed, and the results proved simple positive correlation and highest average value of r^2 (correlation coefficient) for antioxidant activities with quantitative the total antioxidants, total phenolics, total flavonoids, and ascorbic acid content. Among the qualitative antioxidant activities, the highest average value of r^2 was shown by 2, 2-diphenyl-1-picrylhydrazyl, iron chelating, 2,2-azobis-3-ethyl-benzothiazoline-6-sulfonic acid, and superoxide radical.

Conclusion: The study documents that orchid plants have significant antioxidant potential which can contribute to human health.

Keywords: Antioxidant, Correlation, Folklore, Orchids, Phytochemicals.

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INTRODUCTION

Free radicals are reactive chemical species having a single unpaired electron in an outer orbit and are thus unstable [1]. This unstable configuration creates energy to pair with another electron which is released through reactions with adjacent molecules in the cytoplasm of the cell and hence damage it. Humans are constantly exposed to free radicals. Excess of free radicals in the cell prompts a state called "oxidative stress" a major factor in the development and progression of life-threatening diseases, including neurodegenerative and cardiovascular disease [2,3]. The protective effects against free radical damage are balanced by the supplementation of both endogenous and exogenous antioxidant systems combating the undesirable effects of reactive oxygen species (ROS)-induced oxidative damage in the body [4]. Plants are a potent source of useful antioxidant which plays a pivotal role to combat the oxidative stress. Several types of natural and artificial antioxidants are in regular use worldwide for such oxidative stress.

Orchids are belonging to the family Orchidaceae the most highly evolved among monocotyledon with 600–800 genera and 25,000–35,000 species in the world [5]. Orchids were used traditionally in the treatment of a number of diseases, namely, coughing, abdominal pains, heart attack, malaria, tuberculosis, asthma, wounds, bronchitis, ringworm, rheumatism, and kidney disorders [6]. In India, orchids are employed for a variety of therapeutic use in different systems of traditional medicines such as Ayurveda, Siddha, and Unani. Asthavarga is the important ingredient of various classical Ayurvedic formulations such as Charyvaprasa in which four of orchid constituent have been reported, namely, Riddhi, Vridhhi, Jivaka, and Rishbhaka [7]. Recently, there has been tremendous progress in medicinal plants research; however, orchids have not been exploited fully for their medicinal application. Pharmacological and phytochemical investigations may

reveal bioactive compounds that could add value to medicinal and related orchid species. In this study, five orchid species with medicinal folk claims were selected, namely, *Aerides maculatum* (AM), *Coelogyne breviscapa* (CB), *Dendrobium macrostachyum* (DM), *Pholidota pallida* (PP), and *Vanda testacea* (VT) of Karnataka, South India. Review of literature from ethanobotanical reports indicates that the above orchids were used from ancient times for the treatment of various diseases; for example, root and leaf infusion of AM was given for 2 months for tuberculosis [8], paste of pseudobulbs of CB are used for insects bite and swellings [9], tender shoot tips of DM were used as an ear drop for ear ache, pimples, and skin eruptions, and also the plant material was tied overnight to relieve pain [10,11]. Bulb of PP was used in intestinal worms, abdominal pain, and rheumatism [6]. The plant extract of VT called "Rasna" is useful in rheumatism, nervous disorders, and scorpion stings, and leaf is used for cuts and wounds, malarial fever, asthma, earache, antiviral, and anticancer agent [6,12]. Therefore, in the present study, five orchid species with various medicinal folk claims were evaluated for their antioxidant potential by performing various quantitative and antioxidant assays.

METHODS

Collection of plant material

The above selected five orchid species were collected from the forest area of Shimoga District, Karnataka, and were identified and authenticated by Dr. Prashantha K. M, Department of Botany, Sahyadri Science College, Kuvempu University, Shimoga.

Preparation of plant extracts

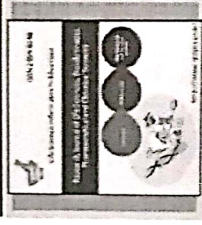
Different parts of the orchid species were used for the extraction. The selection of different plant parts of orchid species was with respect to medicinal folk claims in various ethnobotanical studies. The parts selected from different orchids for extraction were pseudobulbs in

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Original Research Article

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ANTI-INFLAMMATORY AND ANTINOICEPTIVE ACTIVITY OF SOME ORCHIDS

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ABSTRACT: The present study was carried out to evaluate the anti-inflammatory activity assessed by Carrageenan induced rat paw edema model and HRBC membrane stabilization assay whereas Tail flick and Hotplate methods have been used to evaluate the antinociceptive property in selected orchid species viz. *Aerides maculosum* (AM), *Coelogyne breviscapa* (CB), *Dendrobium macrostachyum* (DM), *Pholidota pallida* (PP) and *Vanda testacea* (VT). The Soxhlet extracted (70% ethanol) orchids at 200 and 300 mg/kg bw were selected as a therapeutic dose. Results of anti-inflammatory by carrageenan induced paw edema revealed that the extracts treated animals have shown a significant decrease in paw volume reflecting a reduction of inflammation at 180, 240 and 300 min. HRBC membrane stabilization revealed that the extracts possess the highest percentage of inhibition at 10 mg/ml. From both *in vivo* and *in vitro* inflammatory activity, it was found that VT has maximum effect followed by DM, AM, CB and PP. Further, the results of analgesic methods showed that the extracts are contributing to the significant reduction of pain at 200 and 300 mg by increasing reaction time wherein DM recorded the highest effect followed by VT, AM, CB and PP. The results documents that orchid possess prominent anti-inflammatory and analgesic activities.

KEYWORDS: Orchids, anti-inflammatory, paw edema, HRBC stabilization, antinociceptive.

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PRINCIPAL

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Peels of Citrus Fruits: A Potential Source of Anti-inflammatory and Anti-nociceptive Agents

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ABSTRACT

Introduction: The present study was contemplated to evaluate the anti-inflammatory and analgesic potentials in peels of some commercially grown Citrus fruits of South India viz. Lime (*Citrus aurantifolia*), Orange (*Citrus reticulata*), Sour Orange (*Citrus aurantium*), Pomello (*Citrus grandis*) and Citron (*Citrus medica*). **Methods:** The peel of the fruits were separated and subjected to cold extraction using 70% alcohol. The extracts obtained were screened for the presence of phytoconstituents by qualitative phytochemical analysis; the anti-inflammatory activity of extracts at 250 and 500mg/Kg body weight concentrations were assessed by *in vivo* Carrageenan induced rat paw edema model and *in vitro* HRBC membrane stabilization assay whereas Tail immersion and Hot plate methods have been used to evaluate their analgesic property. **Results:** The results revealed that, all extracts treated animals have shown significant decrease in paw edema volume at 3rd and 4th hour of treatment and increase in reaction time in tail immersion and hot plate readings at 120 and 150 min and are comparable to the standards. From the results it was evident that Citron peel extract exhibited significant anti-inflammatory and analgesic property in all models. Preliminary phytochemical investigation revealed that extracts were bestowed with presence of flavonoids, terpenoids, steroids, glycosides, alkaloids, carotenoids and phenolic compounds which might be responsible for the antinociceptive and anti-inflammatory activities. **Conclusion:** From the results it was evident that all citrus fruits have prominent activity in terms of parameters assessed in a dose dependent manner and are more effective in the later phase. The study thus documents that Citrus peels are good sources of anti-inflammatory and anti-nociceptive agents.

Key words: Citrus peel, Phytochemicals, Carrageenan, HRBC, Tail immersion, Hot Plate.

INTRODUCTION

Inflammation is a local response of living mammalian tissues to injury. It is a body defense reaction in order to eliminate or limit the spread of injurious agents typically characterized by an increase in tissue permeability and endothelial leukocyte influx of blood into the interstitium, causing edema.¹⁻² Though inflammation is a normal response to tissue injury, often it is uncontrolled in chronic autoimmune diseases such as rheumatoid arthritis and Crohn's disease, or when related to allergic response such as asthma and anaphylactic shock.² Analgesia is an "unpleasant sensory and emotional experience that is caused by actual or potential tissue damage", usually evoked by an external and internal noxious stimulus.^{3,4} Inflammation and pain are common non-specific manifestations of many diseases. Various endogenous mediators such as histamine, serotonin, bradykinin, prostaglandins, etc are most abundant in inflammatory cells and among them prostaglandins are ubiquitous substances that indicate and modulate cell and tissue responses involved in pain and inflammation.^{5,6}

The inflammatory agents exhibit therapeutic properties by blocking the action or synthesis of these mediators.

The most widely used medicines in modern practice are cyclooxygenase (COX) inhibitors i.e. NSAIDs and opioids which are effective for the treatment of inflammation and pain.⁷⁻⁸ These drugs block COX-1 and COX-2 enzymes involved in prostaglandin production. However, their chronic use particularly in patients with arthritis or other chronic inflammatory diseases is associated with adverse effects such as gastrointestinal perforation, ulceration, bleeding and renal toxicity mainly due to the blockade of COX-1. Therefore the need arises for the development of newer anti-inflammatory and analgesic agents from natural sources with more powerful activity and with lesser side effects as substitutes for chemical therapeutics.^{7,10} In this context the present study was executed to explore for more naturally available alternatives, so that their therapeutic values can be assessed and expanded.

Several epidemiological studies have suggested that the consumption of fruit and vegetables is associated with a reduced risk of cardiovascular disorders and cancers,^{10,11} and neurodegenerative diseases such as Parkinson's and Alzheimer's diseases,¹² as well as

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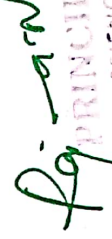


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Accepted Manuscript



The tumor antagonistic steroidal alkaloid Solanidine prompts the intrinsic suicidal signal mediated DFF-40 nuclear import and nucleosomal disruption

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Protective Effect of Dietary Curcumin and Capsaicin on LPS-Induced Inflammation in Mice

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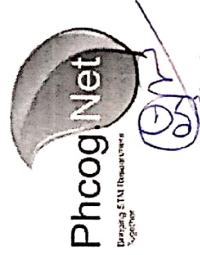
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ABSTRACT

Objective: The current study aimed to evaluate the anti-inflammatory potency of combined curcumin and capsaicin against lipopolysaccharide (LPS) induced organ damage in mice. **Methods:** Adult male albino mice were distributed into five experimental groups for treatment with olive oil, LPS, curcumin, capsaicin and their combination, respectively, for 7 days prior to LPS induced inflammation. At the end of the experiment, blood samples were collected and used for the analysis of serum non-specific enzymes including serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), alkaline phosphatase (ALP), total bilirubin (TB), urea, creatinine and sugar, while the organ homogenates were subjected for the evaluation of antioxidant enzymes such as superoxide dismutase (SOD), catalase (CAT), glutathione S transferase (GST), nitric oxide (NO); lipid peroxidation (LPO) and it was further confirmed by histopathological study of different organs. **Results and Conclusion:** Curcumin, capsaicin and their combination had shown significant restoration of non-specific serum enzymes, antioxidant enzymes and attenuated inflammatory cells infiltration thereby preventing tissue/organ damage in LPS-challenged mice. However, the protective effect was found to be more when the two compounds were fed in combination. This beneficial potency of combined spice treatment is may be due to the contribution of diversified active moieties of curcumin and capsaicin in combination compared to individual molecules. **Key words:** Curcumin, Capsaicin, LPS, Septic shock, Lipid peroxidation, Superoxide dismutase.

INTRODUCTION

Sepsis is a systemic inflammatory response to infection mediated through cytokines and free radicals for controlling local inflammation with eventual elimination of invading pathogens.^{1,2} Massive and uncontrolled release of cytokines such as tumor necrosis factor- α (TNF- α), interleukin- 1β (IL- 1β), high mobility group box-1 (HMGB1)^{3,4} and free radicals trigger the systemic inflammatory process. These mediators contribute to the migration of leukocytes, lymphocytes, and platelets to the infected area and cause endothelial damage, increased microvascular permeability, vasoplegia, hypoperfusion, ischemia/reperfusion injury leading to organ dysfunction and death.^{5,6}

LPS, the outer membrane component of Gram-negative bacteria, is a major pathogenic factor in sepsis⁷ and is a widely used valuable and reproducible model to induce systemic inflammatory response in laboratory animals, which mimic the initial clinical features of sepsis.⁸ Development of significant therapeutic strategies have been made to treat sepsis, nevertheless mortality rate was not significantly decreased.⁹ Previous studies have reported that antioxidants are able to protect LPS-induced septic shock *in vivo*.

Curcumin, a polyphenol of *Curcuma longa*, reported for its beneficial anti-inflammatory, antioxidant, anti-mutagenic and anticancer activities.¹⁰⁻¹² Effective in

protecting heat induced oxidant stress,¹³ chromium-induced renal damage,¹⁴ cisplatin-induced hepatotoxicity,¹⁵ aluminum-induced mitochondrial dysfunction *in vivo*.¹⁶ Whereas, capsaicin, a component of *Capsicum annuum* exerts various pharmacological properties, including antioxidant, anti-inflammatory and anti-epileptic effects.^{17,18,19} *In vivo* reports have established that capsaicin inhibits cisplatin-induced nephrotoxicity, Lipid peroxidation, renal injury, oxidative stress and inflammation,^{20,21} cecal ligation and puncture (CLP) induced systemic inflammatory responses.²² Mechanism of action of curcumin and capsaicin on health beneficial activity have been extensively studied and reported.^{23,24,25} Although these two spice principles share a considerable amount of structural homology nevertheless possesses notable differences in the mechanism of action. The present study was designed to evaluate protective effect of combined curcumin and capsaicin against LPS-induced inflammation in mice.

MATERIALS AND METHODS

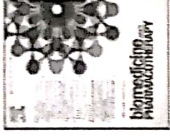
Chemicals

Curcumin, capsaicin, lipopolysaccharide, Glutathione (GSH), nitroblue tetrazolium (NBT) and Griess reagents were purchased from Sigma-Aldrich (USA).

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Synthesis and amelioration of inflammatory paw edema by novel benzophenone appended oxadiazole derivatives by exhibiting cyclooxygenase-2 antagonist activity

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ABSTRACT

Ten new 2(4-hydroxy-3-benzoyl) benzamide-5-phenyl-1,3,4-oxadiazole derivatives (10a-j) were synthesized by coupling 3-benzoyl-4-hydroxybenzoic acid (5) with 2-amino-5-phenyl-1,3,4-oxadiazoles (9a-j). The structures of these compounds were confirmed by IR, ¹H, ¹³C NMR, and mass spectra, and also by elemental analyses. The anti-inflammatory activity of the compounds 10a-j were investigated by screening them against human red blood cells (HRBC) *in-vitro*. The results reveal that among this series, compound 10j with hydroxy substituent, particularly at the ortho position of the phenyl ring attached to the 5th carbon atom of the oxadiazole ring possess significant membrane stabilizing activity in comparison with the control. Further, *in-vivo* chick chorioallantoic membrane (CAM) and rat corneal anti-angiogenesis assays were performed to assess the effect of compound 10j on endothelial cell migration. This confirmed that compound 10j inhibits the proliferation of endothelial cells. Anti-inflammatory studies detected the amelioration of carrageen induced rat hind paw edema. Further *in-vivo* and *in-silico* approaches revealed the inhibition of inflammatory marker enzyme cyclooxygenase-2 (Cox-2) and myeloperoxidase (MPO). The study reports that the compound 10j effectively act against the inflammatory mediated anti-angiogenic disorders which could be translated into a new drug in future.

1. Introduction

Inflammation is a part of the multifaceted biological response of vascularised tissues to damaging stimuli. It is well thought-out as a homeostatic response intended to destroy or deactivate invading pathogens, eliminate squander and debris, that leads to re-establishment of normal function, either through a resolution or restore mechanism [1]. Angiogenesis is considered as a vital constituent of inflammation and its resolution and both are inter reliant events [2]. Some pattern of inflammation, notably chronic inflammation, can encourage vessel maturation. New vessels may add to a tissue's altered inflammatory reaction [2]. Angiogenesis and inflammation, however, remain distinct cellular events that can come about independently. Many chief transcription factors, such as nuclear factor kappa B, signal transducers and activators of transcription, the vital mediators of inflammatory signaling. Mutually, these transcription factors converge and regulates inflammatory pathways [3]. Molecular events related to these processes

include the activation of downstream molecules such as prostaglandins (PGs) which act as local intermediaries of inflammation which is regulated by cyclooxygenases (COXs). The COX-1 isoform is expressed constitutively whereas COX-2 expression is encouraged during specific pathophysiological conditions or in response to inflammatory stimuli [3]. Another prime hallmark enzyme in the inflammatory response is myeloperoxidase (MPO) mainly secreted by activated neutrophils, portrayed to exhibit powerful pro-oxidative and proinflammatory properties and likely to facilitate the angiogenic gene regulation [4]. Blockage of chronic inflammation may be likely to constrain angiogenesis where the stimulus for vascular growth is consequent from inflammatory cells [5]. Some anti-inflammatory agents may also have anti-angiogenic role that is independent of its effects on inflammation, which add up the fact that agents that have been designed to specifically inhibit angiogenesis may also inhibit chronic inflammation [6]. Benzophenone based analogue is known to exhibit a broad range of biological activity. Primarily, it acts as target specific anti-angiogenic

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Antitumor Hybrid BT009K Modulates Inflammation Induced Neovascularization in Both Tumorigenic and Non-Tumorigenic Model System

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Inflammation, angiogenesis, BT009K, EAC, MVD.

ABSTRACT

Cancer being one of the most dreadful diseases and inflammation in cancer is one of the emerged hallmarks of cancer. Discovering new drugs with minimal side effects plays a vital role in drug development process for the treatment of cancer. As an approach antitumor hybrid of "Benzocaine coupled with diamide analog "BT009K" or N-(2-{2-[4-(4-bromo-benzoyl)-2-methyl-phenoxy]-acetyl-amino)-phenyl}-2-[2-methyl-4-(2-methyl-benzoyl)-phenoxy] was screened against different cell lines. Cytotoxic effect was found to be effective against EAC with prolonged effect. The *in-vivo* antitumor effect was observed in EAC ascites tumor model system with reduced peritoneal neovascularisation. Further histological examination with endothelial marker CD31 confirmed the angioregressive effect of BT009K. The results were additionally confirmed in a non-tumorigenic model like CAM and rat corneal angiogenesis assay indicating reduced microvessel density count by BT009K. Further BT009K induces the anti-invasive effect in EAC cells *in-vitro* which could be further developed into therapeutic potential.

INTRODUCTION

Cancer is defined as the interplay between cell intrinsic and extrinsic process due to the instability in the genome, abnormality in the proliferation of cells, inaccuracy in the stromal environment and atypical differentiation amongst epithelial and mesenchymal status (Eran *et al.*, 2013). The development of cancer can be attributed with six vital possessions that cells undergo evasion of apoptosis, uncontrolled angiogenesis, negligence to anti-proliferative signals, unconstrained replicative potential, tissue invasion followed by metastasis (Hanahan and Weinberg, 2000). These phases take place in the development of cancer initiation, promotion, and progression. Initiation is started

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through genomic instability in cancer cells promoting for tumor development endorsed by the survival and clonal expansion and followed by significant growth in tumor size and metastasis of tumor cells (Kinzler and Vogelstein, 1996).

Inflammation, the physiological reaction of the body due to the mutilation of tissue damage instigated through microbes, wounds, chemical irritation (Philip *et al.*, 2004). Inflammation categorized into acute and chronic if the healing of inflammation does not take place it progress from acute to chronic inflammation resulting in recruitment of lymphocytes, leukocytes and various inflammatory cells at the site of the inflamed site. Further chronic inflammation mediates to the formation of the tumor by making a suitable environment for the cancer cells (Cousseus and Werb, 2002; Nathan, 2002). Inflammation during tumor progression induces the angiogenic mediators triggering the angiogenesis (Pollard JW, 2006). Angiogenesis is known as restoration and progression of the new vascular system from the existing matured vasculature to form branching network (Cannelliet, 2005).

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Vimentin and Non-Muscle Myosin IIA are Members of the Neural Precursor Cell Expressed Developmentally Down-Regulated 9 (NEDD9) Interactome in Head and Neck Squamous Cell Carcinoma Cells¹

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Abstract

Here we demonstrate an interaction between neural precursor cell expressed, developmentally-downregulated 9 (NEDD9) and the cytoskeletal proteins vimentin and non-muscle myosin IIA (NMIIA), based on co-immunoprecipitation and mass spectrometric sequence identification. Vimentin was constitutively phosphorylated at Ser56 but vimentin associated with NEDD9 was not phosphorylated at Ser56. In contrast, NMIIA bound to NEDD9 was phosphorylated on S1943 consistent with its function in invasion and secretion. Treatment of cells with the vimentin-targeting steroidal lactone withaferin A had no effect on vimentin turnover as previously reported, instead causing NEDD9 cleavage and cell death. The NMIIA-selective inhibitor blebbistatin induced cells to form long extensions and attenuated secretion of matrix metalloproteinases (MMPs) 2 and 9. While the site of vimentin interaction on NEDD9 was not defined, NMIIA was found to interact with NEDD9 at its substrate domain. NEDD9 interactions with vimentin and NMIIA are consistent with these proteins having roles in MMP secretion and cell invasion. These findings suggest that a better understanding of NEDD9 signaling is likely to reveal novel therapeutic targets for the prevention of invasion and metastasis.

Translational Oncology (2019) 12, 49-61

Introduction

Tumor cell invasion and metastasis to distant organ sites represents the primary cause of mortality and morbidity for most cancer patients. In particular, metastasis is the final step leading to patient death from most solid tumors, including head and neck squamous cell carcinoma (HNSCC). Overexpression of Neural precursor cell expressed developmentally downregulated 9 (NEDD9) is associated with increased invasion and metastasis in multiple cancer sites and a mouse model of melanoma [1]. Indeed, it has been suggested that elevated NEDD9 expression levels may serve as a biomarker for tumor aggressiveness [2]. Consistent with this view, we [3]


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² These two authors made equal contributions to this manuscript.

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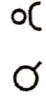
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Antimicrobial studies of stem bark extract and their phytoconstituent from *Semecarpus anacardium* L.



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Antimicrobial studies of stem bark extract and their phytoconstituent from *Semecarpus anacardium* L.

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Antimicrobial studies of stem bark extract and their phytoconstituent from *Semecarpus anacardium* L.

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⁴Manuscript received 21st Nov. 2017, revised 22nd Dec. 2017, accepted 23rd Dec. 2017

Abstract

Background & Objective: To investigate the antimicrobial properties of stem bark extract of *S. anacardium* and their phytoconstituent using agar well diffusion and *in silico* docking methods. **Methodology:** *In vitro* antibacterial activity of petroleum ether, chloroform, methanol stem bark extract of *S. anacardium* was screened against both gram negative and gram positive bacteria. **Results:** The methanol extract of stem bark and anattoflavone, a bioactive compound showed significant antibacterial activity against *Klebsiella pneumoniae* and antifungal activity against *Candida albicans*. *In silico* docking of anattoflavone with bacterial glucosamine-6-phosphatase synthase and three fungal targets, mevalonate-5-diphosphate decarboxylase (1F14), Sec3 - Rho1 complexes (3A58), Kre2pΔint1pΔ1, 2-mannosyltransferase (1S4N) showed significant inhibition with minimum binding energy. When compared to standard drug ciprofloxacin and amphotericin B. **Conclusion:** This study clearly showed that the anattoflavone used as broad spectrum of antimicrobial drug.

Keywords: Antimicrobial activity, *Klebsiella pneumoniae*, Ciprofloxacin, Amphotericin B, Docking studies
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1. Introduction

The *Semecarpus anacardium* L., belongs to a family anacardiaceae. The word *Semecarpus* is derived from *simonion* in Greek means marking/iracing and *carpus* in Greek means nut. Hence, it is popularly known as marking nut. *S. anacardium* called Bhallataka (Bhallatak), Anubhasnava, Anusharab, Aruskama (Arunkara), Arzohira, Balla ta (Bhallata, Ballata), Bhallatakal, Vitarvlesa, Visasya (Sauskery), Indian marking nut, Marsh nut, Oriental cashew nut (English); Bhele (Bhel), Bhelewa, Bhelewa (Bhulv), Bhelewa (Hindi); Erimngi or Erimuki (Tamil); Nallajeedi (Telugu); Bhihannu (Gujarati); Kaadu getu (Kannada) and distributed in sub-Himalayan region, tract east of the base, ascending to

The plant high priority and applicability in indigenous system of medicine with caution, because it has potential to produce allergic symptoms through contact dermatitis (Chopra *et al.*, 1982; Khane *et al.*, 1982). In Ayurvedic medicine the nut (Bhallatak) has been used in the form of *Madhur, Kashay ras, Ushna vitya, Madhur vipak, Madhur laghu, Sitigedha, Tikshna and Ushna givusa* (Goette, 2000). The fruits of plants are largely used in Ayurvedic system of medicine for various ailments such as helminthic infection (Chattopadhyaya and Khare, 1969), leprosy, rheumatic pain, piles, asthma, cough, sexually transmitted diseases viz syphilis and gonorrhoea, skin diseases such as leucoderma (Nadkarni, 1954, 1976), rejuvenating properties, increasing

<https://library.net/document/vzgr0267> antimicrobial-studies-stem-bark-extract-phytoconstituent-semecarpus-anacardium

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Hepatoprotective Properties of *Caesalpinia bonducella* against CCl₄ induced in Rats

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Keywords:

C. bonducella, acute toxicity, Stem bark chloroform extract, phytoconstituent, Hepatoprotective activity.

Abstract

To investigate the hepatoprotective property of leaves, stem bark extract and the phytoconstituent of *Caesalpinia bonducella* on CCl₄ induced rat models. The Wistar albino rats of either sex, weighing about 180–200 g were used to induce the hepatotoxicity using CCl₄. Animals were treated with different leaves, stem bark extracts (300 mg/kg b.wt.) and the isolated phytoconstituent (70 mg/kg b.wt.) orally once in day for a period of 15 days. All the groups received the intraperitoneal dose of 50% CCl₄ after every 72h except vehicle control (1% (v/v) DMSO, 1ml/kg body weight, p.o). At the end of the experimental period, animals were sacrificed by cervical decapitation. The serum and liver samples were used for biochemical marker analysis. The animals treated with stem bark chloroform extract showed significant amelioration effect by elevating the decreased levels of SOD, CAT, GPx and GST levels with increased level of MDA. The isolated phytoconstituent SC2 (Methyl (4E)-5-{2-[(1E)-buta-1,3-dien-1-yl]-4,6-dihydroxyphenyl}pent-4-enoate) was more significant by reducing the serum markers level similar to standard drug silymarin. Normal hepatic architecture, absence of necrosis and few fatty lobules were noticed in the liver sections of the animals treated with stem bark chloroform extract and its isolated compound SC2 against the toxicant CCl₄. The *C. bonducella* extract and the isolated phytoconstituent has potent hepatoprotective property.

INTRODUCTION

Traditional medical inheritance in India is unique its journey from several millennium, it saw the progression of valuable indigenous systems in Folk and Ethnomedicine, Ayurveda, Siddha, Unani etc. Plants have been one of the important cradle of medicines since the dawn of human evolution. Many herbs were predominantly used to treat cardiovascular problems, liver disorders, central nervous system, digestive and metabolic disorders (Lalitharani *et al.*, 2013; Anand and Mohan, 2014). Given their potential to produce significant

therapeutic effect, they can be useful as drug or supplement in the treatment of various diseases (Fawazi Mahomoodally, 2013).

Caesalpinia bonducella is belonging to the family Fabaceae. The plant is distributed in tropical regions of the world especially in India, Sri Lanka, Brazil, Madagaskar Islands etc. (Asolkar *et al.*, 1992; White, 2008).

In India, this species is found particularly along the seacoast throughout the hotter regions of the Western Ghats and Eastern Himalayan forests. It is also present in deltaic regions of Western,

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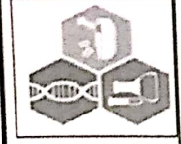
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Distribution of psoralen in different organs of *Psoralea corylifolia* L.

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Abstract

Psoralea corylifolia L. is an important medicinal plant widely used to treat various ailments and also from ancient times it is a part of Ayurveda and in Chinese medicines. Psoralen a linear furanocoumarin widely distributed in this plant which has anticancer activity. The present study carried out to evaluate the distribution of psoralen in various organs of *P. corylifolia*. Organs such as seed, seed coat, endosperm, cotyledons, leaf, shoot and root of *P. corylifolia* L. used for the quantification of psoralen. Psoralen was quantified by high performance liquid chromatography (HPLC). Higher content of psoralen were recorded in whole seed than other organs used in the study.

Keywords: *Psoralea corylifolia* Linn, Psoralen, High performance liquid chromatography, Seed, distribution

Introduction

Psoralea corylifolia Linn is an medicinal herb, extract of this plant known to possess antitumor [1], immunomodulatory [2], anti-inflammatory, and antiproliferative activities [3], anti-microbial [4], cytotoxic activities [5], DNA polymerase inhibitory, DNA topoisomerase II inhibitory [6]. And anti-HIV activities [7]. Psoralen an important linear furanocoumarin found to be inhibiting human tumour cancer cell lines [8] which is widely distributed in this plant. In recent times, as increasing the awareness about side effects of allopathic drugs had made the pharmaceutical industries turn towards herbal medicines. *P. corylifolia* has an extensive demand in pharmaceutical industries owing to various pharmacological properties. However, whole plant has been used to prepare the drugs and do not deal with the identification of active principles that are responsible to treat particular diseases. Quantification of such active principles from various plant parts is valuable for the standardization of herbs and formulations thereof. It is important to know the distribution of these compounds in order to choose the right plant parts and to obtain the right resource for extraction. In the present study, a detailed investigation of the anticancer compound psoralen distribution in various parts of *P. corylifolia* was carried out using HPLC. In particular, the concentration of psoralen content in various parts such as seed, seed coat, endosperm, cotyledon, leaves, shoot and roots were determined and compared.

Materials and Methods

Plant Material

Different organs such as seed, seed coat, endosperm, cotyledons, leaf, stem and roots were excised from the mature plants of *Psoralea corylifolia*, were dried, powdered and extracted using Soxhlet apparatus.

Extraction of Psoralen

Accurately weighed portion of plant material were defatted with petroleum ether (40-60° C) was performed in a Soxhlet apparatus for about 15h, after which same material was continued with methanol again for 15h. The obtained extracts were concentrated using vacuum evaporator and concentrated extracts were subjected for quantification of psoralen.

HPLC analysis

Psoralen was quantified by HPLC analysis using Agilent 1260 infinity HPLC unit equipped with diode array detector (DAD). C18 column at 20 °C, methanol and water (50:50) used as mobile phase with flow rate of 0.8 mL/min and psoralen was detected at 254 nm. Obtained HPLC peaks were correlated with psoralen standard (Sigma-Aldrich USA) prepared in HPLC grade methanol.

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MEDICINAL IMPORTANCE OF USNEOID LICHENS IN WESTERN GHATS, SOUTHERN INDIA

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Abstract

Usnea Adams. is a large genus in the family Parmeliaceae with about 451 species that are widely distributed in polar, temperate and tropical regions of the world. The genus is recognized based on the fruitose thallus, branches with cartilaginous central axis and the presence of Usnic acid in the cortex. India is represented by the 60 species of *Usnea* among them 38 are recorded from the Western Ghats. *Usnea* has been used to treat various illnesses in addition to its historical use as dyes, cosmetics, preservatives and deodorants. Among the 38 species of *Usnea* in Western Ghats, 15 species are known to have medicinal values, in various traditional medicines in different part of the world. The secondary metabolites like Usnic acid, salazinic acid, stictic acid, diffractic acids produced by lichens are unique with respect to those of higher plants. Whole thallus is used in the preparation of medicines. *Usnea longissima* is used as an ingredient in the medicinal for bone settings, *U. ghanterensis* is known for its antioxidant and anti microbial activity. The study aims at the medicinal value of less known group of plants and role of their bioactive compounds.


Key words: *Usnea*, medicinal lichens, Parmeliaceae

Introduction

Lichens are unique group of organisms showing symbiotic association between algae and fungi. These lichens have been used as a household item since ancient days. The medicinal uses of lichens have been recorded from different cultures in Europe, India, China, Tanzania, USA, South Africa, Nepal, Philippines, West Malaysia, Spain, Brazil, Argentina, Korea, Tibet, Russia, Japan, Mongolia, Canada, Libya, Ireland (Prateeksha *et al.*, 2016). Shilpal in Atharveda is the first record of the use of lichen as medicine. In Ayurveda, the Indian medicinal system, it has been widely used in the name of Charila. The Indian subcontinent harbours a rich lichen flora with 2,450 species (Awasthi, 2000). Lichens collected from the different part of India have been used as food, fodder, and exported for many purposes such as food, fodder, medicines, cosmetics, perfumes and dyes.

Western Ghats harbours 949 lichen taxa, belonging to 929 species, 20 varieties, 150 genera and 54 families which is around 45% of the total lichens in India, highest

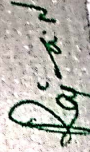
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for any lichenogeographic region in the country (Nayaka and Upreti, 2006). The genus *Usnea* is represented by 38 species in Western Ghats (Mesta *et al.*, 2015).

There are about 800 secondary metabolite identified from lichens and these are unique with respect to those produced by higher plants (Huneck and Yoshimura 1996). These secondary metabolites are useful chemical characteristics in lichen taxonomy (Hegnauer 1962). The slow growth and harsh environmental conditions are responsible for the production of secondary metabolite in lichens. The secondary metabolites have been produced to protect from herbivores (Lawrey, 1989). The secondary metabolite are responsible for the use of lichens in different fields such as medicinal, decorative, food, brewing, spices, dyeing, cosmetic and perfumery properties.

Among the lichens those belonging to the genus *Usnea* are used in medicines from ancient ages. Many species of *Usnea* are used as medicine from ancient ages. *Usnea* are used as an ingredient of medicines by ethnomedical practitioner in India and also in the world (Upreti and Chatterjee, 2007). The most commonly used



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DETERMINING THE FRUIT YIELD OF *JATROPHA CURCAS* L. ACCESSIONS FOUND IN HILLY ZONE AND SOUTHERN TRANSITION ZONE OF CHIKKAMAGALURU AND SHIVAMOGGA DISTRICTS OF KARNATAKA, INDIA

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Abstract

Jatropha curcas L. is the more vigorous candidate for biodiesel production. The current work focuses on systematic measuring of fruit yield of *J. Curcas* per meter of live fence. The present work area is delineated into two zones- 1. Southern Transition Zone (STZ), 2. Hilly Zone (HZ). 31,00x5.240 is the mean number of fruits per meter of live fence. Within HZ, 20,667±10.670 was the mean value obtained. Variation found within the HZ for this parameter was significant at 5 % level. The Mean Value of over 30 fruits per meter of live fence for Southern Transition Zone was recorded in STJCA1, STJCA5 and for Hilly Zone in STJCA4, STJCA5. The soil samples of areas of the respective accessions (SA1, SA3, SA4, and SA8) showed optimum to high Organic carbon and Nitrogen availability. On the other hand low Mean yield of less than 10 fruits per meter of live fence was observed in STJCA10 and STJCA6. The soil samples of the areas belonging to these two accessions showed low Organic carbon and Nitrogen availability. Compared to accessions of HZ, STZ accessions showed better fruit yield with less Annual Rainfall. This indicates *Jatropha curcas* being drought resistant crop could do better in general in semi arid regions compared to wet climate.

Key words – *Jatropha curcas*, STZ, HZ, STJCA1-STJCA12, yield, organic carbon, Nitrogen.

Introduction

During 15th century, the Portuguese introduced the *Jatropha* to Asian and African continents. *Jatropha curcas* L. is a drought-resistant shrub/tree belonging to the family Euphorbiaceae (Heller *et al.*, 1996). In recent past *J. curcas* L. has been considered as a potential biodiesel crop in more than 50 countries. The reason being *Jatropha* biodiesel oil conforms to the International standards (Bangboye and Hansen, 2008). According to (Fairless, 2007) there are more than 2.5 million hectares of *J. curcas* planted in India and China alone. Even after such interest being shown in the large-scale cultivation of *J. curcas*, characterization and conservation of genetic resources remain poor (Halilu *et al.*, 2011). Therefore in the present study attempts are made for to characterize *J. curcas* germplasm by estimating the fruit yield of accessions found in Chikkamagaluru and Shivamogga districts of Karnataka, India.

Materials and Method

Study Area: The study area selected includes taluks of Chikkamagaluru and Shivamogga districts (Table 1) which broadly falls under Southern Transition Zone (STZ) and Hilly Zone (HZ). The field trip was undertaken from the month of June to September, 2017.

Fruit Yield per meter of live Fence

As per Rekha *et al.* (2013) the Fruit set had the highest positive direct path towards seed yield/plant. In our study we had adopted modified method of [6] for measuring the yield of hedge crop - *Jatropha curcas*. The yield was measured by counting the number of ripened fruits per meter of live fence. A measuring tape was laid along the fence and for every one meter counting was done (Henning, 1996). The measuring was done thrice during the peak season i.e. June to September. Meanwhile soil samples of the respective collection sites were collected and later sent to Leaf Analysis Laboratory, Bioscience Centre, Horticulture Department, Government of Karnataka, Shivamogga for analysis.

The data's related to weather was obtained from the website maintained by Karnataka State Natural Disaster Monitoring Centre, A registered society of Government of Karnataka (Table 1). The data's pertaining to results was subjected to ANOVA using software XLSTAT 2017.5.47365 version.

Results and Discussion

Fruit yield per meter of live fence (Table 2) –

STJCA1, STJCA3, STJCA5 and STJCA11 all belonged to Southern Transition Zone (STZ). Within



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**IMPROVED AND EFFICIENT PROTOCOL FOR DIRECT REGENERATION FROM
COTYLEDONARY NODE OF GROUNDNUT (*ARACHIS HYPOGAEA* L.)**

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ABSTRACT

Protocol has been developed for micropropagation of *Arachis hypogaea* L. under *in vitro* conditions. Cotyledonary node explants gave rise to multiple shoots when cultured on MS (Murashige and Skoog) medium supplemented with different concentrations of TDZ, BAP and Kin (Kinetin) singly along with auxin. The highest response of shoot multiplication was obtained in MS containing 1.0 mg/l TDZ and 0.5 mg/l NAA. Multiple shoots were transferred to elongation medium augmented with Gibberellic acid (GA₃) + Indole butyric acid (IBA). The regenerated shoot lets were rooted on MS basal medium with different concentrations of IBA (Indole butyric acid) and NAA (Naphthalene acetic acid). The maximum frequency of rooting and highest number of roots were produced on medium containing IBA 0.5 mg/l. The plantlets, thus successfully established in soil and later to field.

KEYWORDS: Groundnut, Cotyledonary node, Shoot organogenesis, Thidiazuron, Plant micropropagation.

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is an economically important oil and protein rich crop whose seeds contain about 40 to 50% oil and 26 to 28% protein that has a significant impact in tropical and sub-tropical regions of Asia, Africa, North and South America. It is being cultivated on over 25.2 million ha worldwide with a total production of 41.2 million tons with an average yield of 1.67 tons/ha. India is the second largest producer of groundnut accounting 8 million tons from 6 million ha (FAOSTAT, 2014) which needs to be increased up to 15.8 million tons by 2025 to meet the growing demand. Productivity of ground nut has been low due to many biotic and abiotic stresses. There are several common diseases of groundnut crops viz., bacterial wilt and bacterial scab. Fungal diseases have resulted in decreased trend of its yield/acre. Conventional breeding approaches seem to be inadequate due to restricted direct gene pool and sexual incompatibility amongst the wild relatives (Sing and Sing 1989). In order to exploit direct gene transformation, an efficient regeneration system is pre-requisite.

Direct organogenesis from pre-existing meristem may provide a reproducible high frequency regeneration system. Though several protocols were developed. These protocols were specific for some genotypes and often not

reproducible. So there is a need for further improvement in shoot induction. Except cotyledonary node root, leaf and stem it is noticeably one of the least exploited tissues in groundnut tissue culture and genetic engineering, primarily, because of its recalcitrance and lower responses for adventitious plant formation *in vitro* compared to other tissues, such as (McKenly *et al.* 1990; Banerjee *et al.* 2007).

The present study exploits cotyledonary node potential to form reliable shoots *in vitro*. It reports the most efficient protocol that applies different treatments to achieve greater results for abundant multiple-shoot formation that outperforms all existing improved groundnut protocols for shoot induction in cotyledon node (Tiwari and Tuli 2011; Aina *et al.* 2012). The present success could increase the usage of these tissues in tissue culture for *in vitro* commercial and scientific micro-propagation as well as genetic engineering for crop improvement purposes.

MATERIAL AND METHODS

Seeds of groundnut cultivars GPBD-4 were surface sterilized with 0.1% (m/v) mercuric chloride for 4 - 5 min. Seeds were rinsed with sterile distilled water about 4 - 5 times and germinated on filter paper bridges containing sterile distilled water. Cotyledonary node

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DISTRIBUTION OF BIOACTIVE COMPOUNDS IN USNEOID LICHENS FROM WESTERN GHATS

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Abstract

Lichens form an important floral community, playing an important role in ecological succession. The Western Ghats harbor a number of plant resources including lichens, mosses and other lower plants. Among the lichen species, those belonging to *Usnea* have been used medicinally for ages. The present study is focusing on the chemical substances present in the Usneoid lichens from the Western Ghats. The study area mainly contains compositions of vegetation like evergreen, semi-evergreen, moist deciduous, dry deciduous and scrub forests. We have collected 38 species of *Usnea* lichens from Western Ghats. The collected *Usnea* lichens were found to be spread between 500- 3000m of altitude. All the collected lichens are subjected to colour test, Thin Layer Crystallography and microcrystallography. We have identified 13 different secondary metabolites from collected 37 species of lichens. Among them Usnic acid is common to all the species. Apart from that stricte acid and salazinic acid is present in majority of the species.

Key words : *Usnea*, Forest, Salazinic, Crystallography.

Introduction

Lichens are the combination of a mycobiont (fungus) and photobiont (algae). The organism consists of thalli made of fungal tissue in which the algal cells are situated. Hence it can grow photosynthetically. Lichens are the earliest colonizer of terrestrial habitats on the earth (Taylor *et al.*, 1995), and they are distributed in all form of environments from arctic to tropical regions and from plains to highest mountains. The fungal partner may contain characteristic secondary compound (Ahmadjian, 1993). These secondary metabolites are unique with respect to those of higher plants. Lichens produce diverse range of secondary metabolites; depsides, despidones, pulvinic acid. These compounds have attracted because of their antiviral, antibiotic, antioxidant, antitumor, allergenic and plant growth inhibitory activities (Muller, 2001; Boustie and Grube, 2005). Over 800 lichen metabolites have been identified so far (Huneck and Yoshimura, 1996). Of all thallophytes, lichens have been most extensively characterized with respect to their chemistry, and their metabolites are useful chemical

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characteristics in lichen taxonomy (Hegnauer, 1962). Some metabolites may also be produced by the fungus or the algae partner, while others are exclusively produced by synergistic action of both partners in lichens. The large concentrations of mainly phenolic compounds that are accumulated in the thallus are typical of lichens. These secondary metabolites have been produced to protect these organisms from herbivores (Lawrey, 1989). From ancient days lichens have used for various purposes, in particular as dyes, perfumes and in ethnomedicines. Lichens were used by various ethnic groups from the time of early civilization. The lichens were utilized for different purposes on account of their nutritive, medicinal, decorative, brewing, distilling, dyeing, cosmetic and perfumery properties. These different uses are substantiated by the complex lichen secondary metabolism, producing secondary compounds known as "Lichen substances".

Among the lichen, those belonging to *Usnea* are used in medicines from ages. Many species of *Usnea* are used as an ingredient of medicines by Ethnomedicinal practitioners in India and also in the world (Upreti and Chatterjee, 2007). *U. pictoides* shows inhibitory activity

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Physical Properties of Foxtail Millet (*Setaria italica* L): Variety-HNT100-1

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Abstract: Millets grains have substantial benefits as a drought resistant crop. Yield good productivity in the areas with water scarcity, possesses remarkable edible, nutritive values and ease of processing and food manufacturing. Millets being small seeds, contain large proportions of husk and bran. It requires dehusking and debranning prior to consumption (Hulse *et al.*, 1980). Engineering properties of foxtail millets are those which are useful and necessary for the design and the operation of various processing equipments. The mean value obtained for physical properties of foxtail millet such as length (mm), lateral diameter (mm), bulk density (kg/m³), true density (kg/m³) and porosity were 1.90±0.015, 1.60±0.019, 1150±5.17 and 29±1.2 respectively. The angle of repose mean value obtained was 28^o04'. The weight of 1000 grains (whole grains) and dehusked grains were 2.81 g and 2.09 g respectively. The shape of the grain found as spheroid.

Keywords: Engineering properties, foxtail millet, physical properties, processing equipments.

INTRODUCTION

Millets grains have substantial benefits as a drought resistant crop, yield good productivity in the areas with water scarcity, possesses remarkable edible, nutritive values and ease of processing and food manufacturing. Millets are the important ingredient of household food security and nutrition particularly

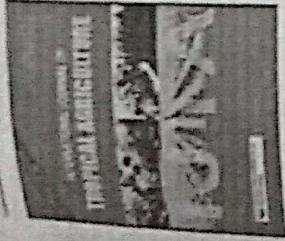
in drought years as the millets are harvested well even in the substantial low rains. Millets being small seeds, contain large proportions of husk and bran, which require dehusking and debranning prior to consumption (Hulse *et al.*, 1980). Despite their nutritional superiority, utilization of millets are restricted due to non-availability of processed millets

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Processing and Value Addition of Minor Millets

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Abstract: Women is supreme inspiration of man's onward march. Women share abundant responsibility and perform a wide spectrum of duties in running the family, she involved in various aspects of agriculture and gainfully employed in other farm related activities. Even farm women involved in forward link up activities importantly preparation of value added products. Millets are the important ingredients of household food security and nutrition particularly in drought areas as the millets are harvested well even in the substantial low rains. The farmers of Chitradurga district are predominantly grow millet crops. The district is popularly known as "millet bowl" of Karnataka. In view of this the study aims to know the area of millets production in Chitradurga district and avenues for preparation of value added products in different millet crops.

The study focused on empowerment of rural women through entrepreneurial activities from women SHG's constituted by small farmers and landless labourers of Yamvilasapura and Gowdabhatti villages of Chitradurga district. Empowerment of women was undertaken through training and demonstrations carried out in a participatory mode. The training was imparted for preparation of value added products in millet crops viz., finger millet (malt and cookies), foxtail millet (Cookies, Rush, malt, chakkuli, nippattu), Little millet (Cookies, malt, chakkuli, nippattu and laddu). For these products emphasis was given to quality control, packing in different methods even facility created to marketing of the product. The SHG groups showed interest to continue this activity. This brings new arena in rural women SHG groups and begins to startup as entrepreneurial activity. These employment creation activities enable them to bet opportunities in their vicinity. The continuous earnings among the rural women will increase their living standards. The nutritive value of the family members will increase, the entrepreneurial activities can promote from preparation of value added activities from millet crops.

Keywords: Entrepreneurship, Millets, Value addition, SHG and Training

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Comparative Leaf anatomy of some species of Habenaria Wild (Orchidaceae).

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ABSTRACT. The present study analyzed the characteristics in the leaf of Terrestrial Orchidaceae member i.e different species of *Habenaria* Wild (*H. plantaginea* Lindl., *H. ovalifolia* Wight., *H. multicaudata* Sedgw., *H. crinifera* Lindl., *H. heyneana* Lindl., *H. elwesii* Hook.f., *H. longicorniculata* J.Graham., *H. peltarioides* Par. & Rehb. f. (*Odisha cleistantha* S. Mishra). Anatomical characters are important in identification and ecological adaptations. The anatomical characters have served as a tool for the genus's systematic. The plants were collected at different forest types from Shimoga district. Materials were fixed in FAA solution. Transverse sections were obtained by freehand sections, stained with 1% safranin. Leaf anatomical organization of *Habenaria* species (Stomata, epidermis, mesophyll, vascular bundles, hypodermis.) was observed. There was a distinct variation in the anatomical characters of the leaf. Detailed leaf anatomical characters can be used to distinguish species from others. Leaf anatomical characters with structural adaptation help plants to survive in different vegetation. The implication of this study is the importance of leaf anatomical features to support species identification and to increase understanding of orchid biology which are important in orchid conservation.

KEYWORDS: Orchidaceae, Anatomical character, *Habenaria* Wild, Adaptations.

INTRODUCTION

Orchidaceae with 25,000-30,000 species shows a high level of specialization and a great capacity for adaptation to different environments, which have contributed to the morphological and physiological, vegetative organization, that vary between species (Dressler, 1993; Frander *et al.*, 2017; Udupa, 2011). Orchidaceae is one of the largest family among monocots. Orchidaceae is the second largest flowering plant family of herbaceous, perennials that includes terrestrial, saprophytic, lithophytic, and epiphytic species (Pridgeon *et al.*, 1993). Orchids are associated with an endophytic symbiotic fungus, mainly in their root terrestrial orchids mainly grows in the floor of the forest and grassland.

Habenaria Wild is an orchid genus of about 600 species widely distributed throughout the tropical, subtropical and temperate regions of the world. This genus of terrestrial orchids is one of the genera having the largest number of species. In India, it is represented by 17 species in Western Himalaya (Jalal and Jayanthi, 2015). In *Habenaria* Wild. Prominent paired tuberoids with a small third tuberoid is also seen in this species (Pande *et al.*, 2010).

Flowers are highly attractive. The species can be easily identified when in bloom, but the vegetative characteristic (number and size of tubers and leaves, stem height) overlap in many of these. These structural and physiological variations permit plants to survive and reproduce in a variety of environmental conditions and contribute to protection against stress and herbivore damage (Frander *et al.*, 2017.) Particularly in the anatomy of groups are of a descriptive nature, and have focused upon the search for similarities or differences that contribute to the taxonomic determination.

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Phenology of Papilionoideae Members of Dummi Village, Holalkere Taluk, Chitradurga District, Karnataka.

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ABSTRACT

Phenology of papilionoid species was carried out at dummi village of chitradurga district, during the study period leafing, floral morphology, flowering pattern, flowering period and leaf fall was clearly observed. Dummi region is rich in floristic composition; the phenology of papilionoid taxa was studied. In the study area 19 species were identified under 9 genera, among the identified species majority of species starts leafing in the month of june and flowers in the month of august and extents upto October, leaf fall occurs in the month of December. All members of this family has papilionaceous corolla but differs from flowering behaviour. Study of floral phenophases helped to understand differential vegetative and reproductive phases in the study area with reference to its climatic condition. That data base can be utilized for further conservation and maintainance of that region.

Key words: Papilionoid Taxa, Phenology, dummi, Holalkere

INTRODUCTION

Phenology is literally "the science of appearance." Seasonal and climatic changes are some of the non-living or abiotic components of the environment that impact the living or biotic components (A R Kasarkar and Kulikarni, 2011). The study of plant phenology provides knowledge about the patterns of plant growth and development as well as the effects of the environment and selective pressures on flowering and fruiting behavior, the flowering of certain plants signals agronomic time (Zhang, et al., 2006).

The Fabaceae or Leguminosae, commonly known as the legume, pea, or bean family, is a large and economically important family of flowering plants. Leguminosae is the third largest family of flowering plants, the plants are often considered to be sub family of leguminosae (papilionoideae). Sanjappa 1990 estimated that there are about 1152 species under 179 genera in India.

According to Ali, it has an essentially worldwide distribution being found everywhere except Antarctica and the high altitudinal arctic regions. The family consists of herbs, sub shrubs, shrubs, trees and climbers. The trees are often found in tropical regions while the herbaceous plants and shrubs are predominant in extra tropical warm

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**FRESHWATER ALGAE AS A RENEWABLE SOURCE OF ENERGY:
BIODIESEL PRODUCTION**

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ABSTRACT

The basic sources of energy are petroleum, natural gas and coal. Biodiesel is a nontoxic and biodegradable alternative fuel that is obtained by the transesterification of triglyceride oil with monohydric alcohols. The need of energy is increasing continuously, because of increases in industrialization and population. In this study naturally occurring fresh water algal samples were collected from different sites of Shivamogga. Algae were identified as *Spirogyra spp.* and *Oedogonium spp.* and they were inoculated into the selective media, which favor the growth of algae oil was extracted from dried algal samples and pH were analyzed. These results indicate that biodiesel can be produced from *Spirogyra spp.* and *Oedogonium spp.*

Keywords: Biodiesel, transesterification, *Spirogyra spp.*, *Oedogonium spp.* glycerin, biomass.

INTRODUCTION

The demand for energy is increasing day by day due to the rapid growth in population and industrial development. The basic sources of energy are petroleum, natural gas, coal. The continued use of petroleum sources fuels is now widely recognized as unsustainable because of the depletion supplies and the contribution of these fuels to the accumulation of carbon dioxide in the environment leading to increase of global warming. Biodiesel from oil crops, waste cooking oil and animal fat cannot realistically satisfy even a small fraction of the existing demand for transport fuels. Recent researchers involved not only the existing renewable sources available from land plants, but also those coming from aquatic systems. The idea of using algae as a source of fuel is not new, but it is now being taken seriously because of the increasing price of petroleum and more significantly, the emerging concern about global warming that is associated with burning fossil fuels.

Biodiesel is an excellent substitute for conventional diesel fuel because of being renewable, nontoxic and biodegradable. It consists of mono-alkyl esters usually produced from renewable feed stocks. Macroalgae are a potential alternative source for the conventional feed stocks and algal oil is suitable for esterification/transesterification reaction of biodiesel production. The recent renewable source of algal oil that could meet the global demand for transport fuels. The rapid replication and high percentage of oil present in many species of algae, reaching about 80% of their biomass, are some of these advantages. Also, unlike other plants, algae do not require large areas for cultivation, and can be up to 20 times more productive per unit area than the top oilseed crops.

Biodiesel is produced through different techniques such as direct/oil blends, micro emulsion, pyrolysis and transesterification. However, the most notable way to produce biodiesel fuel is through transesterification reaction. Transesterification is the reaction of triglycerides to fatty acid alkyl esters and low molecular weight alcohols such as methanol and ethanol in the presence of catalyst. Methanol is the most favored alcohol because it is less costly and easily obtainable. Transesterification reaction is catalyzed by either homogeneous catalyst. After transesterification, biodiesel product comes with contaminants that have to be removed before the fuel is used in diesel engines. The removal of by-product, glycerol is the first step usually carried out. This is mostly done through different separation techniques such as: decantation, sedimentation, filtration and centrifugation.

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**PRODUCTION OF ALGAL BIODIESEL FROM FRESH WATER
 ALGAE - OEDOGONIUM SPP,**

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ABSTRACT

In this investigation, Oedogonium spp., algal oil was used as a raw material for biodiesel production. The decreasing fossil fuel resources cause both insufficiency in providing demand and increase in prices and it triggers the structural change in energy production and resources. In this context, the innovations in encouraging the use of renewable energy sources will make it possible to manage the passage from an unsustainable structure to a more sustainable structure. The necessary conditions for the world oil supply can be said to enter into a new era with the increasing demand pressure. In this study naturally occurring fresh water algal samples were collected from different sites of Shivamogga. Algae was identified as Oedogonium spp inoculated into the selective media, which favor the growth of algae oil was extracted from dried algal samples and pH were analyzed. These results indicate that biodiesel can be produced from Oedogonium spp.

Keywords: Biodiesel, transesterification, *Oedogonium spp.* glycerin, biomass.

INTRODUCTION

The depletion of petroleum diesel reserves has caused an increase in demand and price of diesel. Biofuels are referred to liquid, solid and gaseous fuels derived from organic matter, they generally divided into primary biofuels such as fuel wood are used in an unprocessed form primarily for heating and electricity production, secondary biofuels such as bioethanol and biodiesel are produced by processing biomass and could be used in vehicles and industrial processes. The idea of using algae as a source for biodiesel is not new, but now it has been taken seriously due to the increase in population, and rising price of petroleum. The basic sources of energy are petroleum, coal and natural gas. The continued use of petroleum sourced fuels is now widely recognized as unsustainable because of the depletion supplies and the contribution of these fuels to accumulation of carbon dioxide in the environment leading to increase of global warming. Algal biofuels offer great promise in contributing to the growing global demand for alternative sources of renewable energy. (Bowman *et.al.*, 2006)
 Algae are an important feedstock for many industries such as from medicine to fertilizer and from fodder to food. Algae are the raw material for many industrial productions like carrageenan,



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Transesterification of Algal Oil to Produce Algal Biodiesel

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ABSTRACT

*The role of fossil fuels in modern economy is quite vital. The decreasing fossil fuel resources cause both insufficiency in providing demand and increase in prices and it triggers the structural change in energy production and resources. In this context, the innovations in encouraging the use of renewable energy sources will make it possible to manage the passage from an unsustainable structure to a more sustainable structure. The necessary conditions for the world oil supply can be said to enter into a new era with the increasing demand pressure. In this study naturally occurring fresh water algal samples were collected from different sites of Shivamogga. Algae were identified as *Spirogyra* spp. and *Oedogonium*spp and they were inoculated into the selective media, which favor the growth of algae oil was extracted from dried algal samples and pH were analyzed. These results indicate that biodiesel can be produced from *Spirogyra* spp. and *Oedogonium* spp.*

KEYWORDS: Biodiesel, transesterification, *Spirogyra* spp., *Oedogonium* spp. glycerin, biomass.

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1. INTRODUCTION

The world is about to face the predicament in energy sources. The consumption of fossil fuels and the available energy sources are the main problems needed to be solved. This critical situation that the world is about to face is a threat to modern human existence. Energy crisis will arise when there will not be enough energy sources to survive the demands of the world as the demand for energy increases. (Christii, 2005)

Algae are an important raw material for many industries i.e. from medicine to fertilizer and from fodder to food. Algae are the feedstock for many industrial productions like alginates derivatives, (Demirbas 2007)

carrageenan and agar-agar but they are also widely consumed as food in many countries. Some macroalgae are nutritionally very much valuable they are consumed with fresh or dried vegetables, salads, or as ingredients in a wide variety of cooked foods. Some known algae contain significant quantities of vitamins, protein, minerals and lipids. In algae the nutrient content may vary from species to species, from one geographical location to the other, one season to the other or even due to humidity as well as temperature. (Briggs, 2004)

Transesterification or alcoholysis is the reaction of a lipid with an alcohol to form esters and a by-product, glycerol. This reaction actually converts highly viscous raw lipid/oil into low

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Biodiesel Production from Marine Macro algae of Karwar Region, Karnataka

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ABSTRACT

The demand for energy is increasing in the world due to the rapidly growing global population and urbanization. Throughout history, mankind has used wood as a source of producing energy. After the industrial revolution, the main source of energy shifted to fossil fuels. The accurate amounts of the world's total fossil fuel reserves are not known. Furthermore, the increase in crude oil prices and the pollution caused by petroleum-based energy sources have created serious environmental problems, e.g. global warming. Such concerns about fossil fuels have led to the utilization of alternative energy sources. The primary alternative sources of energy systems that can replace fossil fuels are water, wind, solar energy, and biomass. Currently biomass is gaining a great deal of attention in terms of supplying the world's energy demands. Due to its availability and environmentally friendly nature such as causing no net increase in carbon dioxide levels and producing very low amounts of sulfur, biomass energy is believed to contribute one half of the total energy demand in industrial countries by 2050. In this concern we collect two species of macroalgae from Majali coast of Karwar, Karnataka. The collected algal samples were identified, dried and subject to extract oil by ground method by using hexane as solvent. The extracted oil is converted into biodiesel using transesterification processes and estimates the fatty acid methyl ester content by using GC-MS.

Key Words: Marine Macro algae, Biodiesel, Transesterification

INTRODUCTION

Algal biomass offers an innovative contribution to the challenge of providing sustainable bioenergy resources. Algae have high productivities, can be cultured on non-arable land and can utilize waste-streams as a nutrient source. Their rapid growth through photosynthesis provides for the capture and recycling of carbon dioxide, and algal biomass provides for bioenergy generation through a diversity of processes including direct combustion, gasification, saccharification and fermentation, and thermochemical processing (Demirbas, 2011). However, the major focus for research, development and commercialisation is the cultivation of algae for the production of oil-based products. While algal oils have applications as biodiesel, through the transesterification of lipids to replace fossil-derived fuels, and as feedstock for industrial chemicals, the main emphasis is on high



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Documentation Of Exotic Plants In Shivamogga District, Karnataka

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Abstract. In this review study we have documented the list of exotic plant species in the Shivamogga district in India with additional information on habit and origin. During this study, a total of 63 exotic species belonging to 61 genera in 32 families were identified and listed from various localities in the district. Among them 11 number of the exotic species are native to Tropical America followed by South America with 10 species. Analysis of the habit shows that herbs having included 31 exotic species, followed by 17 trees and 15 shrubs. Among 32 families, Fabaceae is the most dominant family with 12 species followed by Asteraceae with 06 species. There is an imperative need to listing regional data on exotic species in order to study the impact on local vegetation and survey the worldwide pattern of species invasion.

Keywords: Exoticplants, Allelopathic effect, Shivamogga district

1 INTRODUCTION

LIFE FORMS RELOCATING TO NEW AREAS AND THEIR RELATIVES HAVE BEEN ALLUDED TO AS OUTSIDER, EXTRINSIC, OUTLANDISH, PRESENTED AND NON-INDIGENOUS [1]. NATURAL ATTACKS BY OUTSIDER SPECIES ARE ALL INCLUSIVE PERCEIVED AS A HUGE SEGMENT OF HUMAN INCITED ECOLOGICAL CHANGES, REGULARLY BRINGING ABOUT A CRITICAL MISFORTUNE IN THE FINANCIAL ESTIMATION OF YIELDS, WOODLANDS, FISHERIES, BRUSHING LIMIT OF TAMED CREATURES [2,3], IN GENUINE ECOLOGICAL DANGERS TO NEIGHBORHOOD ENVIRONMENTS, BIODIVERSITY AND TO SOCIETY INCLUDING HUMAN WELLBEING [4]. OBTRUSIVE OUTSIDER SPECIES ARE EVERY YEAR CAUSING BILLIONS OF DOLLARS HARM OVER A WIDE SCOPE OF AREAS INCLUDING AGRIBUSINESS, RANGER SERVICE, FISHERY, BIOLOGICAL SYSTEM ADMINISTRATIONS, AND BY AND LARGE CONDITION [5]. OBTRUSIVE OUTLANDISH PLANTS ARE ENSNARED IN THE DECAY OF COMPROMISED AND IMPERILED SPECIES, SINCE THEY ADJUST ENVIRONMENT FORMS, CHANGE VEGETATION STRUCTURES AND UPROOT LOCAL SPECIES, REGULARLY IN LIGHT OF THE FACT THAT THEY ARRIVE AT HIGH DENSITIES AND BIOMASS [6]. PARTHENIUM HYSTEROPHORUS HAS BEEN ACCOUNTED FOR TO BE A WELLBEING RISK, ESPECIALLY TO CULTIVATE WORKERS. INCESSANT CONTACT WITH THIS PLANT CAUSES HYPERSENSITIVITY, DERMATITIS, SKIN INFLAMMATION, ASTHMA, AND GANGRENE [8], AND FURTHERMORE CONSISTENT SNIFFLING, HACK, AND FEVER [9]. ANOTHER OBTRUSIVE SPECIES, LANTANA CAMARA BUILDS THE RATE OF DOZING INFECTION IN BOTH WILD AND TAMED CREATURES, ALSO IN AS PEOPLE [2,7]. THEREFORE, STUDY OF THE SPREAD OF EXOTIC SPECIES HAS BECOME AN VERY IMPORTANT ISSUE IN THE PRESENT STUDY AREA AND WORLDWIDE.

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2 MATERIALS & METHODS

2.1 Study Area

Shivamogga area is arranged in Karnataka territory of India (Figure 1). A significant piece of Shivamogga area lies in the Malnad locale of the Western Ghats. Shivamogga city is its authoritative focus. Shivamogga locale is a piece of the malnad district of Karnataka and is otherwise called the 'Portal to Malnad' or 'Malenaada Hebbagilu' in Kannada. The locale positions ninth regarding the absolute region among the areas of Karnataka. It is spread over a region of 8465 km² (National Informatics Center, 2007). Shivamogga lies between the scopes 13°27' and 14°39' N and between the longitudes 74°38' and 76°04' E at a mean elevation of 640 meters above ocean level [10]. The pinnacle Kodachadri slope at an elevation of 1343 meters above ocean level is the most elevated point in this area.

2.2 Analysis

The present study is an attempt to know the documentation of exotic plants in Shivamogga district of Karnataka. Periodic field surveys were carried out during January to December 2017. Standard methods were followed for the collection of plant materials and the specimens were identified, by referring standard flora [11-17]. As part of this study we focused on building a comprehensive list of exotic species from different habitats in the area (aquatic, semi-aquatic, marshes, open lands, waste lands, agricultural lands, roadsides and slopes etc.).

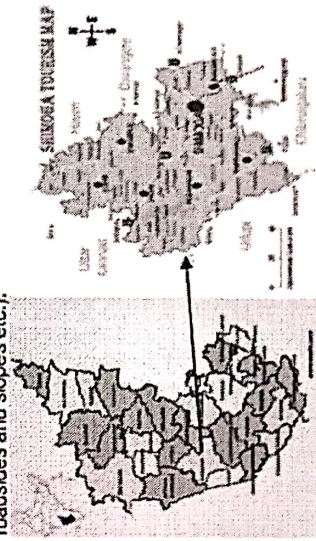


Figure 1: Study area map (Source: www.pinterest.com; www.veethi.com)

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Documentation of Macro Fungi in Thirthahalli Region of Karnataka: A Case Study

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ABSTRACT

The examination on macrofungal assorted variety in mainad surroundings i.e., Thirthahalli taluk of Shimoga region, Karnataka was intended during the period of two months from August to September, 2018 to distinguish and record the species which are available in the referred spa. Bounty and assorted variety is more in rainy season than winter and summer. Mulching and dampness substance of substratum assume vital job in the development of macrofungi. Be that as it may, the work typically needs additional time on the grounds that each time we wouldn't get the macrofungi in the examination locales. It is hard to get similar species because of loss of substratum or change in it. The wood rotting organisms were typically present in every one of the seasons. Overwhelming precipitation additionally influences the development and improvement of macrofungal fruiting bodies. Progressively number of sporocarps and species were found in the period of August 2018, most likely for the most noteworthy precipitation and permeation was more in the dirt and high dampness in the substratum, which delivered increasingly number of fruiting bodies and distinctive macrofungal species. In our examination increasingly number of species have a place with beefy gilled fungi as similar species may require less *chromocarp* or dampness content for its improvement and they found in all the substratum. A few animal groups were consumable (Termitomyces sp.) and numerous species observed to be non-palatable.

Keywords : Macro Fungi, Thirthahalli Region, Karnataka

INTRODUCTION

Among every single living element, growth is an imperative essential part of biodiversity which assume a key job in deciding the assorted variety of different living beings (Zhang et al., 2010). Organisms are key utilitarian parts of woodland biological systems and they have gotten less consideration than creatures and plants, in spite of the fact that they are ubiquitous and profoundly various in nature. Organisms assume a crucial job in biological system works and have enormous impact on people and human-related exercises. Soil parasites assume a focal job in numerous natural procedures that are significant to keeping up biological system steadiness, as impacting soil ripeness, cycling of minerals and natural issue, just as plant wellbeing and sustenance (Barrico et al., 2010). Fungi are critical in woodland territories and are engaged with the deterioration of dead trees and

backwoods litter into soil and convey species-explicit advantages to their host plants, which render their biodiversity of high significance to plant sustenance. Fungi assume a critical job in the day by day life of people other than their usage in industry, horticulture, *penicillium* manufacturing industry, materials, bioremediation, natural cycling, as biofertilizers and numerous different ways. The nearness of broad biodiversity accessible in tropical backwoods has been distinguished as the fortune box for the rising field of biotechnology (Swarna et al., 2008).

Macrofungi have a place with the kingdom *paraphysa*, which establishes the most different gathering of creatures after creepy crawlies on this biosphere. They structure substantial fruiting bodies, visible without the guide of a magnifying instrument and incorporate fruiting bodies, for example, gilled parasites, conifer organisms, jam growths, carafe organisms, entomogenous organisms, tongue growths, coral growths, stinkborns, section organisms, puffballs and flying creature's home growths (Bates 2006). There are a large number of animal varieties which are one of a kind and every specie delightful in its own specific manner. Since the beginning of developments, macrofungi have been entrancing to man because of their bizarre characters like unexpected appearance in confined places in gatherings, rings and in various geometrical shapes. Macrofungi develop productively and are found in numerous pieces of the world. They mix and take part or rival other smaller scale life forms conduct and predators (Razaq et al., 2014).

Sporocarps

The large scale growths are separated by containing spore bearing structures "Sporocarps" that are seen by bare eye, it comprise of mushrooms, puffballs, section organisms, false-truffles and conifer parasites are normal instances of full scale growths. It is regular for a specific parasite to create an unmistakable fruiting body just under an exact mix of conditions, including geographic area, rise, temperature, mugginess, light and encompassing verdure. Sporocarps are fleeting, may last just a couple of days before decaying or being eaten. Plainly visible growths with explicit fruiting organs and size, sufficiently enormous, to be noticeable.



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MULBERRY CULTIVATION PRACTICES AND DISEASES: AN OVERVIEW

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Abstract

Mulberry plant belonging to the family Moraceae and genus *Morus*. It is the main food for silkworm *Bombyx mori*L. Mulberry plant is perennial, various pathogens like fungi, bacteria, viruses and nematodes cause diseases in mulberry. To manage or control these diseases and pests a number of management strategies are followed which include physical, chemical and biological methods. So there is a need to think of ecofriendly safe methods for managing pests and diseases. In this review paper an attempt has been made to discuss in brief about cultivation practices, various disease and pests of mulberry and their management techniques and highlighting the importance of eco-friendly management strategies, their advantages and demerits. This review article will describes the research conducted on cultivation techniques, disease and pests and their management strategies in mulberry for better leaf quality production.

Key words: Mulberry, Cultivation, diseases, pests

INTRODUCTION

Mulberry is derived from Latin word *Morus* and the cultivation of mulberry leaves of rearing of silk worms is called as *Moriculture*. Mulberry is grown as shrub in tropical countries and trees in temperate countries like Japan. It belongs to order *Urticales*, the family *Moraceae* and genus *Morus*. There is an estimated about 68 species of the genus *Morus* with the majority of them occurring in Asia and in China there are over 1000 varieties under cultivation . The most

common species are *M.alba*, the white mulberry, *M.nigra*, the black mulberry and *M.rubra*, the red mulberry.

Mulberry cultivation is the agriculture part of sericulture which constitutes not only the rearing of silk worms but also silk reeling. Cultivation of mulberry plays a significant role in determine the production cost of cocoons and silk as it is estimated that 60-70% of the cost of cocoons goes to mulberry. It is the chief food for *Bombyx mori*. Mulberry leaves protein is the source for silk worms to biosynthesize the silk, which is made up of two proteins i.e., fibroin and sericin and its leaf and cell wall together contains with structural carbohydrates and which is highly digestible. So mulberry is the main food source for silk worms.

One hectare of fertile land can produce about 15-40 tones of mulberry leaves over a 12 month period. This increase in the production of mulberry and reducing the cost of production. Attention has been paid to intensive cultural operations including application of economic dosage of fertilizer and adoption of suitable irrigation schedules furthermore, research conducted an breeding of mulberry as resulted in evolving over 200 varieties of mulberry. Distribution of mulberry cultivation on a global survey of sericulture industries reveals that there are at least 29 countries cultivation of mulberry plant is not only for silk rearing, but so many applications are used. Mulberry are widely distributed because of berries , some of the berries are very sweet tasting as honey , these syrupy sweet mulberries are used in ice cream, jams, jellies and beverages.

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PHYTOCHEMICAL SCREENING OF ANGIOPTERIS EVECTA AND BLECHNUM ORIENTALE L.

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Abstract

Plants contain numerous biologically active compounds, many of which have exhibited antimicrobial properties. Over the past few years, strains of many pathogenic species resistant to all widely available antibiotics have emerged and proliferated. The antibiotics are sometimes associated with adverse effects on hosts, which include hypersensitivity, immunosuppression, allergic reactions and depletion of beneficial gut and mucosal microbes. As in human, reports of antibiotic resistant bacteria emerging in animal populations are appearing with increasing frequency. In many parts of the world plants are used for antibacterial, antifungal and antiviral medicine. The extracts were used as a source of medicinal agents to cure urinary tract infections, cervicitis, vaginitis and gastrointestinal disorders. In this study locally available samples like *Angiopteris evecta* and *Blechnum orientale* L. were collected from the mid-western Ghats of Hosanagara and Thirthalli, Shivamogga District, Karnataka State, India. 80% ethanol extracts of collected plants.

Keywords: *Angiopteris evecta*, *Blechnum orientale* L.

Introduction

Phytochemistry is one of the rapidly expanding areas of Plant Taxonomy which utilizes chemical Information to improve the classification of plants. Plants are endowed with various phytochemical molecules such as vitamins, flavanoids, phenolic acids, lignins, tannins, flavanoids, terpenoids, quinones, coumarins, alkaloids, amines, betalains and other metabolites which are rich in antioxidant activity. Natural compounds may be considered alternative means for medicine, because of low or little toxicity due to their dietary properties or their long history as herbal medicines. In recent years identification and validation of the potential benefits of phytochemicals has become an important area of Pharmaceutical Science. These secondary plant metabolites previously with unknown pharmacological activities have been extensively investigated as a source of medicinal agents. The antioxidant compounds possess anti-inflammatory, antiatherosclerotic, anti tumour, anti mutagenic, anti carcinogenic, anti microbial and antiviral activities. The ingestion of natural antioxidants has been associated with reduced risks of cancer, cardiovascular disease, diabetes and other diseases associated with aging. In the plant World, Pteridophytes are said to be primitive vascular plants and provide important contribution to Earth's Plant Diversity. Pteridophytes are not infected by microbial pathogens, which may be one of the important factors for the evolutionary success of pteridophytes and the fact that they survived for more than 350 million years. They are found scattered all

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“A Survey of human traits with simple inheritance patterns in Sahyadri Science College Campus Shivamogga”

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Abstract

Physical traits are observable characteristics determined by specific segments of DNA called genes. Multiple genes are grouped together to form chromosomes, which reside in the nucleus of the cell. Every cell (except eggs and sperm) in an individual's body contains two copies of each gene. This is due to the fact that both mother and father contribute a copy at the time of conception. This original genetic material is copied each time a cell divides so that all cells contain the same DNA. Genes store the information needed for the cell to assemble proteins, which eventually yield specific physical traits. This study was conducted from July to September 2018. The methodology used in this study was combination of descriptive and interviews and observations of the individual. The assessment of morphogenetic trait of tongue rolling, earlobe, hand clasping, blue eyes, chick dimple, widows peak, second toe longest, short index finger, mid digital hair and six finger in relation to genotype was studied in the Shivamogga.

Keywords: Physical traits, Sahyadri Science College Campus,

Introduction

Most genes have two or more variations, called alleles. For example, the gene for hairline shape has two alleles – widow's peak or straight. An individual may inherit two identical or two different alleles from their parents. When two different alleles are present they interact in specific ways. For the traits included in this activity, the alleles interact in what is called a dominant or a recessive manner. The traits due to dominant alleles are always observed, even when a recessive allele is present. Traits due to recessive alleles are only observed when two recessive alleles are present. For example, the allele for widow's peak is dominant and the allele for straight hairline is recessive.

If an individual inherits:

- Two widow's peak alleles (both dominant), their hairline will have a peak
- One widow's peak allele (dominant) and one straight hairline allele (recessive), they will have a widow's peak
- Two straight hairline alleles (recessive), their hairline will be straight.

A widespread misconception is that traits due to dominant alleles are the most common in the population. While this is sometimes true, it is not always the case. For example, the allele for Huntington's disease is dominant, while the allele for not developing this disorder is recessive. At most, only 1 in 20,000 people will get Huntington's; most people have two recessive, normal alleles. While a few traits are due to only one gene (and its alleles), most human genetic traits are the product of interactions between several genes.

The traits listed on the next pages have commonly been presented as being determined by single genes. However, several have been shown to involve more than one gene, and research studies do not agree



MACROFUNGUS NITSCHKIA MACROSPORA TENG (ASCOMYCETES: NITSCHKIACEAE), A NEW REPORT TO INDIA

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The study of wood inhabiting macrofungi was carried out during October 2017, in the central Western

Ghats region of Shivmogga District, in Karnataka State. An interesting wood inhabiting macrofungus belonging to the family Nitschkiaceae was collected. A critical microscopic study revealed that it is a hitherto unrecorded species from India and hence the note (Bianchiniotti 2004; Huhndorf et al. 2004; Mugambi & Huhndorf 2010).

Members of this family are saprophytic wood degraders with worldwide distribution (Mugambi & Huhndorf 2010). Nitschkiaceae members are generally characterized by turbinate ascomata and later transforms in to cupulate on maturity (Bianchiniotti 2004). Ostiolar opening is indehiscent and thin walled, asci having variable number of spores, ascospores large, fusoid or cylindrical.

The field survey was conducted in Jambekoppa locality (14.10597222°N & 75.14305556°E) of Shivmogga (Shivmogga) District forest regions. This deciduous forest is known for varied macrofungal biota. Sporocarp

were observed, photographs were taken in their natural habitat, field notes were taken along with their geographical ranges (9am/ln-650) and samples were collected with substratum, brought to laboratory, anatomical characters were studied using a compound microscope. Classical taxonomy was followed for the characterization of species.

The name of the taxa was authenticated and confirmed by using <http://www.mycobank.org> and <http://www.indexfungorum.org/names/names.asp>.



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Nitschkia macrospora Teng (images 1–4)

Sporocarp 0.4x0.5 mm in size, black in colour, weakly attached to substratum, found in clusters, earlier rounded later turned into cuplet, without prominent ostiole with smooth surface. Asci clavate, 90–100 x 11–14 µm, with stalks up to 75µm long. Ascospores large, fusiform, septate, slightly curved, 35–45 x 6–7 µm.

Material examined: Accession number KUA:BMK-137, 12.x.2017, on unidentified wood log, Jambekoppa (14.10597222°N & 75.14305556°E), Shivmogga District, Karnataka State, India, coll. K.J. Nandan Patel & M. Krishnapppa. Herbarium samples have been deposited in the department herbarium, department of Applied Botany, Kuvempu University, Shankaraghatta (Image 5).

Nitschkia macrospora was proposed by Teng (1934) from China. Vasilyeva et al. (2010) reported the species from Russia, and Pande (2008) studied the genus

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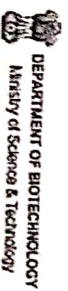
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SHORT COMMUNICATION

Sarcoxylon compunctum (Jungb.) Cooke. A new record to Western Ghats of India

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Western Ghats of India received greater importance because of the rich biodiversity. Xylariaceae is one of the largest families among Ascomycota during exploration of Xylariales members in central Western Ghats regions of Karnataka, India, a gigantic Xylariaceae member was observed, studied and characterized on the basis of morphology and anatomical characters and identified as *S. compunctum*.

Key words: Ascomycota, diversity, saprophytic, Xylariaceae

Xylariaceae of Ascomycota comprises of 85 genera and more than 1300 species across the globe (Patel and Krishnappa, 2017). These members were having variation in their morphology and anatomical characters (Suwanrasai et al, 2012), they are major saprophytes, weak pathogens also rarely found on termite nests and as Coprophilous (Patel et al, 2018). These members play important role in litter decomposition in forest. Western Ghats region of peninsular India characterized by variation in their geography and rich biotic resources including macro fungal diversity. This region covers an area of 16000 km² and lies in between 8°20' - 20° 40' N and 73°-77° E (Ramachandra et al, 2012). It covers Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamilnadu states (Radhakrishnan and Rajmohana, 2012). Many researcher have worked on the macro fungi in this region but Xylariaceae members were still not studied completely, this species record forms an addition to the fungi of Western Ghats of India.

Frequent field survey were conducted to explore the Xylariaceae members in central Western Ghats regions of Karnataka, India, during July to September 2018. A gigantic Xylariaceae member was recorded in the Jambekoppa forest region of Shivamogga district, Karnataka, India. Photographs were taken in their natural habitat

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using Nikon 3300 Digital SLR camera, geographical ranges were recorded using Garmin 650 GPS system, and field notes were taken with respect to their morphological characters and collected without causing any damage to sporocarp and brought to laboratory for further analysis. Anatomical and morphological studies were made using Olympus CH201 binocular and Olympus SZ Stereo microscope, hand sections like Perithecia, ascus, asci and ascospores. The name of the taxa was authenticated and confirmed by using <http://www.mycobank.org> and <http://www.indexfungorum.org/names/names.asp>.

Taxonomic description

Sarcoxylon compunctum (Jungb.) Cooke, Grevillea 13 (68): 107 (1885) [MB#118870]

Hypoxylon compunctum (Jungb.) Fr., Nova Acta Regiae Societatis Scientiarum Upsalensis 1: 114 (1851) [MB#204305]

Xylaria compuncta (Jungb.) Berk. Hooker's Journal of Botany and Kew Garden Miscellany 6: 204 (1854) [MB#184640]

Sarcoxylon compuncta (Jungb.) Cooke (1885) [MB#236026]

Penzigia compuncta (Jungb.) Sacc. & Paol. Atidell'Isitudio Veneto Scienze 6: 387-428 (1888) [MB#245471]

Stromata solitary or fused sometime found in cluster, hemispherical to globose stroma, with a

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Novel bioactive azo-azomethine based Cu (II), Co (II) and Ni(II) complexes, structural determination and biological activity

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Cytotoxicity

ABSTRACT

A novel bioactive azo-azomethine tridentate ligand N-(E)-[2-hydroxy-3-methoxy-5-[(E)-phenylhydrazonyl]phenyl]methylidene]pyridine-3-carbohydrazide (H₃) and its Cu(II), Co(II) and Ni(II) complexes were synthesized and their structure determined by elemental analysis, spectroscopic studies (FTIR, ¹H NMR, IR, ESR, UV-vis, ESR, and powder XRD) and magnetic susceptibility measurements. The molar conductivity measurement proved that all the complexes are non-electrolytic in nature. On the basis of physicochemical and spectroscopic data, the octahedral geometry is assigned for all the metal complexes. The thermal decomposition curve indicated the existence of lattice water molecule. The binding studies of all the synthesized complexes against CF-DNA suggest that the intercalation binding mode. A DNA nuclease activity exhibited that all complexes cleaved pBR322 DNA in an efficient manner. Consequently, the cytotoxic activity of the compounds was screened against A-549 (lung carcinoma), MDA-MB 231 (breast carcinoma) and normal HEK293 (human embryonic kidney cells) cell lines using MTT assay. © 2019 Elsevier B.V. All rights reserved.


1. Introduction

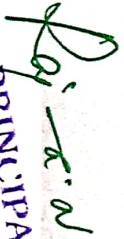
Over the last few decades, remarkable step have been taken in designing of transition metal chelates of azomethines, which are utilized in an extensive range of biological and clinical applications along with remedial drug against cancer cells [1]. Cancer is becoming a leading cause of premature lethal death in most of the developed as well as developing countries [2]. To examine the clinical application of transition metal based tumor drugs one important point is minimization the undesirable side effect of the drug [3]. Cisplatin, carboplatin, and oxaliplatin (with many severe side effects) were major tumor drugs for some decades thus developing novel metal-based complexes with less-toxicity and target specific in an active area of research [4]. The deoxy-ribonucleic acid (DNA) plays an essential role in the replication of cells and storage of genetic information [5]. DNA is the primary intracellular target for many tumor drugs in clinical use and important to understand the binding of metal ion to DNA through both covalent and non-covalent interactions [6]. Three known non-

covalent binding modes of small molecule to DNA are intercalative binding, groove binding and external electrostatic binding [7]. Among these, intercalative binding mode is most important and coherent to the anticancer activity the metal ion [8].

The pyridine-anchored hydrazone moiety have recognised significant interest due to the presence of donor atom like nitrogen and oxygen has achieved dazzling coordination capacity and diverse pharmacological activities [9–11]. In addition, the phenolic aldehyde compounds like vanillin are well known and perform a class of molecule which show a comprehensive biological property [12,13]. An added privilege of using 2-hydroxy-3-methoxy-5-[(E)-phenylhydrazonyl] benzaldehyde over vanillin is the position of hydroxyl group, this group is present at ortho position can readily protonate and coordinate with metal centre [14]. Hence, an immense number of Cu (II), Co (II) and Ni (II) complexes of azo-dye Schiff bases have been extensively studied due to their diverse antifungal, antibacterial, anti-tuberculosis, anticonvulsant and anticancer activities. Thus, the design of new chemotherapeutic drug is now engaging, the consideration of medicinal chemists which reduce the toxicity [15–17]. Furthermore, the interaction of compounds with double helix DNA has been widely studied, due to the site of specific binding and many significant applications in cancer therapy. These coordination compounds were also

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Electrochemical behaviour of 5-methoxy-5,6-bis(3-nitrophenyl)-4,5-dihydro-1,2,4-triazine-3(2H)-thione in presence of salicylaldehyde on zinc cathode with surface morphology and biological activity

Document Type: Original Research Article

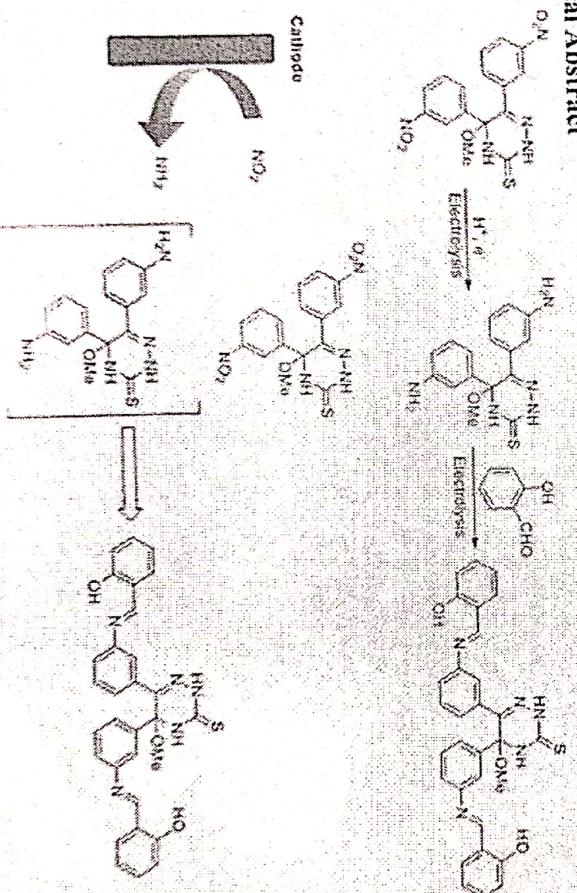
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10.33945/SAMI/AJGC/2020.2.1

Abstract


This paper presents an innovative, green and organic electro synthesis in order to prepare Schiff base product by the reduction of 5-methoxy-5,6-bis (3-nitrophenyl)-4,5-dihydro-1,2,4-triazine-3(2H)-thione followed by the condensation on zinc cathode in aqueous alkaline ethanol media in the presence of salicylaldehyde at room temperature. The main characteristic of this proposal is the electro-reduction and electro-condensation. The bulk electrolysis at constant potential was performed in a three-electrode undivided cell in order to prepare Schiff base. In this sense, good yields and easy purification were achieved. Results indicate that the reduction produced high current in the cell and succeeded a green chemistry process. Products were characterized by IR, NMR (^1H , ^{13}C), and SEM.

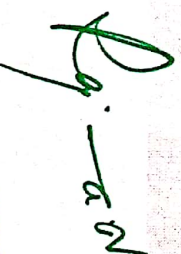
Graphical Abstract



Keywords

Electrolysis, Surface morphology, Organic electro-synthesis, Cathode


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Synthesis, XRD, thermal, spectroscopic studies and biological evaluation of Co(II), Ni(II) Cu(II) metal complexes derived from 2-benzimidazole



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1. Introduction

The metal complexes with benzimidazole motifs are useful compounds of bioinorganic interest [1,2]. Since the imidazole ring is a structural fragment of histidine that provides an essential metal binding site in metalloproteins (one or more benzimidazole units are bound to metal ions in almost all copper and zinc metalloproteins or, e.g., in nickel-containing urease) and thus has intense effects on their biological actions [3,4]. It is also well known that amino group acts as the primary anchor site for metal ions and, as such, is able to promote stepwise deprotonation and subsequent coordination of other successive binding sites, leading to the formation of hydrolytically stable, fused, five-membered chelate rings with M–N bonds. Thus, complexes formed between metal ions and different types of bio-ligands, namely heteroaromatic nitrogen bases, may be considered as models for substrate–metal ion–enzyme interactions and other metal ion-mediated biochemical interactions [5,6]. Newly, benzimidazole-derived drugs have received much consideration owing to the fact that benzimidazole

residue is a constituent of vitamin B₁₂, which supports their potential use as therapeutics [7–10].

In this research article, we describe the synthesis and characterization of ligand 4-((1Z)-1-[2-(1H-benzimidazol-2-ylmethyl)hydrazinylidene]ethyl)phenol (LB) and their metal complexes and characterization by various spectral methods along with XRD and thermal analysis. The cytotoxic studies and molecular docking interactions have been carried out with protein enzyme receptor.

2. Experimental

2.1. Materials

The chemicals 4-hydroxyacetophenone, Hydrazine hydrate, was Sigma-Aldrich Co. The chlorides of Co (II), Ni (II) and Cu (II) were of S.R.L. grade. All other reagents and solvents were purchased from commercial sources and were of analytical grade.

2.2. Physical measurements

Melting points had been recorded on an electro-thermal melting factor apparatus and are uncorrected. ¹H NMR spectra were recorded on Bruker four hundred MHz spectrometer at IISc, Bangalore, Karnataka, India. The chemical shifts have been proven in δ values (ppm) with tetramethylsilane (TMS) as an internal standard. LC-MS changed into acquired the usage of a C-18 column on Shimadzu, LCMS 2010A, Japan. The FT-IR spectra of the compounds were taken as KBr pellet (a hundred mg) the usage of Shimadzu Fourier Transform Infrared (FTIR) spectrometer. Magnetic susceptibility have been measured at 35 °C through the Gouy technique. Silica gel GF254 thin plates from Merck were used for TLC and spots were positioned either by UV or dipping in potassium permanganate solution. The powder X-ray studies was carried out by using Rigaku Mini Flex instrument with Cu-K_α radiation (wavelength 0.154 nm). The thermal gravimetric analysis of all metal complexes were taken by the Diamond TG/DT Analyzer (TG/DTA) at room temperature of 700 °C below heating pace of 20 °C min⁻¹.

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**Mixed ligand Co(II) Complexes: Synthesis, Characterization,
DNA binding and Photonuclase Studies**

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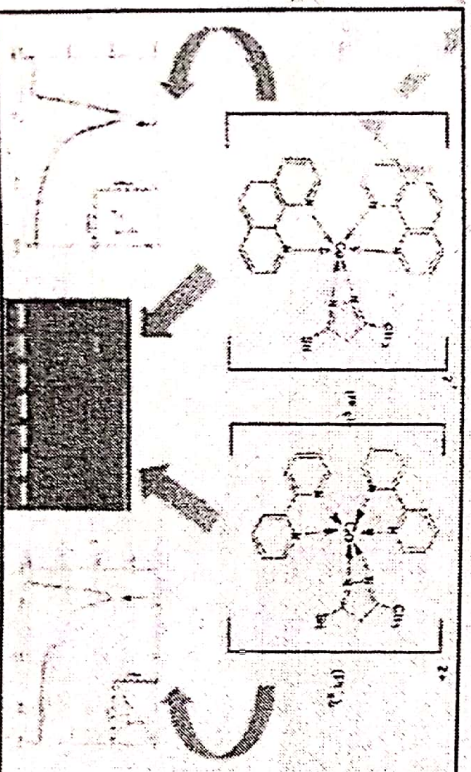
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ABSTRACT

A new cobalt complex of the $[M(L1)_2(L2)]^{2+}$ where M is a Cobalt metal ion and L1 = phenanthroline/bipyridine; L2 = 5-methyl-1,3,4-thiadiazole-thiole, have been synthesized and characterized by elemental analysis (CHN), FT-IR and UV-visible (UV-Vis) spectroscopic techniques. The DNA-binding property of the complexes has been investigated employing absorption spectroscopy, viscosity measurements and thermal denaturation study. The DNA cleavage experiments were carried out by gel electrophoresis method using pUC19 DNA. The experimental results show that both complexes can bind to DNA in an intercalation mode.

Graphical Abstract



Keywords: Thiadiazole, Elemental analysis, Electrophoresis, Intercalation

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Synthesis, characterization and tumor inhibitory activity of a novel Pd(II) complex derived from methanethiol-bridged (2-((1*H*-benzof[*l*]imidazol-2-yl)methylthio)-1*H*-benzof[*l*]imidazol-6-yl)(phenyl)methanone

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In this study, we designed a therapeutic active Pd(II) complex with the new (2-((1*H*-benzof[*l*]imidazol-2-ylmethylthio)-1*H*-benzof[*l*]imidazol-5-yl)(phenyl)methanone ligand in good yield. The structure of the ligand and its Pd(II) complex was characterized via IR, UV-visible, ¹H-NMR, ¹³C-NMR, mass spectroscopy, TGA and powder XRD techniques. The spectral data of the Pd(II) complex indicated the bidentate bonding mode for bis-benzimidazole and suggested a tetrahedral geometry for the metal complex. The *in vitro* antiproliferative effect of the BIPM ligand and Pd(II) complex were tested against the MCF7, A549, Ehrlich ascites carcinoma (EAC) and Dalton's lymphoma ascites (DLA) carcinoma cell lines. The metal complex exhibited excellent antiproliferative potency with a significant IC₅₀ value of ~10 μm against the EAC cell line compared to the ligand alone with a value of ~17 μm. Further, the *in vivo* antitumor effect study on the Pd(II) complex against a murine EAC tumor model system showed obvious extended survivability. The tumor inhibitory mechanism of the Pd(II) complex is due to its antiangiogenic effect and promotion of apoptosis, as verified by DNA condensation and FACS analysis. The potential photo-induced binding mode on double-stranded calf thymus DNA and protein cleavage activity study on pBR322 DNA of the complex confirmed its apoptotic characteristics. The significant hypochromic shift due to the strong π-π stacking interaction between the metal complex and the base pairs of DNA was clearly shown by the intrinsic DNA binding constant, *k_b*. The molecular docking study on the Pd(II) complex interaction with DNA further confirmed its inhibition ability. The experimental results and drug-likeness properties of the Pd(II) complex suggest its potential applications, which can be developed as a potent anticancer drug in the near future.

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See/Reply

1. Introduction

Cancer is the uncontrolled, rapid and pathological proliferation of abnormal cells, which is one of the most formidable afflictions worldwide.¹ Cancer causes about 550 000 deaths a year and is the

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Research Article



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Cd(II) Mixed Ligand Complex Containing 2-Aminothiazole and Triphenylphosphine; Synthesis, Spectral, DFT and Biological Activity Studies

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ABSTRACT

Mixed ligand Cd(II) complex containing phosphine and 2-aminothiazole ligand have been synthesized and their structures was elucidated using a various physico-chemical techniques. The mixed ligand complex are screened for their pharmaceutical activity followed by antimicrobial and antioxidant. These studies showed interesting results and therefore their insitico molecular docking interaction of the complex with antimicrobial receptor 1STTE studied. The result concludes that the complex having good docking interactions with amino acid residues of the receptor 1STTE.

KEYWORDS: Antimicrobial activities; molecular docking studies; MIC level; Antioxidant activity.

INTRODUCTION

Cadmium is a highly toxic metal and a potent carcinogen. However, its mechanism of action still unclear. Complexes containing sulphur are of great importance from a bioinorganic point of view, mainly due to the presence of thiolate donors in the coordination sphere of many metal ions in very diverse metalloproteinase [1-4]. The coordinative behaviour of cadmium(II) is typical of a soft acid. This fact is its strong interactions with S- and HS- groups leading to the formation of highly stable complexes. Cd^{II} is able to substitute Zn^{II} in the active site of several Zn-enzymes and to interfere with the metabolism of Ca^{II}. Therefore, interest has been devoted in the past decade to the coordination chemistry of

cadmium. The coordinative behaviour of the cadmium(II) ion resembles that of mercury(II) and in a lesser extent of zinc(II). The main coordination numbers observed for Cd^{II} are 4, 5 and 6. Owing to the larger size, Cd^{II} assumes coordination number 6 more easily than Zn^{II} [5]. Metal complexes of biologically vital ligands are often more active than the free ligands [6]. Particularly phosphine based cadmium(II) complex has been reported to possess significant bioactivities [7, 8]. The presence of nitrogen and sulphur in these complexes can enhance antitumor, antibacterial and antifungal activities of transition metal complexes [9]. The interaction phases and the geometric position of

SYNTHESIS AND CHARACTERIZATION OF 2-SUBSTITUTED-4-NAPHTHO [2,1-B]FURAN-2-YL)-2,3-DIHYDROBENZOPH[1,4]THIAZEPINE FOR

ANTIBACTERIAL ACTIVITY

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ABSTRACT: A series of 2-substituted-4-(naphtho[2,1-*b*]furan-2-yl)-2,3-dihydrobenzo[*b*] [1,4]thiazepine (6a-4f) were designed and synthesized. The substitutions are aliphatic, aromatic and heteroaromatic compounds. All the synthesized derivatives were characterized by using IR, Mass Spectral and ¹H-NMR Spectral studies. All the series of molecules were screened for their diverse antibacterial activity in relative percent inhibition, minimum inhibitory concentration and minimum bactericidal concentration. All compounds in this series (6a-4f) showed potent antibacterial activities.

KEYWORDS: Naphtho[2,1-*b*]furan, antibacterial activity, minimum inhibitory concentrations, minimum bactericidal concentration.

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1. INTRODUCTION

Heterocyclic compounds play a vital role in organic chemistry, especially in the field of medicinal chemistry. More than half of the naturally occurring compounds and a high proportion of drugs contain heterocycles. Organic and medicinal chemistry is becoming very essential chemistry, explores the role of chemists towards isolation, characterization and synthesis of new compounds that can be used as medicine for the prevention, treatment and cure of certain diseases.

Amongst the various oxygen heterocycles, five membered heterocyclic systems, i.e., furan have been investigated to large extent. Furan ring when fused with carbocyclic systems such as benzene and naphthalene gives condensed heterocycles like, benzofurans and naphthofurans. Naphthofurans possess a broad range of biological activities, which are the constituents of important natural products [1-3]. The literature survey revealed that derivatives of naphtho[2,1-*b*]furan synthesized have been found to exhibit a wide range of biological and pharmacological activity [4-7].

The complexes of naphtho[2,1-*b*]furan exhibit a wide range of biological activities including antimicrobial, antelmintic, analgesic and anti-inflammatory activities [8]. The derivatives of naphtho[2,1-*b*]furan synthesized have been found to possess wide spectrum of pharmacological and biological activities [9-10]. It is general observation that, introduction of nitro group sometimes enhances biological profile of the compounds to some extent. The nitro derivatives of naphtho[2,1-*b*]furan have been reported to exhibit antipyretic [11], analgesic [12], antihypertensive [13], antiviral [14], anti-inflammatory [15], antiparasitic [16], antimicrobial [17], anticancer activity [18] and some were shown to be mutagenic in bacteria [19]. Hence the literature survey reveals that, varieties of naphtho[2,1-*b*]furan derivatives exhibit prominent pharmacological and biological activity. This prompted us to undertake the synthesis of naphtho[2,1-*b*]furan derivatives (Scheme-1) and to evaluate the

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New Approach for the Synthesis of *N*(4-oxo-3-substituted-2-Sulfanylidene Imlidazolidin-1-yl)Naphthol[2,1-b]Furan-2-Carboxamide Derivatives and Their Antimicrobial Activity

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ABSTRACT

The reaction of naphthal[2,1-b]furan-2-carboxamide 4 on treatment with various aromatic phenyl sulfonylurea in glacial acetic acid affords 2-(naphthol[2,1-b]furan-2-carboxyl)-3-(substituted)pyridazine-1-carboxamides 5a-f. This on heating with chloroacetyl chloride in DMF produces *N*(4-oxo-3-substituted)2-sulfanylidene imlidazolidin-1-yl)naphthol[2,1-b]furan-2-carboxamides 6a-f. The structures of 6a-f have been established by spectral studies. In addition they have been screened for antimicrobial activities.

Key words: esylated, 2,1-b]furan-2-carboxamide and antimicrobial activities.

INTRODUCTION

Indazoles are important heterocycles found in many biologically active compounds. Imidazolidrus are biologically active pyrimidines and synthetic intermediates in medicinal chemistry. Imidazolidones exhibit high range of biological activities¹ including anti-oncogenetic, antihypertensive, antidiabetic, antihypoglycaemic², antihyperlipidemic³, analgesic⁴ and anticancer⁵ activities. Naphthol[2,1-b]furan derivatives were known to show various biological⁶ and pharmacological activities. Naphthol[2,1-b]furan derivatives with imidazolidone ring is not synthesised so far. Hence it was thought to synthesize new derivatives of naphthol[2,1-b]furan derivatives with imidazolidone ring by simple method and screened them for antimicrobial activities.

MATERIALS AND METHODS

All the chemicals were of A. R. grade and used with further purification. Melting points were determined with the open capillary and are uncorrected. IR spectra was recorded in Nicolet 5700 FT-IR instrument (Hitachi).

Melting (M.P) (USA) by using KBr pellets. The ¹H NMR spectra are recorded on VNMRS-400 NMR instrument using TMS as internal reference. Chemical shifts are reported in δ (ppm). Mass spectra were recorded using Waters SYNAPT G2 QTOF LCMS instrument. Purity of the compounds was checked by TLC.

EXPERIMENTAL

2-Naphthol is subjected to Reimer-Tiemann reaction to get 2-hydroxy-1-naphtholdehyde 2. This on reaction with ethyl chloroacetate gives ethyl naphthol[2,1-b]furan-2-carboxylate 3. The ester 3 on condensation with hydrazine hydrate in ethanol gave naphthol[2,1-b]furan-2-carboximidone 4. The on treatment with various isothiocyanates yielded naphthol[2,1-b]furan-2-carboxyl)-3-(substituted)pyridazine-1-carboxamide. These compounds on condensation with chloroacetyl chloride in DMF give the title compounds. *N*(4-oxo-3-substituted-2-sulfanylidene)imlidazolidin-1-yl)naphthol[2,1-b]furan-2-carboxamide derivatives 6a-f.

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Synthesis, spectral studies, XRD, thermal analysis and biological screening of metal complexes derived from (N-(3-methoxyphenyl)-2-[(2E)-3-phenylprop-2-enoyl] hydrazinecarboxamide [(2E)-3-phenylprop-2-enoyl] hydrazinecarboxamide

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Abstract: Complexes of nickel(II), cobalt(II), copper(II), zinc(II), and manganese(II) are derived from the ligand, (N-(3-methoxyphenyl)-2-[(2E)-3-phenylprop-2-enoyl]hydrazinecarboxamide [MPH] and structurally characterized by various physicochemical and spectral tools such as FTIR, UV-Visible, ¹H NMR, LC-Mass, P-XRD and TGA-DTC. These studies showed that the ligand coordinated to the 3d metal ions in bidentate manner. X-ray diffraction studies indicates that the Ni(II), Cu(II) and Zn(II) complexes are crystalline in nature. Degradation mechanisms, thermodynamic and kinetic parameters of the synthesized metal complexes have been evaluated. The prepared ligand and complexes were evaluated for *In-vitro* antioxidant DPPH assay, in which metal complexes showed excellent activity. The molecular docking analysis by using human antioxidant enzyme DIT (PDB: 3MNG) have also been evaluated. The ligand and their metal complexes were screened for their antimicrobial activities against different pathogenic bacterial and fungal species.

Keywords: Semicarbazide, Metal complexes, P-XRD, TGA, antioxidant, Molecular docking.

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INTRODUCTION

Semicarbazide and its derivatives are reported to be pharmacologically and physiologically active and find various applications in the treatment of several diseases (1-2). These are biologically active and are nontoxic due to the presence of ureido unit (-NH-CO-NH-), which acts as pseudopeptide motif. The derivatives of semicarbazone are an important class of ligand containing nitrogen and oxygen as donor atoms. The chemistry of the transition metal complexes of semicarbazone became largely appealing because of their extensive profile of medicinal and pharmacological activity that provides a variety of compounds with diverse applications (3-5). The semicarbazone derivatives and their transition metal complexes

show variable bio-potential activities like antibacterial, antifungal, antiarthritic, antimalarial, antitumor, antiviral, and anti-HIV agents and they have been well documented in the literature (6-7). The above important applications of semicarbazone derivatives and their 3d metal complexes in various fields prompted us to synthesize some derivatives of semicarbazone and their complexes to enhance their activities and test against *Mycobacterium tuberculosis* (8-9). Now we report the synthesis, characterization, and biological activities of transition metal complexes containing amide-appended (2E)-3-phenylprop-2-enylhydrazide and 1-isocyanato-3-methoxybenzene. This ligand system coordinates with the metal ion in a bidentate manner through the carbonyl oxygen and azomethine nitrogen (10). The aim of the

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Synthesis, spectral and evaluation of biological activity of Ni(II) mixed ligand complex containing 2-aminothiazole and triphenylphosphine

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ABSTRACT

A mixed ligand Ni(II) complex has been synthesized using 2-aminothiazole and triphenylphosphine in good yield. The structure was characterized by physico-chemical. The antimicrobial activity of the synthesized compound was evaluated against bacteria (*Staphylococcus aureus*, *Staphylococcus epidermidis*, *Bacillus cereus*, *Pseudomonas*, *Vibrio cholerae* and *E. coli*) and two phytopathogenic fungi (*Aspergillus aureus* and *Aspergillus fumigatus*) using standard method at MIC level. Further the compounds are subject to in-silico molecular docking studies on antibacterial enzyme (STE). The lowest docking results concludes that the compounds showing good interactions with amino acids active sites of the receptor. This evidence that the compounds binds to active sites of the receptor and suggesting that it can be a good antimicrobial agent. The complex showed significant antioxidant activity.

Keywords: Antimicrobial and antioxidant activities, Molecular docking studies.

INTRODUCTION

The drug resistance property of bacteria and fungi becoming a major worldwide problem. It is therefore need to design a suitable potent drug that overcome this resistance has become one of the most important area of research today [1]. During recent years coordination compounds of biologically active ligands [2] have received much attention. The presence of nitrogen, oxygen and sulphur in these complexes can enhance antitumor, antibacterial and antifungal activities of transition metal complexes [3]. Phosphine based ligands have widespread pharmacological applications including antiviral, antioxidant, antifungal, anticancerogenic, antibacterial and antitumor [4]. Particularly phosphine based nickel(II) complex has been reported to possess significant bioactivities [5]. These metals play vital role in controlling gene expression, inhibiting cell division and hence are used as valuable anticancer drugs. However, problem associated with such complexes is their ready dissociation in solution leading to very reactive species that are unable to reach their pharmacological targets such as DNA. This rapid aquation and formation of very reactive species could be overcome if nickel(II) complex are stabilized by bulky ligands such as triphenylphosphine. In this context, an attempt has been made to synthesize a pharmacological active new mixed ligand Ni(II) metal complex. The antimicrobial activity, molecular docking and the In-vitro antioxidant scavenging activity of the metal complex have been evaluated.

MATERIALS AND METHODS

General Experiments

2-Aminothiazole, Triphenylphosphine, Nickel chloride, LR grade methanol, LR grade were procured from Sigma-Aldrich (INDIA), Himedia (INDIA), Labo Chemicals (INDIA) were used as received without further purification. Freshly distilled ethanol and methanol solvents were employed for all synthetic purposes.

Spectroscopic grade solvents were employed for spectral works. The products of this reaction was authenticated by matching spectroscopic data of the products obtained with those of the reported in the literature. ¹H NMR spectrum recorded on Bruker 400 MHz spectrometer at 115 \pm , Bengaluru, Karnataka, India. An elemental analysis was carried out with a Perkin-Elmer 2400 Series II C, H, N analyzer. Molecular weights of unknown compounds were characterized by LC-MS spectroscopy. Centralized instrumentation facility, Mysore University, Karnataka, India. UV-vis spectra recorded on varian Cary 5000. The Fourier transform infrared (FT-IR) spectrum of the compound was taken as KBr pellet (100 mg) the usage of a Shimadzu Fourier Transform Infrared (FT-IR) spectrometer. Melting point was determined in an electrically heated apparatus by taking the sample in a glass capillary sealed at one end.

Synthesis of [Ni(Ph₃P)₂(ATh)Cl₂](Ni(II) complex)

An ethanolic solution of NiCl₂ (0.5g, 3.6 mmol) was mixed with a hot stirring ethanolic solution of the 2-aminothiazole (0.36g, 3.6 mmol) and triphenylphosphine (0.94g, 3.6 mmol). The mixture was stirred with heating for 6 h, when the solid precipitated. The excess solvent was removed by filtration. The solid product was recrystallized from the methanol and the obtained complex was kept in a vacuum desiccator. The

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DESIGN, SYNTHESIS OF BIOLOGICALLY ACTIVE HETEROCYCLES CONTAINING INDOL-THIAZOYL-, THIAZOLIDINONE DERIVATIVES

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ABSTRACT

Objective: The present study envisage a novel series of thiazole, indole and thiazolidine derivatives, namely, *N*-(5-substituted-2-phenyl-1*H*-indol-3-yl)methyl-1-(5,6,7-tri-*n*-butyl-5,7-dimethylbenzo [b]thiazol-2-amine (4a-c), 2-(5-substituted-2-phenyl-1*H*-indol-3-yl)-2-(4,5,6,7-trimethylbenzo[d]thiazol-2-yl)thiazolidin-4-one (6a-c) and 5-benzimidazole-2-(5-substituted-2-phenyl-1*H*-indol-3-yl)-2-(4,5,6,7-trimethylbenzo[d]thiazol-2-yl)thiazolidin-4-one (6a-c) and 5-benzimidazole-2-(5-substituted-2-phenyl-1*H*-indol-3-yl)-2-(4,5,6,7-trimethylbenzo[d]thiazol-2-yl)thiazolidin-4-one (6a-c).

Methods: All the newly synthesized compounds were characterized by infrared, ¹H, ¹³C nuclear magnetic resonance and mass spectral data and elemental analysis and evaluated for *in vitro* antimicrobial activity.

Results: Novel compounds *N*-(1-(5-substituted-2-phenyl-1*H*-indol-3-yl)methyl)-1-(4,5,6,7-tetrahydro-5,7-dimethylbenzo [b]thiazol-2-amine (4a-c), 2-(4,5-substituted-2-phenyl-1*H*-indol-3-yl)-3-(4,5,6,7-trimethylbenzo [b]thiazol-2-yl)thiazolidin-4-one (5a-c) and 5-benzimidazole-2-(5-substituted-2-phenyl-1*H*-indol-3-yl)-2-(4,5,6,7-trimethylbenzo[d]thiazol-2-yl)thiazolidin-4-one (6a-c) have been made and characterized using spectral and analytical data. The results of antibacterial and antifungal activities showed that some of the synthesized compounds exhibited promising activities.

Conclusion: All the newly synthesized compounds were carried out by the broth microdilution method (MCCI, 2002) in a DMF concentration of 500, 250, 125, and 62.5 µg/ml. Gentamycin and Fluconazole are used as reference standards for antibacterial and antifungal activity, respectively. The final results revealed that compounds 4b, 5b, and 6b exhibited potent antimicrobial activity when compared to the standard drugs.

Keywords: Indole, Thiazole, Thiazolidin-4-one, Antibacterial, Antifungal activities.

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INTRODUCTION

Heterocyclic compounds have occupied a unique place in the chemistry and these compounds displayed a wide range of biological activities, such as antibacterial and antifungal activities [1-6]. Further, the treatment of infectious diseases is lessens caused still remains an important and challenging problem for researchers due to their combination factors increase the number of multidrug-resistant in microbial pathogens developed. In despite a large number of antibiotics and chemotherapeutic drugs available for medicinal use in the market, at the same time, the phenomenon of old and new antibiotic resistance was developed in the past decades, medicinal properties substances need for new classes of antimicrobial agents. There is a real need for the discovery of new substances which provide with potent antimicrobial activity. However, by the high frequency of renal toxicity and several adverse effects [7] through the various synthesized molecules and for the above aim and to reduce the adverse effects [8,9].

It was demonstrated that thiazoles a unique heterocyclic containing sulfur and nitrogen atoms, occupies an important place in medicinal chemistry in terms of decreased toxicity after oral or intravenous administration and are often utilized in the treatment of fungal infections. Therefore the derivative of thiazole could be considered as possible antimicrobial agents [9]. Further, the thiazole nucleus frequently appears in various natural products and biologically active compounds. Similarly, there has been a keen interest in the chemistry of thiazolidin-4-one ring system, which is a core structure in various synthetic pharmaceuticals displaying a wide range of biological activities [10]. Thiazolidinone ring also occurs

in nature, thus aceticacid acid isolated from *Streptomyces* strains exhibit slightly specific *in vitro* activity against *Mycobacterium tuberculosis* [11]. Thiazolidinone derivative are also known to exhibit diverse bioactivities such as anticonvulsant [12], antibacterial [13], anti-plasmodic activating factor (PAF) [14], antihistaminic [15], anti-allergic [16], cyclooxygenase inhibitor [17], Ca²⁺-channel blocker [18], PAF antagonist [19], cardioprotective [20], anti-ischemic [21], anticancer [22], tumor necrosis factor- α antagonist [23], and nematocidal activities [24]. The synthesis of heterocycles containing multi-structure in a molecule has received much attention in recent years [25].

It is well known that heterocyclic compounds containing nitrogen and sulfur are of great interest to researchers due to their diverse biological activities. The literature data show that 4-thiazolidinone scaffold is very versatile and has featured in a number of chemically used drugs in the market. They have exhibited an antibacterial, antifungal and antimycobacterial activity [26], antitubercid [27], antiochidial [28], anticancer [29], and analgesic [30] activities. However based on the wide spectrum of biological profile of indole, thiazole and thiazolidin-4-one and their derivatives increasing importance in the pharmaceutical and biological field. Hence, linked heterocycles containing indole, thiazole, and thiazolidinone have been synthesized and in continuation of our ongoing research on biologically active heterocycles [31-38], these observations encourage us to design drug strategy to synthesize several indole derivative possessing thiazole and thiazolidin-4-one moieties at 3-position of indole ring in a single molecular framework with potential antimicrobial activity.

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Spectral, DFT Calculations, Biological and Molecular Docking Studies of 2-[(Thiophen-2-ylsulfanyl)Methyl]-1H-Benzimidazole Based Metal (II) Complexes

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ABSTRACT

The metal complexes of Co(II), Ni(II), Cu(II) and Zn(II) derived from 2-[(thiophen-2-ylsulfanyl)methyl]-1H-benzimidazole (BI) were synthesized. The bonding mode and geometrical structures of the BI and its metal complexes were analyzed by different analytical and spectral methods. All the complexes adopt the bidentate mode of coordination and display the octahedral geometry, except Cu(II) complex exhibits distorted octahedral geometry. X-ray diffraction powder pattern data suggest that mono-crystalline phase for BI, Co(II) and Cu(II) metal complexes. The DFT calculations were applied to optimize geometric structures of the ligand BI, Co(II), Ni(II) and Cu(II) complexes. Using DFT-based optimization of structure, bond length, bond angle, HOMO-LUMO, energy gaps were theoretically calculated at the B3LYP/6-31G(d,p) level of theory. The anti-hepatic activity has been carried out in which Ni(II) and Zn(II) exhibit potent enzyme inhibition against chicken pancreatic lipase enzyme. Moreover, the BI and all complexes were studied with respect to their DPPH antioxidant activity, showed excellent activity and it is correlated with the in-vitro docking studies by using antioxidant inhibitor 1,2-dithiolane-4,5-diol (DTT) with human pancreatic enzyme (PDB code: 3MRG).

KEYWORDS: 2-mercaptobenzimidazole, metal complexes, DFT, XRD, In-vitro docking

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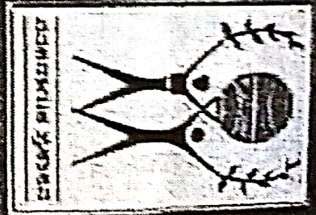
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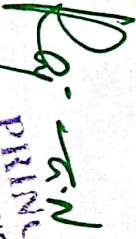


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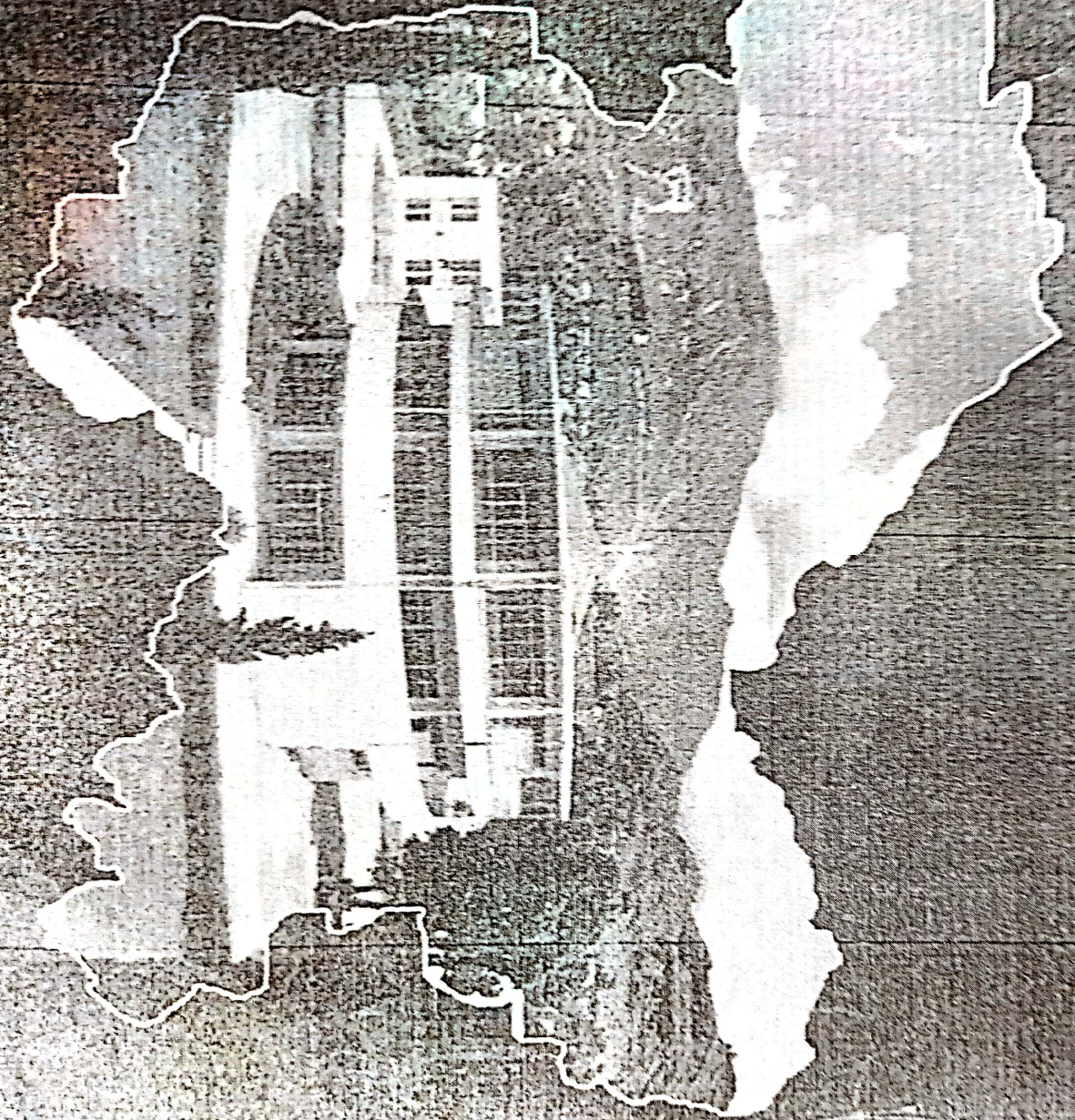
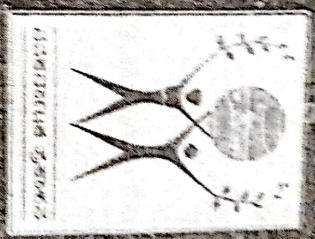
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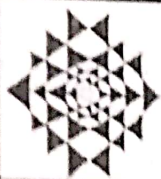
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INDIGENOUS ORNAMENTAL CYPRINID FISH DIVERSITY OF BHADRA RESERVOIR, KARNATAKA

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Abstract

This present work, based on an extensive field survey and fish sampling conducted over a period of 12 months, illustrated the status and availability of cyprinid indigenous ornamental fish species in Bhadra reservoir, Karnataka. A total of 27 species and 13 genera were recorded. The survey result showed that among the total fish species collected, genera *Labeo* is dominant with 5 species followed by *Puntius* with 4 species. Among the 27 species of fishes, 13 species can be regarded as classified aquarium fishes and the rest 14 species as non-classified aquarium fishes. Many of these species have been reported to have good domestic as well as export market value. Hence, proper management and utilization of this fish wealth is necessary to take up the sustainable steps to monitor and conserve indigenous fishes.

Keywords: Bhadra reservoir, Indigenous ornamental fishes, Classified & Non classified aquarium fishes.

INTRODUCTION

India is one among the top ten mega-diverse countries of the world in terms of fish diversity (Dudgeon 2003). Fish Base (Froese & Pauly 2016) has listed 917 freshwater fish species (out of 2465 total fish species) as occurring in India. Considering the enormous and diverse indigenous fish resources of the country, there is immense scope for India to become a potential candidate and a strong competitor in the international ornamental fish trade. Among the different states of India, West Bengal holds the high diversity of fish resources (Sanyal et al., 2012) of which there are some indigenous varieties which could be gainfully utilized as ornamental fishes due to their attractive color, shape, behavior etc. The popularity of these fish varieties as aquarium species both in domestic as well as in the international markets has already been documented (Gupta & Banerjee 2008, 2012a,b, 2014; Gupta et al., 2016).

The Western Ghats is the richest region in India with respect to endemic freshwater fishes. Northeastern India, which has a very high diversity among freshwater fish, does not have many endemic species within India because of its jagged political boundary. There are about 450 families of freshwater fishes globally. Roughly 40 are represented in India (warm freshwater species). About 25 of these families contain commercially important species. Number of endemic species in warm water is about 544. Freshwater fishes are a poorly studied group since information regarding distribution, population dynamics and threats is incomplete, and most of the information available is from a few well-studied locations only (Zoorach organization 2010; Sabuj Kumar Chaudhuri 2010). Ornamental fishes usually mean attractive colorful fishes

of various characteristics, which are kept as pets in confined space of an aquarium or a garden pool for fun and fancy. Ornamental fishes are usually kept in glass aquarium and hence popularly known as "Aquarium Fishes". These living jewels need not always have bright colors; as sometimes their peculiar characteristics such as body color, morphology, mode of taking food etc. may also add to their attractiveness (Timpis/Smiths edition).

However, detailed information on the freshwater indigenous ornamental fishery resources of Bhadra reservoir is still lacking. To fill this gap, the present study was carried out to document the indigenous ornamental fish faunal resources from upstream and downstream stretch of the Bhadra reservoir, Karnataka provide baseline information on their diversity and conservation status.

MATERIALS AND METHODS DESCRIPTION OF THE STUDY AREA

Bhadra reservoir is situated in Gulbarghore district of Tankere taluk near Lakshavalli village, of Karnataka. The reservoir is located at 13°42'00" N latitude and 75°38' 20"E longitude. It is located at an elevation of 601 m above Mean sea level. The Bhadra River arises from Yarsala hills (Ganga Mool). This is multipurpose project for power generation as well as for irrigation. The Bhadra basin gets the inflows from the south west monsoon (June-September) and North-east monsoon (October-December). The catchment area at site is about 1968 Sq km, the average rainfall of that area is 117 cm to 513 cm. The depth of the reservoir is about 186 feet and total length is 1445 feet. Reservoir is designed to impound 61.70 TMC of water to irrigate an area of 1, 05,570 ha of land in Chikmagalur, Shivamogga, Chitradurga and Bellary district. The water

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Population Dynamics Of Yellow Stem Borer *Scirpophaga incertulas* (Walker) On Rice (*Oryza Sativa*): Using Sex Pheromone Trap At Shivamogga District, Karnataka.

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Abstract: The insect *Scirpophaga incertulas* commonly known as yellow stem borer (YSB) of rice is distributed widely covering almost all Asian countries. YSB usually occupied more than 90% of the borer population in the rice crop from seedling to maturity stage of the crop their infestation caused "Dead heart" at vegetative stage and "White ear" at reproductive stage respectively. Pheromone traps are the convenient tool to monitor adult male moth population of YSB in rice field. The present investigation was under taken at purple village, Shivamogga, Karnataka to monitor the population dynamics of YSB using sex pheromone trap during summer and kharif seasons 2017. The experimental result revealed that the YSB moth catches reaches its peak during 1st standard week (44.4 moths/week) during summer and 3rd standard week (36.2 moths/week) during kharif respectively.

Key words: Sex pheromone trap, Insect *Scirpophaga incertulas*, Jyothi cultivar.

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I. Introduction

Rice (*Oryza sativa*) occupies the prominent place in Indian agriculture. It is the most important staple food crop of most of countries in developing world. About 90% of the world rice is produced and consumed in Asia (Anonymous 2004) being a staple food of 2.7 billion people in Asia alone (Kumar et al., 2009). Approximately 148 million hectares of land globally under rice cultivation with a production of 483 million tonnes (FAO, 2012). A number of insect pests infest of the rice crop. Among them extent of damage caused by stem borers varied from 80-90% (Sharma et al., 1996). The yellow stem borer *Scirpophaga incertulas* (Pyralidae: Lepidoptera) of rice is one of the major destructive pest in all rice growing region of the Asia (Lisinger, 1979) and is the dominant and is considered as prime destroyer responsible for major causing yield loss of about 10-60% (Chatterjee and Mondal, 2014). The larvae of *Scirpophaga incertulas* cause Dead heart (DH) during vegetative stage of the crop and White ear head during the reproductive stage of the crop respectively. Pheromone traps (Sex pheromone traps) are the convenient tools to monitor adult male moth population of YSB in rice. Pheromone traps has been used for monitoring the male moth population of YSB with three reasons, the first is to detect the occurrence of the pest, the second is to identify occurrence of the pest and third is to estimate the actual field population density of the pest.


II. Materials And Methods

The experiment was conducted at purple, Shivamogga district Karnataka, during summer and kharif seasons of 2017, in order to monitor the population dynamics of yellow stem borer using sex pheromone trap on rice variety Jyothi, for this purpose field preparation was done and all the recommended cultivation practices were followed during the period of investigation except plant protection measures. Geographically shivamogga is situated between 13° 27' N latitude and 75° 37' - 75° 52' E longitude with an altitude of 650 meters MSL. The mean annual rainfall of Shivamogga was about 829 mm. The place lying in Southern Transitional Zone (Zone-7) and receives an average annual rainfall of 842.33 mm distributed well over the season.

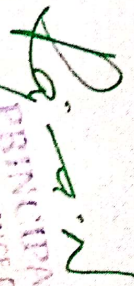
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Studies On Water Quality Evaluation Of Nidige Tank (Chunchadri Water Sports), Shivamogga, Karnataka, India

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Abstract: Present work was designed to study the water quality of Nidige tank (Chunchadri water sports) of Shivamogga based on physico-chemical aspect. Sampling was done from June 2014 to May 2015. Physico-chemical parameters like Water temperature, pH, Turbidity, Dissolved Oxygen, Biological Oxygen Demand, TDS (Total Dissolved Solids), Total alkalinity, Carbon dioxide, Total hardness and Chloride were analyzed. Mean with standard deviation and correlation matrix were taken. In this study, the air temperature ranges from 23.3°C to 30.3°C whereas water temperature ranges from 10.1°C to 26.8°C. pH ranges from 7.32 (January) to 7.76 (May). Lowest value of turbidity observed in December (14.4 NTU) and highest value was observed in August (55.3 NTU). Dissolved oxygen fluctuated between 5.14 to 8.21 mg/l. The values of Biological oxygen demand ranged from 0.78 to 1.85 mg/l. Total hardness values observed are 25.1 to 33.9 mg/l. Free carbon dioxide varies from 1.3 to 4.1 mg/l. Lowest value of TDS observed in July (19.5) and highest value was observed in June (29.32). Total alkalinity level ranges from 31.15 mg/l (July) to 62.78 mg/l. Chloride content ranges from 24.32 to 16.14 mg/l. According to above result, the selected tank water is used for human consumption after proper treatment.

Key words: Nidige tank, physico-chemical parameters, Correlation co-efficient, Shivamogga, Karnataka

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1. Introduction

Water resources are of critical importance to both natural ecosystem and human development (Medudhula Thirupathaiah et al., 2012).. It is essential for agriculture, industry and human existence. The healthy aquatic ecosystem is dependent on the physico-chemical and biological characteristics (Venkatesharaju et al., 2010). Water is one of the most important and abundant compounds of the ecosystem. All living organisms on the earth need water for their survival and growth (Yogitha and Ramachandra, 2018). Physico-chemical parameters play an important role in the quality of any type of water body. The normal ranges of physico-chemical characteristics indicate the good water quality (Swaminathan and Manonmani, 1997). The quality and quantity of surface water bodies like lakes and tanks depend upon on the climate, catchments, geography of the area and inputs and outputs both natural and manmade (Gray, 1994). The water quality of lakes and tanks can be degraded due to microbiological and chemical contaminants. Lentic water bodies play a very important role in maintaining the biodiversity and over all ecological balance in nature. Environmental pollution is a modern day evil affecting all ecosystems (Mahapatra and Rangarajan, 1995). Unplanned urban development has posed gigantic problems of environmental pollution. Due to this, water of natural bodies is getting polluted at an alarming rate (Shastri et al., 2008). Due to anthropogenic activities, rapid industrial growth, domestic and agricultural activities of the region, the water body is being polluted, which is the case with almost all major water bodies of the country (Manjappa et al., 2008). The physico-chemical study could help in understanding the structure and function of particular water body in relation to its habitats. The proper balance of physical, chemical and biological properties of water in ponds, lakes and reservoirs is essential for limnological studies. Abundance of particular element might suggest the type of organism that may be found as well as indication of ecologically unfavorable ecosystem which can have negative or positive impact on the population i.e. high concentration of nitrate or phosphate is indicative of eutrophication (Pauli Shilpa et al., 2012).

Now-a-days, increasing effects of pollution have become a serious threat. Thus, periodic monitoring of water bodies is necessary to access its suitability for drinking and other purposes. Studies on physico-chemical dynamics of lentic water bodies were reported by several researchers (Sayeswara et al., 2011; Mahesh and Sayeswara, 2011; Sayeswara et al., 2012; Mahesh et al., 2012; Nafesa Begum et al., 2012; Neelam and Monodi, 2013; Bhamagar and Devi, 2010; Mahesh et al., 2014; Qureshimarva and Solanki, 2015; Dhananjai et al., 2016; Balbeen and Dayananda, 2016; Karhika et al., 2016; Sajitha and Vijayamma, 2017; Dinesh et al.,

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Butterfly Species Diversity, Occurrence and Abundance In Gandhi Park of Shivamogga, Karnataka, India

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Abstract: The survey was conducted to prepare a preliminary checklist of butterflies of Gandhi Park at Shivamogga, Karnataka. Shivamogga City Corporation is a heart land of Karnataka state. Climate of Shivamogga is tropically wet and dry. Majority of the rainfall occurs between June and early October. Butterflies were sampled from July to November 2016. This short term study recorded 36 species of butterflies in 27 genera from five families. Nymphalidae dominated the list with 16 species. Papilionoidea and Pieridae with 8 species each. Lycaenidae with three species and Hesperidae with only one species. It was found that two species of butterflies were very common, nine species are common, thirteen species are not rare and twelve species of butterflies were rare in occurrence in Gandhi park of Shivamogga. This study will enlighten the information regarding the diversity of butterflies and forms a baseline data for future butterfly studies.

Key words: Butterflies, Nymphalidae, Gandhi Park, Shivamogga

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I. Introduction

Arthropods are good indicators of habitats biodiversity, because they respond quickly to environmental changes, and are highly diverse taxon. Lepidoptera (Butterflies and moths) are the second largest order of arthropods and are most easily identified, making them particularly useful for biodiversity survey (Ehardt, 1985; Kremen, 1994; Inouye, 2001; Tiple and Arun, 2009). Butterflies are sensitive biota, which get severely affected by environmental variations and changes in forest structure (Pollard, 1991). Butterflies are the most beautiful and colorful creatures on the earth and have a great aesthetic value. They form an important part of the food chain of birds, reptiles, amphibians, spiders and predatory insects (Aneesh *et al.*, 2013). Butterflies are also sociologically significant as they are morphologically and colorfully meaningful which has various effects to the culture to some groups of people (Alma *et al.*, 2015). Butterflies serve the ecosystem especially by recycling nutrients (N,P & K) essential for crops (Schmidt and Roland, 2006). Their larvae release faeces while feeding on the agrastals and provide required nutrients to the crops (Marchiori and Romanowski, 2006) Butterflies and their caterpillars are dependent on specific host plants for food, thus the diversity of butterflies indirectly reflects overall plant diversity especially that of shrubs and herbs in the given area (Padhye *et al.*, 2006). Most of them are strictly seasonal and prefer only particular set of habitats (Kunte, 1997). The adult butterflies act as pollinators and help in pollination of many native plants. To a large extent, butterflies contribute to the growth, maintenance and expansion of flora in the tropical regions where these insects show high abundance and species diversity. For many predators like birds, lizards these butterflies both in larva and adult stages act as their prey species. Diurnal butterflies are preferred indicators of habitat disturbance because of their sensitivity to environmental changes, diversity, advanced taxonomy, and lower economic and temporal costs of collection (Bonebrake *et al.*, 2010; Daily & Erlich, 1995; Leon-Cortes *et al.*, 2003; Bonebrake & Soto, 2009). They also have been used as models to monitor temporal changes in plant-insect interactions, because climate change induces phenological mismatches between butterflies and their exploited plant species that can produce changes in trophic webs (Parmesan, 2006; Altermat, 2010; Koosis & Hufnagel, 2011). India is home to about 1504 species of butterflies (Triple, 2011) which is about 8.74% of total butterfly species of world and constitutes of 65% of total Indian fauna. Different species of butterfly are supported by different ecosystems of our country (Sprin *et al.*, 2015). Appropriate abiotic and biotic factors such as climate condition, temperature and wind exposure, availability of host and larval plants (Barlow *et al.*, 2007), food and vegetation (Ravindra *et al.*, 1996; Khan *et al.*, 2004; Jain & Jain, 2012; Kharat *et al.*, 2012; Kumaraswamy & Kunte, 2013), topographic features (Amala *et al.*, 2011), habitat quality (Barlow *et al.*, 2007) are some of the most important parameters to determine butterfly composition in a community. Increased urbanization is one of the main cause of decrease in butterfly species richness, diversity and abundance (Blair and Launer, 1997; Clark *et al.*, 2007; Porewicz *et al.*, 2009) In the present day scenario, due to fragmentation of habit and depletion of natural cover many species of

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